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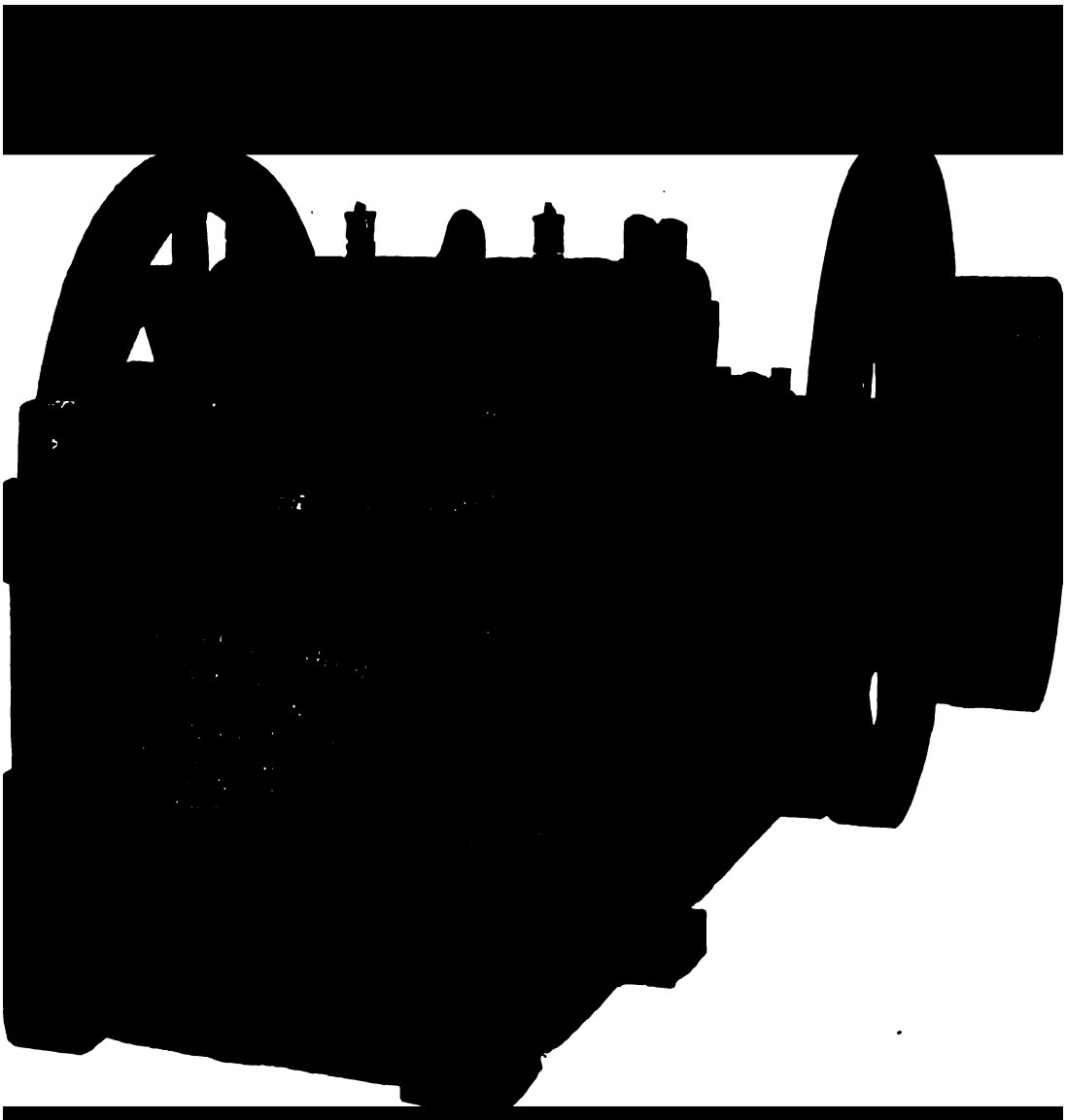

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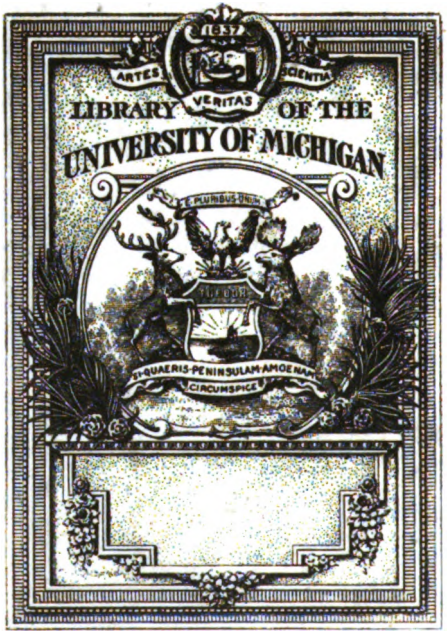

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THE COPPER HANDBOOK

A MANUAL OF THE COPPER INDUSTRY OF THE WORLD

VOL. IX

COMPILED AND PUBLISHED BY
HORACE J. STEVENS
HOUGHTON, MICH., U. S. A.
1909

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BY
HORACE J. STEVENS

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PREFACE.

This edition of the Copper Handbook, the ninth annual volume, is given to the public with a lively sense of its shortcomings, as compared with most of the preceding issues. To be sure, it is much larger and more comprehensive than any of the previous numbers, but a very large portion is a reprint from the issue of the year preceding. The new matter in the book is comprised in the two final chapters, giving an additional list of mines, with descriptions, and the usual statistical chapter, fully revised.

In explanation of the deficiencies of the present volume, it is necessary to state that an average of fourteen months has been required for the revision and issue of each annual number, and this has thrown the date of issue so far behind that this volume, dated 1909, will appear in March, 1910. The present book, the ninth in the series, is, like all preceding issues, the work of a single man, the author having had no assistance, except of a purely clerical nature, in the preparation of the work. The plan of writing followed is one that is very laborious for the author, but renders the work much better adapted to the needs of its readers. The plan of writing the book that has been followed from the first edition calls for the examination of a vast amount of material, from a great variety of sources, and the extraction therefrom of matter for the book in the form of notes. For the present volume upwards of one hundred thousand notes were dictated or written. These notes when written are placed in a certain set order, under various sub-captions, and the new descriptions written or dictated from the information contained in these notes, combined with available matter from the preceding edition, together with data contained in the direct reports of the properties furnished for this work, where such are on file.

It is obvious that the work of preparing an annual revision of the book along the lines that have been followed in the past is beyond the scope of one man's powers, and for future editions it will be necessary that the labor be divided, to which end capable assistance will be secured. It is hoped that what the Copper Handbook may lose in the unity that results from the work of a single author may be more than made up by the greater regularity of date of future issues, and the full and complete annual revision that should be given such a work.

To the end that nobody may have a just cause of grievance against the book or its author, a circular letter will be mailed to every old subscriber to the work, before the date of issue, giving full notice of the deficiencies of the present volume, and all others ordering the work will be given the right to return it within a week, should it prove unsatisfactory.

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The book is printed, this year as last, on special thin paper made for this publication, this being necessary in order to keep the work in single volume under the weight limit of two kilograms prescribed by the International Postal Union.

In the nine years of its life, the Copper Handbook has grown from a modest volume of 328 pages, in its first issue, to the present size of 1,630 pages, and the pages, as now set, contain 34.8 per cent more matter than was the case with volumes one to seven, inclusive, rendering the present issue equivalent, in matter, to 2,200 pages of the earlier editions. The first volume contained descriptions of 256 properties, while the present issue lists and describes no less than 7,551 mines and mining companies. So far as known, this is the largest number of titles ever given in any work of reference devoted to any branch of mining, or to mining as a whole.

The author wishes to return his sincere thanks to the mining companies and mining engineers who have shown their friendship for the book by furnishing returns, data, information and corrections. Without their assistance the book would be but a mere shadow of what it now is.

As in preceding editions, the author wishes expressly to disclaim all pretensions to infallibility, and to request criticisms, corrections and suggestions from any and all honest sources. Criticism and corrections will be welcomed, for it has been by such assistance that many past errors have been set right, and many pitfalls avoided. In this connection the author wishes to especially request investors in copper shares to bear in mind that the Copper Handbook is not infallible, and that errors will creep in, while later developments may change, most radically, the position or value of any given mining stock. While the matter in this work has been prepared in good faith, and with great care, there are several hundred thousand statements of fact contained within the covers of the book, and even were the proportion of accuracy to run as high as 99 per cent., which scarcely would be possible, the work would contain several thousand errors. All investors and all intending investors should use reasonable care and discretion in buying or selling mining shares.

To the subscribers of the Copper Handbook, to whose loyal support the success of the enterprise is due, and who have given this work the largest circulation of any mining annual printed in any language, the thanks of the author are returned most cordially.

HORACE J. STEVENS.

HOUGHTON, MICHIGAN, U. S. A., Dec. 30, 1909.

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THE COPPER HANDBOOK

CHAPTER I.

THE HISTORY OF COPPER.

The mists of antiquity shroud the discovery of copper, but the metal and its alloy, bronze, were known at a period so remote as to antedate the beginnings of history. Possibly gold, which occurs native, was discovered before copper, but the uses of gold in prehistoric times seem to have been purely ornamental, while those of copper, and its alloy, bronze, were utilitarian as well as ornamental, from their discovery.

The Neolithic, or polished stone age, was succeeded by the age of bronze, but the process of substituting weapons and implements of bronze for those of polished stone was not instantaneous, and doubtless was spread over hundreds of years, as polished stone and bronze instruments, obviously of about the same age, have been found in juxtaposition, at many points, and it should be borne in mind that while the comparatively civilized peoples of Asia Minor and the Nile valley were far advanced in the bronze age, the Greeks doubtless were in the Neolithic period, while the barbarians to the north had not advanced beyond the Paleolithic age. Similarly, the natives of the two Americas were in the bronze and stone ages, when discovered by Columbus, in the Fifteenth Century, at a period when the civilized peoples of Europe had left the bronze age two thousand years behind.

Copper is one of the six metals mentioned in the Old Testament, and the bible names Tubal Cain as a cunning artificer in brass and iron. A legendary account of the discovery of iron on Mount Ida has been handed down, but it is certain that copper was known to the ancients for a long time, probably some thousands of years, before the discovery and utilization of iron, and it is known that copper mines were worked on Mount Ida, in Asia Minor, centuries before the alleged discovery of iron.

According to the latest historical investigations, copper was known long before the time of Menes, the founder of the First Dynasty, who was the first king of Upper and Lower Egypt, and who reigned at a period possibly as early as 5500 B. C. Copper was known, at least as a rarity, by one of the aboriginal races of Egypt, probably as early as 7000 B. C. and possibly at a date considerably more remote. At a much later period, yet antecedent to the First Dynasty, the use of copper became more

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widely disseminated, and the metal was in quite general use in Egypt before the time of Menes. It is believed that the Egyptians used unalloyed copper for centuries before discovering the use of tin, the alloy of copper and tin producing bronze that is much harder than pure copper, consequently much better suited for weapons and implements of all sorts. The ancient Egyptians are believed to have used arsenic for hardening the copper when used alone.

Bronze was in very early use in Egypt, for the making of weapons and tools, and the use of bronze is mentioned in inscriptions antedating the great pyramids. Rawlinson says "A metallurgy of no small merit must have formed and originated the implements whereby materials, such as those used by the Egyptian sculptors, were worked with ease and freedom." Some of the blue and green pigments used by the earliest Egyptian painters contained copper.

King Sneferu, the first Pharaoh of the Fourth Dynasty, ascended the Egyptian throne at a date variously estimated from 2000 B. C. to 5000 B. C., succeeding the king who carved the great sphinx, and being in turn the immediate predecessor of Cheops, builder of the great pyramid at Gizeh. King Sneferu, according to the inscriptions of his reign, conquered the Sinaï Peninsula for its stores of mineral, hence the inference that its copper mines must have been opened at an even earlier date. The copper mines of Mount Sinaï, which are the oldest now known to man, are said to have been worked as recently as 1300 B. C. Ancient workings are still visible, with slags from the furnaces and occasional remains of tools. The oldest piece of bronze, of anything like an established date, is a knob from the scepter of Pepi I, a Pharaoh of the Sixth Dynasty, who flourished circa 3000 B. C. This remnant of the regal might of an early day now reposes in the British museum. The Posno collection, in the Louvre, at Paris, shows two small statues, believed by Perrot to date from the close of the Old Empire, or the beginning of the Middle Empire, circa 2300 B. C. These are light, hollow and cast in single pieces, showing workmanship of a high order. A hollow cast statue of Rameses II, of excellent workmanship, dates from 1300 B. C. As early as the New Empire, more than 2000 B. C., copper seems to have been the monetary basis of Egypt, as accounts were recorded in uten of copper, the uten being a spiral of metal, of about 91 grams weight. In the time of the New Empire, bronze was in use for armor and weapons, artisans' tools, occasional farm implements, household utensils, nails, locks, butts, hardware for chariots and boats, and for jewelry and general decorative purposes. In the old hieroglyphs, several varieties of bronze are referred to, according to their composition. The most common variety of bronze in use in ancient Egypt, as determined by modern assays, contained, respectively, 85 per cent copper and 15 per cent tin, and 88 per cent copper and 12 per cent tin, while bronze used for weapons and cutting tools contained 94 per cent copper, 5.9 per cent tin and 0.1 per cent iron, the iron probably having been included as an impurity, and not through design.

M. de Sarzec judges that copper was produced in Babylonia about 4000 B. C. Gudea, patesi or high priest of Lagash, who became a dependent king under Dungi II of Babylon, who reigned approximately 2000 B. C., at Ur—"Ur of the Chaldees"—collected, as material for temples and statues,

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copper from northern Arabia, and the metal and its alloy, bronze, were in quite general use throughout Babylonia at least as early as 2000 B. C.

Apparently copper was known to the Greeks from the earliest historical times. The ancient Greek historians credited the discovery of copper to Cadmus, who also is said to have invented the alphabet, both of which credits are open to serious doubt, as Cadmus really adapted the Phœnician alphabet to Greek use and doubtless brought the first knowledge of copper smelting to the Greeks from the same source. Apparently copper was first found by the Greeks near Chalkos, on the Island of Eubœa, hence took the name of chalcos, and was so termed by Homer, Hesiod and other early Greek authors. Pliny states that the method of reducing copper from its ores was discovered on the Island of Cyprus, whence the metal was termed by the Romans, first aes cyprium, and later, cuprum. This discovery unquestionably was merely an adaptation of the methods known to the Egyptians several thousand years earlier. The name of the metal in most of the modern European languages, as the English copper, Swedish koppar, Norwegian kobber, German kupfer, Spanish and Portuguese cobre, and French cuivre, are corruptions of the Latin cuprum. In the ancient mythologies, copper was consecrated to Hathor by the Egyptians, to Aphrodite by the Greeks and to her counterpart, Venus, by the Romans.

It is probable that the first copper mines of Cyprus were opened by the Phœnicians and that knowledge of the metallurgy of the metal was derived from them by the Greeks. The Phœnicians also brought copper from Asia Minor, and later from Iberia, beyond the Pillars of Hercules, and some of the ancient Carthaginian mines, in the Provinces of Huelva in Spain, and Alemtejo in Portugal, were reopened during the latter half of the Nineteenth Century, and remain large producers. It is certain that the Phœnicians brought tin, and possibly copper also, from Cornwall, at a period as remote, in all likelihood, as 500 to 700 B. C., which would indicate that the native Britons were possessed of a rudimentary metallurgy of considerable importance, at a period long antecedent to the conquest of Caesar. The hegemony of the ancient Phœnician world was wrested from the cities of Tyre and Sidon by Carthage, an early Phœnician colony which became far greater than its parent, and Carthage, in turn, lost the supremacy of the Mediterranean to the Romans.

The knowledge of copper possessed by the Romans doubtless was inherited from the Greeks, all of the historical evidences pointing to this conclusion, but it is certain that copper mines in Tuscany were worked by the Etruscans previous to the foundation of Rome. The copper mines of Piedmont, Liguria and Tuscany were worked extensively in Roman times, but the Ibèrian mines, wrested from the Carthaginians, formed the chief source of the copper supply of the Roman Empire. Spain has been furnishing copper to the world for nearly or quite three thousand years, and remains one of the principal sources of the world's supply. The Rio Tinto mine has been worked, off and on, for about three milleniums, yet remains one of the greatest copper producers of the globe. Prof. Vogt estimates that not less than twenty to thirty millions of metric tons of ore were mined during the eras of Phœnician, Carthaginian and Roman domination, from this mine alone.

During the dark period of the middle ages, mining, while not a lost

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art, certainly was not followed as systematically and successfully as during the more prosperous and enlightened era of the Roman Empire. The world's supply of gold and silver decreased from century to century, owing to the losses from attrition and misplacement not being made good by new production. Iron, being subject to rust, was mined and smelted as required, though the production was surprisingly small, and it is probable that the United States Steel Corporation now turns out, in every working day, more iron than was produced in all Europe in a full year, during the period of greatest darkness of the mediæval era. The supply of copper during the middle ages must have been very small, but statistics are so fragmentary that they scarce afford basis for estimates.

The production of copper from Iberian mines was spasmodic, but more or less of the metal was produced in every century, though the industry suffered a severe check when Spain was lost by the Western Roman Empire to the Visigoths, who, in turn, were succeeded by the Moors, that warlike race that held possession of southern Spain and Portugal, until driven out, late in the Fifteenth Century, by Ferdinand and Isabella. The San Domingos mines of Portugal, which were opened, certainly as early as Roman times, and, in all likelihood, by the Carthaginians, or their predecessors, the Phœnicians, were worked spasmodically during the middle ages, and were reopened in 1859, under modern methods.

The mines of Italy and Austria were small producers of copper in mediæval times, the most important Austrian mine being the Gratslitz, in Bohemia, which probably was the largest European producer about the Fourteenth or Fifteenth Century, but which was abandoned in the Eighteenth Century, though reopened, on a small scale, late in the Nineteenth. There are evidences that copper mines were worked in Bulgaria, and probably in Servia also, during the Roman era, and the Servian mines were small producers during the middle ages. There also was a little copper mining in Hungary during mediæval times, and possibly in Roumania also. Copper has been mined and smelted on a small scale in both European and Asiatic Turkey for some centuries.

In Germany, the Rammelsberg mines, in the Ober Harz, were opened circa A. D. 933, and have been producers for nearly a thousand years. The Mansfeld mines of the Ober Harz, opened A. D. 1199, have been fairly steady producers for 700 years, though with occasional hiatuses in output, due mainly to some of the numerous wars that were at once the business and the recreation of the middle ages. These mines made about 1500 long tons of fine copper in the days of Martin Luther, and were producers to about the same extent in 1860, but since have been developed into very large and successful mines, by the use of modern methods and equipment.

Stora Kopparberg, at Falun, Sweden, was opened A. D. 1228, and is claimed to have given to the world, to the end of the Nineteenth Century, not less than 1,200,000 tons of fine copper, remaining a small producer.

One of the earliest English mines was at Newlands, near Keswick, in Cumberland. This property was worked as early as A. D. 1250, and was working as late as A. D. 1470. The Ecton Hill mines, in Staffordshire, were among the earliest English copper mines after Newlands, and the tin mines of Cornwall were small producers of copper also, at least as early as the time of Queen Elizabeth, and probably for a century or

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two earlier, though copper production on a large scale began with the Eighteenth Century. The copper mines of Anglesea, in Wales, were producers in Roman times, and were reopened in the Eighteenth Century, but have been idle since about the middle of the Nineteenth Century. In Ireland, mines worked during the Eighteenth Century and up to their closing in 1880, have been reopened, in an exploratory way, during the early years of the Twentieth Century. As early as A. D. 1586, copper ore was shipped to Anglesea for reduction, and in A. D. 1765 there were several smelters treating copper ore near Bristol. The Welsh smelting industry at Swansea seems to date from the Sixteenth Century. The first copper pennies of England were coined A. D. 1717.

At the beginning of the Eighteenth Century Great Britain was making at least three-quarters of the world's copper. The Cornish mines produced 4,923 tons of refined copper in 1799, and the Welsh mines of Anglesea made nearly 2,000 tons in the same year. The great Mansfeld mine, in Germany, made only 372 tons in that year, and only estimates are obtainable for the products of other countries. Spain's output was insignificant, and the United States made but a few tons. Russia and Japan probably ranked next in importance after England as producers, and Austria, Norway, Sweden, Italy and several other nations made small contributions to the world's copper stock. Australia, South Africa and Canada were then unknown as sources of supply. It is a notable fact that one hundred years ago, the mines of the United States, Spain, Chile, Mexico, Canada, South Africa, Australia and Tasmania, which now make about 90 per cent. of the world's copper, were either totally undeveloped, or else producers of but a few tons each, while Great Britain, which made almost 7,000 tons of copper in 1799, produced but 550 tons in 1899.

At the beginning of the Eighteenth Century the English mines, in Cornwall, were making much the largest part of the world's copper output, and even at that date were of such considerable depth, and with such extensive underground openings, that the problem of disposing of the water was of vital importance. Many good mines were allowed to remain idle, solely because the expense of keeping them free of water was greater than the profits of operation. The first steam engine was built for a Cornish mine, the Wheal Por, by a Captain Savery, very early in the Eighteenth Century. It was but a partial success, and the plan was improved on by Newcomen, who erected a pumping engine at the Wheal Fortune mine, Cornwall, in 1720. The Newcomen steam engine was a crude and wasteful device, according to the standards of the present day, but it was much more effective than hand and horse power, or a water wheel, and was used in many of the larger Cornish mines for fifty years or more, until the genius of Watt brought forth the modern steam engine. It should be said, however, for Savery and Newcomen, that crude as were their engines, the pumping plan followed by them was essentially sound, and the Cornish pump, first made by Savery two hundred years ago, and improved a little later by Newcomen, remains the basic model for the Cornish mine pumps, scattered over the habitable world, wherever there are mines.

The first Watt engine, erected at Chacewater, Cornwall, in 1777, proved a great success, and came none too soon, as the larger mines, deepened by reason of the aid given from Newcomen's pumps, were at a depth

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where the first crude engines no longer could give satisfactory results.

Although steam power was first applied to copper mining two centuries ago, it was used only for handling water until after the beginning of the Nineteenth Century. The first application of steam power to other mining uses was in the first or second decade of the Nineteenth Century, when a hoisting drum was first actuated by steam.

For the first half of the Nineteenth Century, Great Britain maintained its position at the head of the world's copper producers, but for British copper mines the latter half of the century was a period of ever increasing depression, relieved by only occasional years of prosperity. The invention of the Watt engine and its application to pumping machinery enabled the mine operators of Cornwall and Anglesea to penetrate to depths theretofore undreamed of. In 1790 the Dolcoath mine, in Cornwall, was 600 feet deep; in 1816 it was down 1,368 feet, and in 1830 the Tresavean mine, also of Cornwall, reached the great depth of 1,920 feet. As the mines increased in depth rapidly, various improvements became necessary. The old method of raising ore in baskets, carried up ladders on the backs of men and women, was replaced by whims, operated first by hand, then by horse power, later by water-wheels, and eventually by steam, the ropes that hoisted ore in wicker baskets being coiled around these whims. A little later the hempen ropes were replaced by wire cables, and the baskets gave way to iron skips and cages. In 1842 the first man-engine was built, for taking miners to and from their work in the deep shafts. Mine surveying was introduced, and machinery employed in the mills, where hand-work had been the rule for centuries. The Anglesea mines enjoyed great prosperity for the first quarter of the century, but gave unmistakable signs of exhaustion a few years later, and in the fourth decade ceased to be important factors in the world's copper industry. The smelters of Wales had attained such growth, however, that Swansea still remains the seat of one of the greatest and most diversified smelting industries of the world.

Apparently the first copper mining was done in Japan circa A. D. 700, but the industry did not become important until about A. D. 1600, and in the Seventeenth Century, more or less copper was exported to Europe, through the medium of the trading ships of the Dutch, who enjoyed a monopoly of Japanese trade, until the excesses of the traders and missionaries lead to the closing of the ports in Japan to all foreign trade, after which Japan was a sealed book to the balance of the world, until reopened by Commodore Perry, in 1854. In 1830 the production of Japan was about 4,000 long tons, and in 1874 was only 3,360 long tons, of which four mines furnished about half, and nearly 200 mines the other half, giving an average annual production of about 10 tons only for the smaller mines. Modern Japan may be said to date from 1869, when the Tokugawa government was deposed, and the Shogun was compelled to surrender his usurped power to the Mikado, the rightful ruler. The readjustment of internal political affairs occupied the attention of the Japanese, almost to the exclusion of other matters, for some years, but about 1880 the task of readjusting the ancient economy of the empire to modern environments was begun in earnest, and from that year, in which the first modern mining and smelting machinery was introduced to Japanese

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mines, may be said to date the beginning of the present copper industry of Nippon—an industry that has made gigantic strides, and which is well equipped and conducted upon as modern methods as can be found in any country on the globe. Since 1890 the progress has been steady and rapid.

As early as the Sixteenth Century, copper was discovered in Cuba, Mexico, and several of the South American countries, but the Spanish conquistadors were more anxious for the gold of the Peruvian Incas and the silver from Potosi and Guanajuato, than for the baser metals, hence the production of copper in Spanish America remained trivial, being merely sufficient for local needs, until about the middle of the Nineteenth Century. In Chile a little copper mining was done during the Eighteenth Century, but the inception of the great copper mining industry of that country may be said to date from about 1840, when the systematic development of the great copper measures of Chile was undertaken along modern lines.

Argentina first became a producer of copper about 1856, but never has become a large factor in the industry, though possessing copper fields of promise, which doubtless will be heard from in the future.

In Mexico, copper was mined and smelted in a crude way, and to a very limited extent, by the Aztecs. A little metal was produced under Spanish domination, but the Mexican copper mining industry did not become important until about 1880, the profits of silver mining having blinded the miners to the possibilities of great returns existing in the baser metals. Mexico now ranks second only to the United States among the copper producing fields of the world, and its present large production is but an earnest of future possibilities, practically unlimited in extent.

In Cuba, copper mining was begun in the Sierra Madre Mountains, near Santiago, during the Sixteenth Century. These mines were reopened early in the Nineteenth Century, and secured a considerable tonnage between 1817 and 1868, the principal production being after 1834, when the various mines were bought and consolidated by an English company, annual production averaging about $1,000,000 in value, until the rebellion of 1868, when the plant was burned by insurgents.

In the United States, copper was discovered in Massachusetts as early as 1632, and in 1709 a company was incorporated in Connecticut, for the purpose of working copper ores. The copper deposits of New Jersey were exploited as early as 1719, but the copper mines of Vermont, dating from the Eighteenth Century also, remained the principal source of American production until the opening of the Lake Superior mines in 1844. A promising copper industry was begun, circa 1850, in Tennessee, but was destroyed by the American Civil War, and was not rejuvenated until nearly forty years later.

Really important copper mining in the United States dates from 1844, when the first production, a few tons of black copper ore, probably chalcocite, was taken from a fissure vein near Copper Harbor, Keweenaw County, Michigan. The beginnings of the Lake Superior industry were crude, but the growth was fairly steady from the start, and within two decades the Lake Superior mines became the most important producers of the United States, and second only to the mines of Chile, which were passed in the ninth decennium of the Nineteenth Century. The existence

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of the rich stores of native copper in the Lake Superior district was known to the aborigines, and these mines had been worked by some prehistoric people that left considerable traces of their extensive operations. In 1882 Montana, now the largest copper producing district of the world, made its first production of the metal, and the beginnings of the great copper industry of Arizona were a decade earlier.

In British North America, Newfoundland opened its first mines of importance in 1865. A little mining of cupriferous pyrites was done shortly afterward in the Province of Quebec. Copper mining in the Province of Ontario begun with the opening of the Bruce Mines in 1846, but really important copper production dates only from the exploitation of the great nickel-copper deposits of Sudbury about 1886, and the large and promising copper industry of British Columbia had its inception in the last decade of the Nineteenth Century.

In Northern Africa the mining of copper ore, along the shores of the Mediterranean, dates from prehistoric times, but in Southern Africa the industry had its inception in the opening of the O'okiep mine, in Little Namaqualand, Cape Colony, in 1852, though copper had been discovered late in the Seventeenth Century by the Dutch settlers, and some fugitive efforts made in the direction of mining. The exploitation of the copper resources of Central Africa, still at an early stage of development, dates from the closing years of the Nineteenth Century and the same remarks hold true regarding the copper measures and mines of German Southwest Africa. The first recorded production of Australian mines was in 1844, and it is probable that in the future Australia will become a much more important factor in the copper market than has been the case in the past.

In Asia, copper mining and reduction, along very crude lines, have existed for unknown centuries, in China, India and Persia. The copper measures of China are of much promise, and this ancient empire, now awakening to the light of Twentieth Century civilization, doubtless will become a large producer of this necessary metal during the present generation.

The copper industry of the Twentieth Century may be said to date practically only from about the middle of the Nineteenth Century. Of the leading copper producing fields of the world, Lake Superior, Montana, Arizona and Utah, in the United States, were unknown in 1840. Mexico, which now holds second place as a producer, made no copper worth mentioning previous to the last quarter of the Nineteenth Century. The present great copper industry of Canada is so recent that all of its principal developments have occurred since 1880. The copper production of Australasia and South Africa date from about the middle of the Nineteenth Century, and production along modern lines, and on an important scale, in Chile, also began about 1850. Of the really important copper producing fields of the world, only Spain, Germany and Japan have a history that is not covered by the span of life of a man of three score and ten.

The beneficial influence of the copper industry upon the mining and metallurgical methods of the world has been most marked, and the copper industry has been well to the fore in the introduction of improvements. Gunpowder for blasting was first used at Frieberg, in 1610, and was

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introduced at the Wheal Vor mine, in Cornwall about 1670. Steam for pumping and later for general use, was first introduced to mining at the copper properties of Cornwall. Wire rope and iron buckets for hoisting were first used in copper mining, and high explosives and power-drills for breaking rock were first used in the Lake Superior mines. The history of the metallurgy of copper for the past quarter century is almost coincident with the history of metallurgy as a whole for the same period.

Various attempts have been made to corner the production of copper since it became a metal of prime importance. The first attempt along these lines was made by the Associated Smelters of Swansea, which perhaps was the original copper trust. The Associated Smelters, which flourished from 1840 to 1860, was most arbitrary in its operations, buying as cheaply and selling as dearly as possible, and zealously guarding its smelting processes. The short-sighted policy of this association, in screwing prices of ore to the lowest possible figure, while advancing the price of the finished metal, aggravated by its arbitrary charges for draftage and moisture, and by the use of unfair assay methods, led to the establishment of independent smelters at or near the mines, in most of the principal copper producing districts, and effectually shattered the power of Swansea as the arbiter of the copper industry.

The second attempt at a copper corner was made by a group of French financiers, under the leadership of M. Secretan. The basis of this corner was the Société des Metaux, of Paris, formed 1877, which in February, 1887, became one of sixteen underwriters that organized the Secretan Syndicate, with a nominal capitalization of $13,587,000, eventually reduced to $10,718,500. Of this capitalization, the Société des Metaux held $2,910,000, and M. Secretan, personally, $2,328,000. The Comptoir d'Escompte, which then was second only to the Bank of France, among French financial institutions, became involved, first through guaranteeing purchases from the mines, and later through loaning funds to the Syndicate, originally upon the security of the metal itself, and latterly upon endorsements. The first step of the Secretan Syndicate was to secure control of the production of the Anaconda mine, in December, 1887, the Anaconda being, at that time, the largest copper producer of the world. This was followed shortly by the making of contracts with the Calumet & Hecla, Rio Tinto and other large mines producing at least 75 per cent., and probably as much as 85 per cent., of the copper output of the globe. At the end of August, 1888, the Syndicate had borrowed $24,825,000, and at the end of December, 1888, the Comptoir d'Escompte had loaned to the Syndicate the enormous sum of $33,368,000, of which only $16,878,000 was fully secured. The price of copper was advanced, speedily, by the Syndicate, from 11 cents to 17¾ cents per pound, this advance taking place within one month. Consumers, understanding the situation fully, reduced their demands to the lowest possible figure, and an immense amount of old copper was broken up and resmelted, the available supply of old copper proving vastly greater than had been anticipated by anyone, and forming perhaps the largest single factor in causing the downfall of the Secretan Syndicate.

Very early in 1899 the credit of the Syndicate was exhausted, and the Comptoir d'Escompte was so seriously involved that the manager

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committed suicide, and the bank was saved with great difficulty, while the Secretan Syndicate was demolished utterly. Notice of the failure of the syndicate was followed by an immediate drop, from the market price of £100 per long ton of copper, and, in a single day, in the spring of 1889, copper dropped £70 to £35 per long ton. The bankers, who had loaned immense sums upon copper stored in bonded warehouses, decided to sacrifice their holdings, at any price that would enable them to realize upon their collateral, but, through the action of the Calumet & Hecla, backed by the Anaconda, which threatened to put the price of copper to five cents per pound, unless the bankers would spread the marketing of the surplus over a period of years, utter paralysis of the copper trade was averted. The accumulation of copper made by the Secretan Syndicate, in a period of about eighteen months, has been estimated variously, but may be set down safely at about 175,000 long tons. A period of four years was required to work off this accumulated surplus, which was marketed without serious disturbance to the trade, though entailing six years of low prices for the metal.

The third attempt at a copper corner was made in February, 1899, by the organization of the Amalgamated Copper Company, avowedly formed with the intention of controlling, first the American, and, later the world's copper trade. This corporation was organized with a controlling share interest in the Anaconda, and several other smaller mines of Butte, to which, two years later, was added the Boston & Montana mine. The Amalgamated Copper Co., operating through its sales agency, the United Metals Selling Co., maintained the price of copper at 17 cents per pound until October, 1901, when it was seen that a break in prices was inevitable, and at which time nearly 200,000,000 pounds of copper had been accumulated, this being owned mainly by the Amalgamated Copper Co., and by its subsidiary and affiliated producers. A panic in the copper market was precipitated by the action of the United Metals Selling Co., in making repeated cuts in the price of the metal, at regular intervals. The Amalgamated was credited, popularly, with the intention of cutting the price of the metal squarely in two, to 8½ cents per pound. This price was not reached, however, for the reason that several of the large independent producers, led by Phelps, Dodge & Co., aided by several of the largest American consuming interests, stepped in and bought up all of the surplus copper remaining in the market, at prices around 12 cents to 13 cents per pound.

Early in 1907 an effort was made, by strong interests, to form a combination to include the leading American producers, with a view to maintaining prices through regulation of marketing, and by restricting production if necessary, but this effort was frustrated by the stand taken by several leading independent producers of the United States.

Further and more detailed particulars regarding the history of mining and metallurgical developments will be found in the chapters devoted to metallurgy and to the copper deposits of the world, in addition to which detailed references to the history of individual mines will be found in the descriptions of many of the more important copper properties, contained in the long chapter devoted to copper mines.

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CHAPTER II.

The Geology of Copper.

Merely an outline of geological features of interest pertaining to copper is attempted in this chapter. The subject is so great that many books of value have been written upon the matter by different authorities. From its very nature, geology is largely an empirical science, but the Twentieth Century geologist is a vastly better-fitted worker, in his chosen field, than his predecessor of even the preceding generation. The geological work of the Nineteenth Century, until well toward its close, was largely of a synthetical nature, but the new school of geology teaches, and with wisdom, that analysis must precede synthesis. As a consequence of this new spirit, great strides have been made in geological knowledge, and in the special field of copper, much work of a brilliant and highly valuable nature has been done during the few years of the present century. The work of Weed, Winchell, Kemp, Lindgren and other scientists of solid attainments and indefatigable industry has added greatly to our sum of knowledge of the geology of copper. The geologist, who was regarded, fifty years ago, by practical men, as belonging to much the same class of pseudo-scientists as the alchemist, has made for himself, through sound work, a safe place in the ranks of the technical men whose labors are of practical, as well as of theoretical value, to the world.

There is much diversity of opinion, on various important points, among the leading geologists of the present time, but out of this turmoil of argument and confusion, is arising a newer and a sounder knowledge of geology, not only in theory, but in its vital bearings upon the industry and civilization of the world, so fundamentally dependent upon an assured supply, at reasonable cost, of the important metals and minerals.

Rocks may be divided into three classes, these being igneous, sedimentary and metamorphic. The igneous rocks, fused in the bowels of the earth, and ejected by volcanic action, or oozing forth as magma from cracks in the earth's crust, may be divided into granitic, porphyritic, vitreous and tufaceous forms, this latter division including the tuffs ejected as scoriaceous material, by volcanic action. The sedimentary rocks were deposited by the action of water, usually on the beds of ancient seas. The detrital material so deposited formed conglomerate, shale, sandstone and limestone strata, and, in the case of the three forms first named, the material for sedimentary beds was obtained necessarily, mainly from the breaking down of the older igneous rocks. Strata of igneous and sedimentary rocks frequently alternate in the older geological groups. The third, or metamorphic class of rock forms, consists of altered rocks of both the igneous and sedimentary forms, in which the phenomena of crystallization and replacement have been brought about since their formation

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by the action of intrusive deposits of molten magma, and by the effects of percolating waters, whether meteoric or volcanic.

The ores of copper are described in detail in the chapter on chemistry and mineralogy, but some brief reference thereto is necessary in an outline of the geology of the metal. The principal copper ores of commercial importance may be divided into seven classes, as follows: Native copper, existing alone, or practically so, in the Lake Superior district, Bolivia and elsewhere, and occurring in the oxidized zone of mines of copper ore in almost every mineral field; oxide ores, including cuprite and melaconite; carbonate ores, including malachite and azurite; sulphide ores, of which chalcocite, bornite and chalcopyrite are the more important; chalcanthite, or sulphate of copper, occurring as an alteration product in many rich sulphide mines, and being the source of the copper secured by precipitation from cupriferous mine-waters; enargite, among the arsenides, and atacamite among the chlorides. In importance, the sulphide group is overwhelmingly preponderant, about three-fourths of the world's copper supply coming from ores of this class. Contrary to the opinion formerly held, chalcocite is a far more important source of copper supply than chalcopyrite, and bornite probably is but slightly behind chalcopyrite, as a source of copper supply from the sulphide ores. It is probable that chalcocite, which is the most important ore of copper, produces nearly one-half of the world's supply of the metal.

The copper ores are very showy, giving nearly every color of the spectrum, hence attract attention more readily than most ores of other metals, but nature has so deposited many of our most important stores of copper, as hereinafter described, that the outcrops first visible to the discoverer are merely rusty stains of hematite and limonite, both ores of iron, with colors ranging from yellow through brown to red, these outcrops occasionally carrying small quantities of green and blue copper carbonates.

The industrial metals known to man have varying affinities, this referring not only to their valencies, as determined by their position among the elements, but also referring to their preference for combining with other elements, and furthermore to their choice of neighbors, this latter depending, necessarily, largely upon the material available. It is found, however, in geological and mineralogical research, that certain groups of metals may be looked for in juxtaposition, under given circumstances. Gold, the king of metals, and platinum, scarcely the inferior of gold, hold themselves aloof from the common herd, and occur but rarely as ores. Silver is more democratic, and the common workaday metals are found commingled in a spirit of fellowship, but, as in the social fabric of man, there are certain family relations, and cleavage lines by which classes are formed.

Most copper deposits carry both gold and silver, usually in small quantities, but frequently in sufficient amounts to add materially to the gross values recovered, especially since the very general utilization of the electrolytic process for copper refining has made it possible to recover the precious metal values, practically without cost, while eliminating the impurities remaining in the blister copper turned out by the smelters. Lead and zinc are found very commonly in connection with copper ores,

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the three sulphide ores of copper, lead and zinc, being closely affiliated, and iron, while rarely considered a commercial product of copper ores, is found in the great majority of copper mines, first as the iron hat, marking the outcrop of the vein, and in the lower workings of the mines, chemically united with copper and sulphur, as chalcopyrite, or, as is frequently the case, intimately, but mechanically, associated as chalcocite and pyrite, the sulphide ores respectively of copper and iron. Arsenic and bismuth also are common associates of copper, these being deleterious elements. Zinc also, mechanically mixed with many copper sulphide ores, is a damage, and its presence has prevented the successful development of many otherwise valuable copper mines. Only within the past few years has it become possible to mechanically remove zinc from sulphide copper ores, previous to smelting.

The more common metals, and frequently the rarer ones, are found as component parts of many ordinary igneous rocks, though commonly in such small quantities that these rocks cannot be considered as ores of even the lowest grade. There are notable exceptions to this rule, as in the case of the monzonite ore bodies of Bingham, Morenci and Ely, and it is probable that in the future other sources of copper supply, of the first magnitude, will be found in igneous rocks, in which the original cupriferous contents have been enriched by local action. The enrichment of the monzonite ore bodies referred to, seems to have been due to the shattering of the solidified upper portions of the cooled magma, containing originally a small quantity of magmatic copper concretions, followed by the precipitation of additional copper, in the form of chalcopyrite, from the heavily mineralised magmatic vapors rising into the shattered zone from the still molten mass below. This process may have been aided by later enrichment from percolating waters, which would tend, however, as a rule, to extract the mineral values disseminated throughout the rock-mass, and segregate these values in fissures in the igneous rocks, or along the line of contact with adjacent sedimentary or metamorphic rocks.

In the light of present geological knowledge, it seems probable that the original source of most of the present workable copper deposits was in chalcopyrite disseminated sparingly, in minute particles, through the magma of igneous rocks. From these disseminated particles of chalcopyrite, most of our copper ore bodies have been formed, either by magmatic segregation, in which the greater part of the ore values was deposited, usually at the point of contact with adjacent rock forms, or by leaching therefrom. Nature is much the greatest chemist and metallurgist now doing business, and the work of her laboratories and forges, while exceedingly slow, is upon a vast scale, and never ceases. The sulphide ore values, contained originally in molten magma, have been reconcentrated, and redeposited, repeatedly in many cases, during the millions of years that have elapsed since the work was begun, consequently the miner finds ores existing in a great variety of forms, and giving evidences of complicated chemical reactions, as well as of long continued mechanical concentration.

In a complex magmatic intrusion, the edges of the intrusive mass naturally cool first, through the radiation of heat to adjoining rocks, and, in addition, the less soluble minerals are the first to crystallise. Copper,

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having a greater affinity for sulphur than is possessed by any other metal, is one of the first minerals to crystallize out of the molten magma, as chalcopyrite. These facts afford an explanation of the occurrence of magmatic ore bodies along the point of contact between igneous intrusives and the rocks so intruded. Many of the best workable bodies of copper ore are found at or near the contact between granitic intrusions and sedimentary or metamorphic strata adjoining, occurring either as contact deposits, or, frequently, in fissures traversing either or both the igneous mass and the adjoining strata.

Many important bodies of copper ore occur as contact metamorphic deposits, at or near the contact between intrusive rocks and stratified formations. While the exact genesis of these ore deposits varies according to circumstances, and frequently remains somewhat obscure, the main point of magmatic segregation seems sufficiently plain, and much corroborative evidence has been brought to light by recent investigations. These deposits may be separated roughly into two classes, the first being products of simple metamorphism, with slight changes in ore bodies previously laid down, while the more important, and probably more common class, is attended by contact metasomatism, due to reactions caused by vapors and magma emanating from the intrusive rocks. Where such ore bodies are deposited in limestone, which frequently is the case, further alterations and reactions of prime importance have followed the cooling of the igneous rock, in many instances, the limestone offering an exceptionally suitable reagent, in connection with percolating waters, for further chemical changes in the nature of the ores.

Rain, falling upon the surface of the earth, carries small quantities of oxygen and carbonic acid gas, both weak solvents of many minerals. The weakness of the solvents has been fortified by the immense quantity of rain so falling, and by the lapse of untold millions of years, during which the process of leaching has been continuous. When attacking primary sulphide ores, such as chalcopyrite or pyrite, the water carrying oxygen and carbon dioxide in solution, eventually sets free an atom of sulphur, which, combining with the water, forms a dilute sulphuric acid, very weak to be sure, but a much more powerful solvent than carbonic acid gas or oxygen, and the weak sulphuric acid solution reattacks the sulphide ores, gradually breaking them down, and taking them into solution, and they are redeposited, at suitable points, lower down, as enriched sulphides, carbonates and oxides, and occasionally as native copper. The synthesis of most of the important ores of copper has been fairly established by extended and successful laboratory reactions.

The important part played in ore deposits by water is now acknowledged by all geological authorities. In fact, it is a question if the importance of the work done by water in forming commercial ore bodies is not over-rated by some geologists. While the work of water in laying down ore bodies is generally acknowledged, there are considerable differences of opinion as to whether deposition has come mainly from waters of meteoric or of volcanic origin, and also whether the ore was deposited mainly from descending or ascending waters. There seem excellent grounds for believing that both descending and ascending waters have played very important parts in depositing mineral values. The rains that fall upon

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the surface of the earth sink into the rocks to great depth, there being practically no rock formations that are impervious, though the degree of permeability varies greatly. For all practical purposes the rocks composing the earth's crust may be considered permeable by water to the depth where increased temperature vaporizes it. That percolating meteoric waters have been responsible for a considerable proportion of the ore bodies now in existence seems reasonably assured, but that the meteoric waters have been, in many cases, greatly assisted by terrestrial waters, ascending from great depth, strongly charged with metallic solutions, also seems a hypothesis fully warranted by known facts. The terrestrial ascending waters naturally would possess the advantage of heat, to a degree adding greatly to their natural solvent power, and the pressure existing at great depths also would add largely to the solvent power of such waters.

In addition to the primary force of magmatic segregation, and the secondary force of waters carrying minerals in solution, there are other genetic forces of lesser, but by no means negligible importance. That organic matter has played a considerable part in the precipitation of copper minerals is shown plainly in numerous instances. There also is a theory, now in rather general discredit, that metallic values have been precipitated by electro-chemical action, from sea-water. The water of the ocean contains a very small quantity of copper, probably less than one grain in one hundred cubic meters, but, in the aggregate, the seas hold an enormous amount of this metal. Apparently the sea was the source of the metal found in cupriferous shales at many points on the earth's surface, and there is corroborative evidence that the native copper found in the Keweenawan belt of Lake Superior may have been precipitated in metallic form by the action of sodium chloride, the ferrous condition of the small quantities of iron found associated with this native copper seeming to substantiate this view.

Another theory, once widely held, but now in general disfavor, is that the metals were deposited by electrical action. In all likelihood, electricity, which seems but another name for all energy, whether dynamic or static, was not devoid of power in the great work of concentrating mineral values from the original disseminated particles contained in rock magmas, to the point of sufficient richness to be available for the uses of man.

An evidence of the truth of the hypothesis that mineral values have been deposited from heated ascending waters is furnished at a number of points on the earth's surface by hot springs, that are now depositing copper in small quantities. Not the least interesting of these is a hot spring in Java that carries in solution copper iodide, which is concentrated and produced commercially on a small scale.

Clays possess the power, through adsorption, of extracting metals from wonderfully dilute solutions, and it has been ascertained that all clay-shales are more or less cupriferous, though usually valueless as ores. Copper is a peculiarly soluble metal, in most of its compounds, which are largely associated with iron sulphides, hence easily attacked by oxidizing waters. Carbonaceous and organic matters are powerful reagents, and lead to numerous reactions, in connection with the oxygen, carbon dioxide and dilute sulphuric acid found in underground waters.

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Copper, nickel and cobalt are found frequently in basic gabbros, in many parts of the world. The Lake Superior traps are of this class, as a rule, and copper, in small amounts, is found as impregnations in dense dioritic rocks, and in uncomformable adjacent sandstone of a later geological horizon, near the point of contact, where there are some evidences of metamorphism. The home of the Lake Superior copper, however, is in the metamorphic amagdaloidal traps and conglomerates, and in the sandstones of the upper Keweenawan series. Native copper is found frequently in greenstone, as in the amygdaloids of Lake Superior, in the Nicholai deposits of the Copper River district of Alaska, in the melaphyrs of Newfoundland, in Amador and Calaveras counties, California, and at a number of other points.

Various classes of copper ore deposits are found, these including magmatic segregations, metamorphic contact deposits, fissure veins and deposits formed by percolating waters and mineralized vapors, replacements, sedimentary deposits, and impregnations in sandstones, tuffs, conglomerates and breccias. While these various classes of deposits are distinct, in theory, and usually distinguishable in practice, the lines between individual deposits are extremely difficult to draw in some cases.

While some ore bodies are entirely covered by flows of later geological age, and while some of the contact deposits in stratified rocks, notably in limestone, show very small outcrops, as a rule there are strong surface indications of cupriferous values at depth. Occasionally the unaltered sulphide ores outcrop at surface, as in the case of deposits of disseminated chalcopyrite in the Algoma district of Ontario and elsewhere, and in the instance of the magnificent surface croppings of massive bornite, chalcocite and chalcopyrite found in the Copper River district of Alaska, the latter probably being the richest outcrops ever discovered. As a rule, however, a copper-bearing fissure vein or contact deposit shows a gossan, or iron hat, this deriving its color of rusty yellow, brown or red, from iron in the form of hematite or limonite. The gossan may, and frequently does, show copper ore, usually as carbonates, either both malachite and azurite, or more commonly, the green carbonate alone, and occasionally there are other oxidised copper ores shown in the gossans, but, as a rule, these carry but small copper values, and rarely can be considered commercial ores of copper, though in numerous cases the gold contents are sufficient to warrant their working as gold mines. In fact, many mines have been opened for gold that really contained immensely greater values in copper, at depth, and there are frequent instances of gold mines turning into copper mines at depth, the most recent example of importance of this change in metallic values being afforded by the Mount Morgan mine, of Queensland, Australia, for many years one of the largest gold producers of the world, and now a copper mine of great value, at a depth of 1,000 feet or more.

Frequent reference is made to the silver mines of Butte turning into copper mines at depth, but this is somewhat misleading. The first mines at Butte were silver properties, and there seems good reason to believe that some of these may turn into copper mines at great depth, but, as a matter of fact, the silver mines were opened on an entirely different set of veins than those carrying the wonderful copper values for which

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Butte is famed, and the discovery of the copper mines was due to cross-cutting, at depth, from the mines on the silver veins, as the copper veins contain practically no values for 500 to 1,000 feet depth from surface. Some of the greatest ore bodies at Butte have no gossans, and surface indications are most meagre, not being sufficient to justify the expense of exploring, in an unproven district.

Examples of silver-lead mines turning into copper properties at depth are fairly numerous in Utah, Mexico and elsewhere, probably the best examples being furnished by the mines of the Bingham district of Utah. At Leadville, Colorado, the zinc ores of the upper workings are being replaced by copper at depth.

In the majority of cases the outcrops of copper ore bodies are leached, and, in such cases, only infrequently give workable values in copper at surface, though, as before stated, there are numerous instances of gossans carrying workable gold values, causing the opening of gold mines that at depth have turned into copper mines.

As chalcopyrite, which may be considered the original form of copper ore, carries one atom of iron, and one of copper, held together by two atoms of sulphur, the breaking up of the granule of chalcopyrite not only releases copper, for redeposition in the form of an enriched sulphide, or as a silicate, carbonate or oxide ore, but also releases the atom of iron, which may be carried upward or downward, or left in place, and which usually appears as hematite, the sesquioxide of iron, or as limonite, the hydrated sesquioxide, disseminated through the outcrop of the vein. This is the gossan or iron hat, a welcome sign of probable copper values below, in nearly every copper mining district of the world. It is not, however, an invariable indication of workable values at depth, and there are numerous instances where fine gossans, of the most promising appearance, have proven deceptive as to values carried in the vein beneath. These gossans also have the bad habit of spreading beyond the limits of the walls of the vein below, through lateral surface filtration, and occasionally a wide gossan covers a narrow vein. At other points the original gossan has been removed by surface erosion, or by glacial action, but, as a rule, a good gossan means at least a fair chance of a good mine beneath.

The depth of gossan cappings varies greatly, according to local circumstances, occasionally being merely superficial, but sometimes extending to the water level. In the case of a typical cupriferous fissure vein with a typical gossan, the iron capping is succeeded by a leached zone, and where the leaching has been long continued and thorough, and erosion light, the mineral values have been removed, almost completely, from the leached zone, to be redeposited at greater depth. In other instances, the leaching has been less thorough, and copper values, usually small, remain in the leached area. The depth of the leached zone varies greatly, according to the circumstances following the first deposition of the ore, and occasionally the leached zone is of great depth, as at Butte, while elsewhere it is comparatively shallow, and sometimes is lacking entirely. The great depth of the leached zone in Butte, and the great depth and richness of the succeeding zone, afford evidence in support of the palpable hypothesis that, under average circumstances, the greater the depth of leaching, the greater the quantity of secondarily enriched ores to be found below.

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The typical cupriferous fissure vein may be divided into five zones. The upper is the iron hat or gossan outcrop, succeeded by the leached zone. The third zone is that of oxidized ores, carrying rich oxides and carbonates, and occasional silicates and chlorides, followed immediately by the fourth zone, carrying enriched secondary sulphides, such as chalcocite and bornite, with occasional covellite. The limits between the zone of oxidized ores and that of enriched sulphides are not always clearly defined, and these two zones frequently are considered as one, under the name of the zone of secondary enrichment. It is, however, possible to draw a rough line of demarcation between the oxidized ores above and the enriched secondary sulphides below, in this so-called zone of secondary enrichment, in most cases. The source of the copper in the enriched zone is, of course, the values leached from the vein above, and here redeposited. The depth of the zone of secondary enrichment varies enormously, being dependent upon a considerable variety of factors, including the average percentage of copper in the original vein, the depth to which leaching has been carried, the amount of surface erosion, and the time that has been consumed. In some of the mines of Butte the zone of secondary enrichment is of tremendous depth, a strong vein of massive chalcocite having been found at a depth of 2,400 feet in one of the Anaconda mines.

In the fifth or final zone, the ore is chalcopyrite, sometimes massive, but more commonly disseminated, and usually associated with pyrite, or chalcocite in thin films, as coatings on grains of pyrite. In this zone, values gradually decrease with depth, until the vein pinches out, or, as is more commonly the case, carries lessening values that lead to the abandonment of the property as unpayable.

Bonanza ores in the zone of secondary enrichment sometimes hold to great depth, but, usually are comparatively shallow, the most important exception to this rule being in the case of the deep mines at Butte, previously referred to. The zone of secondary enrichment sometimes carries silicate and chloride ores of copper, as the results of various reactions. Where the unaltered ores in the final zone are argentiferous, copper ores rich in silver occur in the zone of secondary enrichment. Copper ore bodies frequently carry the native metal in the zone of secondary enrichment, where crystals of cuprite shade into crystals of native copper. Masses of native metal of hundreds, and even of thousands of pounds in weight, occur in many of the well-known copper ore mines, but such masses of native metal must be held radically distinct in genesis from the native copper of Lake Superior.

The influence of wall-rocks seems of considerable weight in determining the nature of secondary deposits. Where the wall-rocks are silicious, the products of secondary enrichment, in the sulphide zone, usually are chalcocite and occasionally covellite, while limestone walls are apt to give more or less chrysocolla in the oxidized zone. Chalcocite is especially liable to occur in veins traversing silicious rocks, but frequently is found in considerable quantities in limestone deposits. The copper and tin deposits of Cornwall afford an interesting field for speculation in this connection. According to the best authorities, these metals were given off from granitic magmas, in the form of gases, heavily laden with metallic vapors, which deposited the tin and copper in the same veins, but with a

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fairly sharp line of demarcation, the copper occurring mainly in those portions of the fissures that traverse slate, while tin usually occurs in granite.

The most common gangue of copper ore is quartz, which also is true of many other metals. Calcite and spathic iron ore frequently are found also, and occasionally barite. Very commonly the gangue is merely altered country-rock.

All copper ore bodies, including the native copper mines of Lake Superior, notwithstanding a general impression to the contrary, show decreased values at great depth. The exact depth at which the permanent decrease begins depends, necessarily, upon many factors, and no general rule, other than the one herein laid down, can be predicated.

Deposits of copper ore, of size and tenor sufficient to warrant ranking them among commercial ore bodies, may be considered, as to occurrence, by three widely differing methods of grouping. The first of these is geographical, and, while, for commercial reasons, the geographical occurrence of copper is of prime importance, and is treated of fully in later chapters covering the entire world, under the title of Copper Deposits, such a grouping is essentially commercial, and by no means in accordance with geological rules, for the reason that the geographical divisions of the earth have been made by man, hence rarely correspond with the geological divisions made by nature. The two other methods of grouping occurrences of ore may be termed the method of geological horizons, and the lithological plan. It is necessary, in order to afford even an outline of the geology of copper, to give brief consideration to occurrences grouped under both of the latter-named headings. Viewed by geological ages, it is noted that copper deposits occur in rocks of practically all periods except the Quaternary, but the ore bodies are mainly post-Cretaceous deposits of Devonian and Carboniferous ages, laid down in rocks of those or of previous ages. The Permian veins throughout the world are notably cupriferous, and furnish a number of mines, though many of the Permian beds are too low in copper tenor to be considered as available deposits, at the present time, though doubtless these will have their place in the economy of future generations. The rocks of the Permian age, and the Jura-Trias system of the Mesozoic, or age next younger than the Permian, are more uniformly cupriferous than those of any other period, but are apt to carry disseminated ores of very low copper tenor, and these are workable only in occasional spots of exceptional richness, usually due to local enrichments caused by igneous intrusives. While the percentage of copper in the Permian and early Mesozoic beds is small, the aggregate of copper so deposited is past computation, owing to the dissemination of the ores through beds of vast area.

Viewed from a lithological standpoint, workable ore deposits occur mainly in igneous areas, most usually at or near the point of contact between igneous intrusive rocks and stratified beds, limestone being the most common form of the latter, but a number of the largest deposits now worked, including those of Lake Superior, Butte and Mansfeld, are of other classes. Very many of the principal copper deposits now worked are closely connected with intrusive granite rocks, of post-Cretaceous age.

Like most workable deposits of practically all other metals found in place, copper occurs in mountain ranges, perhaps more frequently in the

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flanks or the foot-hills than in the higher peaks. In frequent instances, as in the Lake Superior deposits, copper is found in the roots of very ancient mountain ranges that have been quite thoroughly eroded. Many of the largest copper deposits are found at or near the point of contact between igneous intrusives and other rock forms, leading necessarily to the assumption that the metallic values were contained originally in the granitic magma, and either were deposited as magmatic segregations, at or near the point of contact, or, as is more commonly the case, were leached from the magma and redeposited as concentrated ore in fissures and limestone cavities, or as impregnations in permeable rocks. Primary ores usually are associated with basic rocks, or may be contact deposits of igneous acid rocks, but the secondary ores may occur in any adjacent rock strata offering a place for their deposition.

There are occasional occurrences of magmatic copper ores not existing as segregations distinct from the magma, though such deposits offer evidences of strictly local segregation, but most of these cases are of scholastic rather than of commercial importance. Exceptions must be made, however, in the instances of the wonderful monzonite ore bodies of Bingham, Utah, and of Ely, Nevada, and of a portion of the deposits of Clifton and Morenci, in Graham county, Arizona. It is probable that in the future greater attention will be paid to the possibilities of discovering similar porphyritic ore bodies containing magmatic ores, low in copper tenor, to be sure, but immensely valuable because of the almost unlimited quantity of such ore that may be found to occur in a single deposit.

The districts carrying copper in sedimentary formations are low in copper tenor as a rule, but more extensive in area than those fields carrying copper in igneous and metamorphic rocks. The Mansfeld district of Germany covers about two hundred square miles, and the Permian formation of the Ural Mountain range, that separates Russia and Siberia, is very extensive on both flanks, covering several thousand square miles. The Lake Superior copper district is of an exceptional nature, and of unusual extent, having a known length of about 400 miles, from Michipicoten Island, on the east to Pine and Chisago counties, only a short distance north of Minneapolis and St. Paul, on the west, but nearly half of this distance is submerged under Lake Superior, between the western end of Michipicoten Island and the eastern tip of the Keweenaw Peninsula. The present limits of exploitation include a strip of about 100 miles only in length, the Keweenawan series having a width of 2 to 8 miles, and being flanked by beds of sandstone.

Copper is found in practically every class of mineral deposit known to miners, and, in Alaska, and elsewhere, occurs as native stream metal. Copper deposits of more or less value are found in nearly every country on the globe, but many of these are not of sufficient value to justify present working, though what the future may have in store, when the world demands more tons of copper yearly than it now requires tons of pig iron, the best of prophets scarcely could foretell. Copper ores frequently occur in lenticular form, some lenses, as in the case of the Rio Tinto mine, being of immense size, but some of the ore deposits formerly classed as beds are now rated, in view of later and more exact knowledge, as veins.

In the commercial exploitation of copper ore bodies, one of the most

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common and most fatal of errors is in attempting to base the future of the mine upon the rich and easily smelted ores of the zone of secondary enrichment. The wise management endeavors to learn the nature and extent of its ore bodies at depth, before building large and costly reduction plants of a permanent nature. When a mine is already opened in rich copper ores, sinking always is a good policy. Only by sinking to depth can the future of the mine be predicated with safety, and only by determining the different kinds and grades of ore, and the proportions in which they exist, can permanently satisfactory reduction plants be planned and installed.

Detailed information regarding the distribution of copper ores throughout the globe, with numerous detailed references to the geology of copper, will be found in the various chapters devoted to the geography of the metal. Geological particulars regarding individual mines also will be found scattered through the long chapter devoted to detailed mine descriptions.

The foregoing matter in this chapter is intended merely as an outline, and is not put forth as infallible in any particular, being merely the best judgment of the author, deduced from such limited studies of ore deposits as he has been able to make personally, amplified by the more detailed and valuable studies of many better authorities. For those who wish to make more careful investigation into the subject of ore deposits, and the geology of copper, I would recommend the perusal of Weed's Copper Mines of the World. While not holding with Mr. Weed on all points, the author of this brief monograph bears witness, cheerfully and gladly, to the vast amount of patient and well-considered investigation of details that has been made by Mr. Weed, and his exposition of the genesis and occurrence of copper ores, while by no means representing the last possible word in so wide a field, where so much remains to be learned, is much the most luminous and satisfactory of anything yet put forth in this particular line. The searcher after truth would do well also to read Kemp's Ore Deposits of the United States and Canada, and in this connection the monographs of Winchell, Lindgren and Sperr are worthy of the most serious consideration.

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CHAPTER III.

Chemistry and Mineralogy of Copper.

In this chapter is given a brief outline of pertinent facts regarding the chemistry and mineralogy of copper, ending with an alphabetical list of copper minerals, which will be found to include a considerable number not mentioned in any other work. Despite the appreciable length of this chapter, no attempt has been made to render it exhaustive, as such an effort would, of necessity, include a long treatise on general mineralogy, which not only would be out of place in a work of this nature, but which, even were the ability at command, has been done to such excellent purpose by two generations of scientists of one family that Dana's System of Mineralogy stands, as it long has stood, the world's authority in the special field of mineralogy. To the average reader this chapter will give sufficient detail, and may be found of some interest to all who are especially interested in copper, while those desiring to make a serious study of the subject are referred to Dana's monumental work.

The elements with which copper unites most readily are sulphur, oxygen, carbon, silicon, arsenic, antimony, bismuth and chlorine. Among the other metals, iron is the most common associate of copper. Many copper ores are more or less argentiferous, and sulphide copper ores frequently carry gold, though gold is not found in chemical combination with copper.

Following is a list of the 36 elements with which copper has been found chemically united in nature. Following the full name of each element is its chemical symbol and atomic weight, as now figured by the best authorities.

Element	Symbol	Atomic weight.	Element	Symbol	Atomic weight.
Aluminum	Al	27.	Nickel	Ni	58.6
Antimony	Sb	120.	Niobium	Nb	93.7
Arsenic	As	74.9	Nitrogen	N	14.
Barium	Ba	137.	Oxygen	O	16.
Bismuth	Bi	207.5	Phosphorus	P	31.
Calcium	Ca	39.9	Platinum	Pt	194.3
Carbon	C	12.	Potassium	K	39.
Chlorine	Cl	35.4	Selenium	Se	78.9
Chromium	Cr	52.5	Silicon	Si	28.
Cobalt	Co	58.7	Silver	Ag	107.7
Copper	Cu	63.2	Sodium	Na	23.
Hydrogen	H	1.	Sulphur	S	32.
Iodine	I	126.5	Tellurium	Te	125.
Iron	Fe	55.9	Tin	Sn	117.4
Lead	Pb	206.4	Tungsten	W	183.6
Magnesium	Mg	24.	Uranium	U	240.
Manganese	Mn	54.8	Vanadium	V	51.1
Mercury	Hg	199.8	Zinc	Zn	65.1
Molybdenum	Mo	96.			

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The ores of copper (alone or with other metals) may be divided into the following groups:

antimonides	iodides	sulphoantimonates
antimonites	manganates	sulphoantimonites
arsenates	molybdates	sulphoarsenates
arsenides	niobates	sulphoarsenites
arsenites	nitrates	sulphates
arsenoantimonites	oxides	sulphides
arsenobismuthites	oxychlorides	sulphobismuthites
arsenophosphates	phosphates	tellurides
bismuthides	phosphochromates	tungstates
carbonates	selenides	uranates
chlorides	selenites	vanadates
chlorosulphates	silicates	

While the appended alphabetical list of copper minerals gives several hundred titles, the more important ores are scarcely more than a dozen in number, though many of the minor minerals are of local importance in certain fields.

The sulphide ores are of predominant importance. Of these chalcopyrite, the lowest in copper tenor, is the most common, being found in practically every copper field. The major production from sulphide ores comes, however, from the rich chalcocite or copper glance. Bornite, the first alteration product of chalcopyrite in the ascending scale of enriched sulphide ores, is a valuable ore, and is found in large quantities in many copper fields. Covellite, the next richest sulphide above bornite, is found in connection with bornite and chalcocite in most sulphide districts, but as a rule does not occur in large quantities, though by no means a rare ore, and in a few fields, as in Utah and Wyoming, is found in quantities of considerable commercial importance. There are numerous other copper sulphides and copper-iron sulphides that are found in greater or less profusion, but many of these greatly resemble the more important sulphides previously noted, and rarely are differentiated in practical mining operations. There are a number of copper sulphates, of which chalcanthite is the only important ore. While found in natural beds, in Chile, this mineral is, as a rule, essentially a joint product of man and nature, the mine openings in sulphide ores made by man being leached by nature. Being readily soluble, and the copper contents easily precipitated, considerable copper is secured, in many districts, by leaching mine waters charged with bluestone, and in Spain a large part of the extensive copper product is secured in this form.

Next in commercial importance after the sulphide ores comes native copper. This is mined very extensively in the Lake Superior district, and on a considerable scale in Bolivia. Native copper is found in the upper workings of most rich mines of copper ore, and the aggregate production therefrom is quite large.

Third in importance come the carbonates. Of these, azurite and malachite are the only ones usually found in considerable quantities, and malachite is of much the greater importance. This ore is found in profusion in the upper or oxidized workings of many mines, and being rich and easily smelted, is the source of a considerable share of the world's copper supply.

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The copper oxides usually are found in connection with the carbonates, and are mined and smelted therewith, being rich and easily reduced. Cuprite is the richest of all copper ores, but melaconite is far more common.

The only important commercial ore among the copper silicates is chrysocolla. This occurs frequently, and in considerable quantities, with the oxidized ores of many mines, and also is found disseminated in low-grade ore bodies at many points. It is probable that a larger proportion of copper will be secured, eventually, from silicate ores, perhaps by leaching processes.

The arsenical ores are common, but as a rule are present in just sufficient quantities to interfere with smelting. In Butte, Montana, enargite is a highly important copper ore, and is handled with signal success. In Chile and Perú arsenical ores are found in large quantities. Tetrahedrite, which shades by almost imperceptible gradations into tennantite, is a fairly common ore, but is not regarded with favor by miners, unless carrying considerable quantities of silver, which frequently is the case, the presence of both arsenic and antimony, frequently with bismuth added, rendering it difficult of smelting. Formerly the metal produced from gray copper ores was so poisoned with arsenic, antimony and bismuth, all deleterious elements, that such copper was suitable for only the roughest and cheapest of uses to which the metal could be put, but the general adoption of the electrolytic refining process has provided a way for eliminating these undesirable elements from the copper produced from gray ores.

In Chile considerable copper is secured from chloride ores, mainly atacamite.

An alphabetical list of copper minerals, including native copper and synonyms, is appended.

ACICULITE. Aikinite.

ADAMITE. A hydrous basic zinc arsenate, in which copper sometimes replaces zinc to the extent of circa 18%.

AGUILARITE. An unnamed alternation product of aguilarite has the formula $5(Ag,Cu)_2S.(Sb,As)_2S_3$. The mineral, which is a arsenosulphoantimonite is isometric.

AIKINITE. $3(Pb,Cu_2)S.Bi_2S_3$. A lead and copper sulphobismuthite, carrying 11% copper. Common names needle ore, acicular bismuth. Crystallization, orthorhombic. Fracture, uneven. Hardness, 2 to 2.5. Gravity, 6.1 to 6.8. Lustre, metallic. Color, blackish lead-gray, tarnishing to pale copper-red. Fuses on charcoal and is soluble in nitric acid. Occurrence, Ural Mountains of Russia and Gold Hill, North Carolina.

ALASKAITE. An argentiferous and cupriferous variety of galenobismutite, which is a lead sulphobismuthite, carrying 3.5 to 5.1% copper.

ADGODONITE. Cu_3As. A copper arsenide carrying 85.5% copper. Structure, massive and granular. Fracture, subconchoidal. Hardness, 4. Gravity, 7.62. Lustre, metallic on fresh fractures, dulling on exposures. Color, steel-gray to silver-white on freshly polished surface. Is less fusible than domeykite. Occurs in Chile and Lake Superior, in the latter district being found in cross-courses traversing the cupriferous beds of the South Range mines, causing the copper product to be highly arsenical.

ALISONITE. $3Cu_2S.PbS$. A copper and lead sulphide, carrying 53.5% copper, and 23.5% lead. Is related to cuproplumbite. Structure, massive. Color, deep indigo-blue, quickly tarnishing. Occurs at Coquimbo, Chile.

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AMMIOLITE. Formula undetermined. A mercury and copper antimonite, carrying circa 12.5% copper. Occurs, as an earthy powder, in Chile.

ANDREWSITE. Formula undetermined. A hydrous iron and copper phosphate related to chalcosiderite, containing circa 8.6% copper.

ANNIVITE. A bismuthiferous variety of tennantite, from Switzerland.

ANTIMONIAL COPPER. Common name for chalcostibite.

ANTLERITE. Formula probably $10CuO.3SO_3.7H_2O$. A basic copper sulphate, containing circa 54.7% copper. Structure, massive. Gravity, 3.93. Color, light green. From Yucca, Mohave county, Arizona.

APHANESITE. Clinoclasite.

APHTONITE. An argentiferous and zinciferous variety of tetrahedrite.

ARNIMITE. $5CuO.2SO_3.6H_2O$. A hydrous basic copper sulphate, containing 47.6% copper. Occurs in acicular crystals.

ARSENICAL COPPER. Domeykite.

ASPEROLITE. $CuSiO_3+3H_2O$. A hydrous copper silicate. Apparently a hydrated chrysocolla, from Tagilsk, Perm, Russia.

ATACAMITE. $CuCl_2.3Cu(OH)_2$. A hydrous copper oxychloride, containing 60.5% copper. Crystallization, orthorhombic. Fracture, conchoidal. Tenacity, brittle. Hardness, 3 to 3.5. Gravity, 3.75. Lustre, adamantine to vitreous. Color, emerald green to blackish green. Streak, apple-green. Is transparent to translucent. Occurs, as sandy granules, in numerous mines in the province of Atacama, Chile, and elsewhere. Usually occurs disseminated, and low in copper tenor, but is extensively mined in Chile.

ATELITE. $2CuO.CuCl_2.3H_2O$. A hydrated copper oxychloride. An alteration product from Mt. Vesuvius, closely related to atacamite chemically and mineralogically, but occurring as a pseudomorph after tenorite.

ATLASITE. A copper carbonate containing chlorine, from Chañarcillo, Chile. Apparently is merely an intimate mixture of azurite and atacamite.

AURICHALCITE. $2(Zn,Cu)CO_3.(Zn,Cu)(OH)_2$. A basic zinc and copper carbonate, containing 16.6% copper. Crystallization, probably monoclinic. Occurs in acicular crystals, forming drusy incrustations; also columnar, laminated and granular. Hardness, 2. Gravity, 3.5 to 3.6. Lustre, pearly. Color, pale green to sky-blue. Streak, light green to light blue. Is translucent. Is soluble in acids. Occurs in small quantities in many zinc and copper fields.

AZURITE. $2CuO.2CO_2.H_2O$. A basic, copper carbonate, containing 55.3% copper. Common names, blue carbonate of copper, blue malachite, azure copper ore. Crystallization, monoclinic. Fracture, conchoidal. Tenacity, brittle. Hardness, 3.5 to 4. Gravity, 3.77 to 3.83. Lustre, vitreous. Color, azure blue. Streak, lighter blue. Is subtranslucent to transparent. Is soluble in nitric acid. Occurs frequently in the oxidized zone of copper ore bodies, almost invariably with malachite, but is much less common than malachite. Is a valuable commercial ore of copper.

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BARNHARDTITE. Formula uncertain. A copper and iron sulphide, probably an alteration product from chalcopyrite that has lost part of its iron and copper, containing 46.7 to 50.4% copper. Apparently is nearer to bornite than to chalcopyrite. Structure, massive, compact. Fracture, conchoidal. Hardness, 3.5. Gravity, 4.5. Lustre, metallic. Color, bronze-yellow, tarnishing to pinchbeck-brown. Streak, grayish black, slightly shining. Occurrences, North Carolina and Arizona.

BARRACANITE. Cupropyrite.

BAYLDONITE. $4(Pb,Cu)O.As_2O_5.2H_2O$. A hydrous basic lead and copper arsenate containing 26.1% copper. Occurs in minute mamillary concretions with drusy surface. Fracture, subconchoidal. Hardness, 4.5. Gravity, 5.35. Lustre, resinous. Color, grass-green to blackish green. Streak, apple-green. Is subtranslucent. Soluble, with difficulty, in nitric acid. Occurs in Cornwall, England.

BEAUMONTITE. A very doubtful hydrous copper silicate, from Chessy, France.

BELL-METAL ORE. Common name for stannite.

BERZELIANITE. Cu_2Se. A copper selenide containing 61.6% copper. Occurs disseminated in incrustations. Is very soft. Gravity, 6.71. Lustre, metallic. Color, silver-white, soon tarnishing. Streak, shining. Usually is argentiferous. Occurs in Småland, Sweden.

BEUDANTITE. Apparently this name is applied to two minerals, one an arsenate and the other a sulphate of iron, lead and copper, carrying from a trace to 9.8% copper.

BINNITE. Formula probably $3Cu_2S.2As_2S_3$. A copper sulphoarsenite, containing 37.7% copper. Crystallization, isometric. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5 to 3. Gravity, 4.47. Lustre, metallic. Color, dark steel-gray to iron-black. Streak, reddish brown. Occurrence, Binnenthal, Switzerland.

BLACK COPPER. Common name for melaconite or disseminated chalcocite. In all likelihood much of what has been taken for melaconite in the past was disseminated chalcocite.

BLUE COPPER. Common name for azurite.

BLUE MALACHITE. Common name for azurite

BLUESTONE. Common name for chalcanthite; also for blue vitriol, the manufactured product corresponding in chemical formula with chalcanthite.

BLUE VITRIOL. Common name for chalcanthite or bluestone.

BOGOSLOVSKITE. Chrysocolla carrying carbon dioxide as an impurity, from the Bogoslovsk mine, Perm, Russia.

BOLEITE. $(Pb,Cu,Ag)Cl_2OH_2$. A hydrated lead, copper and silver oxychloride, containing circa 12% copper. Crystallization, isometric. Hardness, 3 to 3.25. Gravity, 5.08. Color, indigo-blue. Occurrence, at the Boleo mines, Baja California, Mexico.

BORNITE. Cu_5FeS_4. A copper and iron sulphide, containing 55.5% copper, 16.4% iron, 28.1% sulphur. Common name, peacock copper ore. Crystallization, isometric, with many hexagonal penetration twins. Struc-

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ture, granular or compact. Fracture, small conchoidal to uneven. Tenacity, brittle. Hardness, 3. Gravity, 4.9 to 5.4. Lustre, metallic. Color, copper red to bluish brown, quickly tarnishing to iridescence, often most brilliant. Streak, pale grayish-black. Is soluble in nitric acid, with separation of sulphur. Is the first alteration product from chalcopyrite among the secondary copper sulphides, and often carries nodules and occasionally larger masses of chalcocite. Is one of the most important ores of copper.

BOTALLACKITE. Atacamite.

BOURNONITE. $3(Pb,Cu_2)S.Sb_2S_3$. A lead and copper sulphoantimonite, containing 13% copper, and 42.5% lead. Crystallization, orthorhombic. Structure, massive, granular and compact. Cleavage, imperfect. Fracture, subconchoidal to uneven. Tenacity, rather brittle. Hardness, 2.5 to 3. Gravity, 5.7 to 5.9. Lustre, brilliant metallic. Color and streak, steel-gray, inclining to blackish-gray or iron-black. Fuses easily on charcoal and is soluble in acids. Occurrence, in many copper fields.

BRASS ORE. Common name for aurichalcite.

BROCHANTITE. $4CuO.SO_3.3H_2O$. A basic copper sulphate containing 56.2% copper. Crystallization, orthorhombic. Fracture, uneven. Hardness, 3.5 to 4. Gravity, 3.9. Lustre, vitreous. Color, emerald-green to blackish green. Streak, paler green. Is translucent to transparent. Is found in many copper fields, and is an important commercial ore in the Clifton district, Graham county, Arizona.

BURATITE. An aurichalcite containing calcium monoxide, probably as a mechanical admixture.

CACHEUTAITE. A lead, copper and silver selenide carrying 7 to 26% copper. Is closely related to zorgite.

CALCIOVOLBORTHITE. $4(Cu,Ca)O.V_2O_5.H_2O$. A hydrous basic copper and calcium vanadate, containing 31.7% copper. Hardness, 3.5. Gravity, 3.5 to 3.86. Color, gray to green. Streak, brownish yellow to greenish yellow. Occurrence, Thuringia, Germany.

CALEDONITE. $2(Pb,Cu)O.SO_3.H_2O$. A basic lead and copper sulphate, containing 9.4% copper. Crystallization, orthorhombic. Fracture, uneven. Tenacity, rather brittle. Hardness, 2.5 to 3. Gravity, 6.4. Lustre, resinous. Color, verdigris-green to bluish green. Streak, greenish white. Is translucent. Occurrence, Scotland, Hungary, California, etc.

CANTONITE. A dimorphous variety of covellite, apparently a pseudomorph after galena, crystallized in cubes with cubical cleavage.

CAPILLARY RED OXIDE OF COPPER. Common name for cuprite.

CARMENTITE. A variety of digenite.

CARROLLITE. $CuS.Co_2S_3$. A cobalt and copper sulphide containing 20.5% copper and 38% cobalt. Crystallization, isometric. Fracture, subconchoidal to uneven. Hardness, 5.5. Gravity, 4.85. Lustre, metallic. Color, light steel-gray, with faint reddish hue. Occurrence, Carroll county, Georgia.

CASTILLITE. $(Cu,Ag)_2S.2(Cu,Pb,Zn,Fe)S$. A copper, silver, lead, zinc and iron sulphide carrying circa 41% copper. Apparently an impure bornite. Structure, massive. Hardness, 3. Gravity, 5.19 to 5.24. Resembles bornite in color, streak and tarnish. Occurrence, Guanacevi, Mexico.

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CHALCANTHITE. $CuSO_4+5H_2O$. A hydrous copper sulphate containing 25.4% copper. Common names, blue vitriol, bluestone, copper sulphate. Crystallization, triclinic. Structure, massive, stalactitic and reniform, sometimes fibrous. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5. Gravity, 2.12 to 2.30. Lustre, vitreous. Color, sky-blue. Streak, uncolored. Is translucent to subtransparent. Is soluble in water. Occurs as deposits from mine water in most sulphide copper mines, and is found in impure state, in beds, in Chile.

CHALCOCITE. Cu_2S. A copper sulphide carrying 79.8% copper. Common names, copper glance, cuprous sulphide. Crystallization, orthorhombic; also occurs massive, with structure granular to compact and impalpable. Cleavage, indistinct. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5 to 3. Gravity, 5.5 to 5.8. Lustre, metallic. Color and streak, blackish lead-gray, tarnishing to dull green or blue. Is soluble in nitric acid. Occurs in all copper districts, frequently in large quantities. Is the richest commercial ore of copper and yields more than one-half of the world's copper supply.

CHALCOLITE. Torbernite.

CHALCOMENITE. $CuO.SeO_2.2H_2O$. A hydrous copper selenite containing 28% copper. Crystallization, monoclinic. Gravity, 3.76. Lustre, vitreous. Color, bright blue. Is transparent. Is soluble in acids. Found at Cacheuta, Mendoza, Argentina.

CHALCOMICHLITE. Bornite.

CHALCOPHACITE. Liroconite.

CHALCOPHYLLITE. $7CuO.As_2O_5.4H_2O$. A hydrous basic copper arsenate containing 42.3% copper. Crystallization, rhombohedral. Hardness, 2. Gravity, 2.43 to 2.66. Lustre, vitreous. Color, grass-green to verdigris-green. Streak, grass-green. Occurs in Hungary, Siberia and Utah.

CHALCOPYRITE. $Cu_2S.Fe_2S_3$. A copper and iron sulphide containing 34.5% copper and 30.5% iron. Is the primary ore of copper. Crystallization, tetragonal, sphenoidal, often twinning, also frequently massive and compact. Fracture, uneven. Hardness, 3.5 to 4. Gravity, 4.1 to 4.3. Lustre, metallic. Color, brass-yellow, often tarnishing to iridescence. Streak, greenish black. Is soluble, except sulphur, in nitric acid, and, on being heated, yields a portion of its sulphur. On exposure to moisture and heat becomes hydrated, and copper and iron change readily to sulphates. Alters to azurite, malachite, melaconite, chalcocite, covellite, bornite, brochantite, chrysocolla, tetrahedrite and tennantite. Is found in practically every copper field in the world, and is second only to chalcocite in importance among the commercial ores of copper.

CHALCOPYRRHOTITE. $CuS.Fe_5S_6$. An iron and copper sulphide containing 13% copper and 48.2% iron. Structure, massive. Hardness, 3.5 to 4. Gravity, 4.28. Color, brassy, with brownish tinge. Occurrence, Nya Kopparberg, Sweden.

CHALCOSIDERITE. $CuO.3Fe_2O_3.2P_2O_5.8H_2O$. A hydrous iron and copper phosphate containing 6.4% copper. Hardness, 4.5. Gravity, 3.1.

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Lustre, vitreous. Color, light siskin-green. Streak, pale green. Occurs in Cornwall, England and Westphalia, Germany.

CHALCOSINE. Chalcocite.

CHALCOSTIBITE. $Cu_2S.Sb_2S$. A copper sulphoantimonite containing 25.6% copper and 48.5% antimony. Crystallization, orthorhombic. Fracture, subconchoidal. Tenacity, brittle. Hardness, 3 to 4. Gravity, 4.75 to 5. Lustre, metallic. Color, between lead-gray and iron-gray. Occurrence, in the Hartz Mountains of Germany and in Guadix, Spain.

CHALCOTRICHITE. A form of cuprite with capillary or acicular crystallization. Common name, plush copper ore.

CHELEUTITE. A ferruginous, nickeliferous and slightly cupriferous smaltite.

CHENEVIXITE. $2CuO.Fe_2O_3.As_2O_5.3H_2O$. A hydrous copper and iron arsenate containing 21% copper. Structure, massive. Fracture, subconchoidal. Hardness, 3.5 to 4.5. Gravity, 3.93. Lustre, vitreous. Color, dark olive-green to greenish yellow. Streak, yellowish green. Is soluble in acids. Occurrence, Cornwall, England and Eureka, Juab county, Utah.

CHESSY COPPER. Common name for azurite.

CHILEITE. Formula uncertain. A hydrous lead and copper vanadate containing 11.7 to 13.6% copper. Is related to psittacinite. Structure, earthy. Occurrence, Chile.

CHILENITE. $(Ag,Cu)_6Bi$. A silver and copper bismuthide containing 8.5% copper and 75% silver. Structure, amorphous, granular. Is soft. Color, silver-white. Occurrence, Copiapó, Chile.

CHIVIATITE. A lead sulphobismuthite carrying circa 2.5% copper.

CHLOANTHITE. Empirically nickel diarsenide, but analyses invariably show cobalt and iron, and commonly small quantities also of copper, lead, silver, bismuth and antimony.

CHLOROTHIONITE. $CuCl_2.K_2SO_4$. A copper and postassium chlorosulphate. Is an alteration product from Mt. Vesuvius.

CHLOROTILE. Formula probably $3CuO.As_2O_5+6H_2O$. A hydrous copper arsenate containing circa 33% copper. Is related to trichalcite. Crystallization, orthorhombic; also occurs fibrous and massive. Is soft. Color, pale emerald-green. Is transparent.

CHRYSOCOLLA. $CuSiO_3+2H_2O$. A hydrous copper silicate carrying 36% copper. Common names, mountain green and mountain blue. Structure, cryptocrystalline, enamel-like, sometimes botryoidal. Fracture, conchoidal. Is brittle and somewhat sectile. Hardness, 2 to 4. Gravity, 2 to 2.24. Lustre, vitreous to earthy. Color, mountain green, bluish green and sky blue to turquoise-blue, with impure varieties brown to dull black. Streak, white, from pure green and blue varieties. Is opaque to translucent. Is decomposed by acids, without gelatinization. Commonly occurs with carbonate ores in the oxidized zones of copper ore bodies, and is a commercial ore of value in many districts.

CLAYITE. A lead sulphoantimonite, carrying copper as a replacement of lead to extent of circa 8%.

CLINOCLASITE. $6CuO.As_2O_5.3H_2O$. A hydrous basic copper ar-

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senate carrying 48% copper. Crystallization, monoclinic. Is brittle. Hardness, 2.5 to 3. Gravity, 4.19 to 4.36. Lustre, vitreous to resinous. Color, blackish blue-green externally, dark verdigris-green internally. Streak, bluish green. Is subtransparent to translucent. Is soluble in nitric acid. Occurrence, Cornwall and Utah.

COPPER. Cu. Native copper. The chemical symbol Cu is an abbreviation of cuprum, the Latin word for copper. The metal, native or refined, has the following names in modern languages: kupfer in German; koppar in Swedish; kobber in Norwegian; cobre in Spanish and Portuguese; cuivre in French; rame in Italian.

Atomic weight, 63.2. Belongs in the first group and is the leader of the fifth series of Mendeleéf's Periodic System. The group is as follows: 1, hydrogen; 2, lithium; 3, sodium; 4, potassium; 5, copper; 6, rubidium; 7, silver; 8, cæsium; 9, unknown (possibly terbium, atomic weight 160); 10, gold; 11, unknown. The fifth series, of which copper is the basic leader, is as follows: 1, copper; 2, zinc; 3, gallium; 4, germanium; 5, arsenic; 6, selenium; 7, bromine. The three metallic elements falling between series four and five in Mendeleéf's table, are iron, cobalt and nickel. The frequency with which these three elements are found associated with copper, and the ease with which all four metals replace one another, are notable. The general resemblance between copper, silver and gold, which form ascending steps in the same group, is readily apparent.

System of crystallization, isometric. Tetrahexahedronal forms are the most common, with much twinning. Crystals often show cavernous faces and occasionally elevations, are often distorted and pass gradually through distortions into filiform and arborescent forms. Native copper also occurs massive, in granular form, and in laminæ. In the Lake Superior mines the metal occurs in all observed forms and sizes, including lamellæ from microscopic flakes up to sheets of immense size and weight, crystals of greatly varying form and size, grains from microscopic size to considerable nodules, and druses, often of considerable size, show various filiform and arborescent shapes. The finest particles are grains and exceedingly minute flakes, occurring in an upper sandstone of the Keweenawan series, while the largest masses, weighing upwards of 500 tons, have been found in contact and fissure veins.

Cleavage, none. Fracture, hackly. Tenacity, second only to that of iron. Is perfectly sectile and highly ductile and malleable, ranking in these particulars with the precious metals. Electrical conductivity, 931, as compared with 1,000 for silver, which possesses the most perfect electrical conductivity of any known metal or alloy. Conductivity for heat, 898, as compared with 1,000 for gold, the most perfect conductor of heat.

Hardness, 2.5 to 3. Specific gravity, in vacuo, at 0 degrees Centigrade (equal to 32°, or freezing point, Fahrenheit), when chemically pure and devoid of porosity, is 8.945. Specific gravity of the ordinary copper of commerce, none of which is free from impurities, varies from about 8.75 when cast, to about 8.95 when rolled, hammered or drawn, the exact gravity depending upon how handled, as well as upon the extent and nature of the impurities contained.

Lustre, metallic. Color, copper-red. Streak, copper-red, metallic, shin-

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ing. Tarnishes upon exposure to air to brownish red, and is liable to form a coating of verdigris or oxide upon long exposure to air. Atmosphere laden with moisture and carbonic acid is especially favorable to the formation of verdigris.

Fusibility: Copper is fusible at approximately 2,000° Fahrenheit, or a trifle less than 1,100° Centigrade. Color, when fused, sea-green. Copper becomes volatile under the high temperature of the electric arc.

Solubility: Copper is soluble in nitric acid, aqua regia, and strong boiling sulphuric acid, also, slowly, in dilute hydrochloric and sulphuric acids, with admission of air. When in solution in nitric or sulphuric acids will deposit metallic copper on iron immersed therein.

Affinities: Copper has a greater affinity for sulphur than for any other element, possessing also marked affinities for oxygen, carbon dioxide, arsenic, antimony and bismuth, and unites with many other elements.

Alterations: Native copper alters on exposure, especially in damp air, to the simpler oxide and carbonate ores, such as cuprite, malachite and azurite, and occasionally, in time, to the more complex ore forms.

Occurrence: Native copper occurs, usually in small quantities, in most of the principal copper districts of the world. The native metal is mined upon a considerable scale only in Lake Superior, U. S. A., and Bolivia. The Lake Superior native copper carries considerable silver, mechanically admixed, though not alloyed, but carries no gold. In districts outside of Lake Superior and Bolivia the metal occurs most frequently in connection with the oxide and carbonate ores, and occasionally with the secondary sulphide ores.

Impurities: Native copper frequently contains silver, arsenic, bismuth, antimony, zinc and occasionally mercury. Commercial copper, refined from ores, may contain any of the elements already named, and also gold, tin, lead, selenium and tellurium, the latter two elements in very minute quantities.

COPPER GLANCE. Common name for chalcocite.

COPPER MICA. Common name for chalcopyrite.

COPPER NICKEL. Common name for niccolite.

COPPER PHOSPHATE. Common name for libethenite.

COPPER PITCHBLENDE. An impure chrysocolla containing limonite.

COPPER PYRITES. Common name for chalcopyrite.

COPPER SULPHATE. Common name for chalcanthite in nature; bluestone when manufactured.

COPPER URANITE. Common name for torbernite.

COPPER VITRIOL. Common name for chalcanthite when found native, or for bluestone when manufactured.

COPPITE. A ferruginous variety of tennantite.

CONDURRITE. Apparently a copper arsenide, related to domeykite. Is supposed to be an alteration product of tennantite. Is soft and black. Occurs in the Condurrow mine, and at Carn Brea, Cornwall, England.

CONICHALCITE. $4(Cu,Ca)O.\ As_2O_5.\ 1\frac{1}{2}H_2O$. A hydrous basic copper and calcium arsenate, carrying 24% copper. Structure, reniform and mas-

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sive. Fracture, splintery. Tenacity, brittle. Hardness, 4.5. Gravity, 4.12. Color and streak, pistachio-green. Is subtranslucent. Occurs in Andalusia, Spain and at Eureka, Juab county, Utah.

CONNELLITE. Formula probably $Cu_{19}(Cl,OH)_{32}SO_{10}.15H_2O$. A hydrous basic copper chlorosulphate, containing circa 57.6% copper. Crystallization, hexagonal. Hardness, 3. Gravity, 3.36. Lustre, vitreous. Color, fine blue. Is translucent. Is soluble in nitric acid. Occurrence, Cornwall, England.

CORNWALLITE. $5CuO.As_2O_5.3H_2O$. A hydrous basic copper arsenate containing 46.5% copper. Structure, massive. Fracture, conchoidal. Hardness, 4.5. Gravity, 4.16. Color, verdigris-green to emerald green. Occurrence, Cornwall, England.

COSALITE. Empirically lead sulphobismuthite, but usually cupriferous to the extent of from a trace to 8.75% copper.

COVELLINE. Covellite.

COVELLITE. CuS. A copper sulphide containing 66.4% copper. Chemical name, cupric sulphide. Crystallization, hexagonal; also occurs massive. Is flexible in thin layers, with basal cleavage. Hardness, 1.5 to 2. Gravity, 4.6. Lustre, submetallic on crystals, dull when massive. Color, dark indigo-blue. Streak, lead-gray to black, shining. Occurs in most sulphide copper districts, as a secondary ore and is a valuable commercial ore of copper, when found in sufficient quantities, as in Utah, Wyoming and elsewhere.

CLARITE. A dimorphous form of enargite, from Schapbach, Baden, Germany.

CREDNERITE. $3CuO.2Mn_2O_3$. A copper manganate containing 34.4% copper. Crystallization, monoclinic. Cleavage, basal, perfect, less distinct in other directions. Hardness, 4.5. Gravity, 4.9 to 5.1. Lustre, metallic. Color, iron-black to steel-gray. Streak, brownish black. Is soluble in hydrochloric acid.

CROOKESITE. $(Cu,Tl,Ag)_2Se$. A copper, thallium and silver selenide, containing 44 to 46% copper, 17 to 18.5% thallium and 1.5 to 5% silver. Structure is massive, without crystallization. Is brittle. Hardness, 2.5 to 3. Gravity, 6.9. Lustre, metallic. Color, lead-gray. Occurrence, Småland, Sweden.

CUBANITE. $CuS.Fe_2S_3$. An iron and copper sulphide containing 23.3% copper and 41.3% iron. Crystallization, isometric; also occurs massive. Cleavage, cubic. Hardness, 4. Gravity, 4.026 to 4.169. Color, bronze to brass-yellow. Streak, dark reddish bronze to black. Occurrence, Cuba and Sweden.

CUMENGITE. $PbCl_2.CuO.H_2O$. A hydrous lead and copper oxychloride, related to boléite. Crystallization, tetragonal.

CUPRIC OXIDE. Tenorite, when found in nature; copper monoxide in chemistry.

CUPRITE. Cu_2O. A copper oxide, containing 88.8% copper, being the richest copper ore. Chemical names, cuprous oxide, copper protoxide. Common names, ruby copper, red glassy copper ore, octahedral copper ore. Crystallization, isometric, commonly in octohedrons; also occurs massive,

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granular and sometimes earthy. Fracture, conchoidal. Is brittle. Hardness, 3.5 to 4. Gravity, 5.85 to 6.15. Lustre, adamantine to earthy. Color, light to dark red; when fresh, usually ruby-red, but fades to duller red. Streak, brownish red, shining. Is subtransparent to subtranslucent. Occurs in most copper districts in the upper oxidized zone, frequently shading into crystals of native copper.

CUPROBISMUTITE. $3Cu_2S.\ 4Bi_2S_3$. A copper sulphobismuthite containing 15% copper and 65.1% bismuth. Occurs in prismatic crystals. Gravity, 6.31 to 6.68. Lustre, metallic. Color, dark bluish black. Streak, black. The copper frequently is replaced partially by silver.

CUPROCALCITE. Formula perhaps $(Cu_2O)_2.\ CO_2+2CaO.\ CO_2+H_2O$. Apparently merely an intimate mixture of cuprite and calcium carbonate. Hardness, 3. Gravity, 3.9. Color, vermilion-red. Is soluble in hydrochloric acid.

CUPROCASSITERITE. Formula possibly $4SnO_2+Cu_2Sn(OH)_2$. Occurrence, Black Hills of South Dakota.

CUPRODESCLOIZITE. A cupriferous variety of descloizite, which is a basic lead and zinc vanadate.

CUPROFERRITE. Pisanite.

CUPROIODARGYRITE. CuI.AgI. A copper and silver iodide. Apparently a decomposition product of stromeyerite. Occurs, as incrustations, at Huantajaya, Chile.

CUPROMAGNESITE. $(Cu, Mg)\ SO_4+7H_2O$. A copper and magnesium sulphate. Color, bluish green. Is an alteration product, occurring as incrustations, from Mt. Vesuvius.

CUPROPLUMBITE. $5Cu_2S.\ PbS$. A copper and lead sulphide, carrying 61.3% copper and 19% lead. Structure, massive. Lustre, feeble or lacking. Color, lead-gray to indigo-blue. Occurence, Catemou, Aconcagua, Chile, Butte, Montana, and Semipalatinsk, Siberia.

CUPROPYRITE. $CuFe_2S_4$. An iron and copper sulphide, carrying 24% copper. Is closely related to cubanite.

CUPROSCHEELITE. $(Ca,Cu)WO_4$. A calcium and copper tungstate carrying 3 to 5% copper. Is a variety of cuprotungstite in which copper is mainly replaced by calcium.

CUPROTUNGSTITE. $CuWO_4$. A copper tungstate carrying 24% copper. Structure, granular and incrustive. Hardness, 4.5 to 5. Color, pistachio-green to leek-green. Streak, greenish gray to greenish yellow. Is soluble in hydrochloric acid. Occurrence, Llamuco, Santiago de Chile.

CUPROURANITE. Torbernite.

CUPROUS OXIDE. Cuprite in nature. Chemical term for two atoms of copper united with one atom of oxygen.

CUPROVANADITE. Chileite.

CYANOCHALCITE. A phosphoriferous variety of chrysocolla, from Nijni Tagilsk, Perm, Russia.

CYANOCHROITE. $CuSO_4.K_2SO_4+6H_2O$. A hydrous copper and potassium sulphate, carrying 14.3% copper. Crystallization, monoclinic. Color, clear blue. Is an alteration product from Mt. Vesuvius.

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CYANOTRICHITE. $4CuO.Al_2O_3.SO_3.8H_2O$. A hydrous basic copper and aluminum sulphate, carrying 39.4% copper. Crystallization, orthorhombic. Lustre, pearly. Color, smalt-blue to sky-blue. Occurrence, Hungary, France, Arizona and Utah.

DARWINITE. Whitneyite.

DELAFOSSITE. An iron, copper and aluminum oxide containing 37.9% copper, 47.99% iron sesquioxide and 3.52% aluminum sesquioxide. Occurrence, Ekaterinburg, Perm, Russia.

DEMIDOVITE. A phosphoriferous variety of chrysocolla from Tagilsk, Perm, Russia.

DIGENITE. Apparently a partly altered chalcocite containing a considerable percentage of covellite.

DIHYRITE. $5CuO.P_2O_5.2H_2O$. A hydrous basic copper phosphate containing 55.2% copper. Crystallization, monoclinic; also occurs massive and fibrous. Fracture, conchoidal to uneven. Tenacity, brittle. Hardness, 4.5 to 5. Gravity, 4 to 4.4. Lustre, adamantine. Color, dark emerald-green. Streak, pale emerald-green. Is translucent. Is soluble in nitric acid. Occurrence, Germany and the Ural Mountains of Russia.

DILLENBURGITE. An impure chrysocolla containing copper carbonate.

DIOPTASE. $CuO.SiO_2.H_2O$. A hydrous copper silicate carrying 40.3% copper. Common names, emerald copper, emerald malachite. Crystallization, rhombohedral; also occurs massive. Fracture, conchoidal to uneven. Tenacity, brittle. Hardness, 5. Gravity, 3.28 to 3.35. Lustre, vitreous, Color, emerald-green. Streak, green. Is subtranslucent to transparent. Gelatinizes with hydrochloric acid. Is fusible with charcoal and soda. Occurrence, Chile, Hungary, Siberia, French Congo, Arizona, etc.

DOGNACSKAITE. Formula perhaps $3Cu_2.5Bi_2S_3$. A variety of cuprobismutite carrying slightly less copper and sulphur and slightly more bismuth than the normal mineral.

DOLEROPHANITE. $2CuO.SO_3$. A basic copper sulphate carrying 53.1% copper. Crystallization, monoclinic. Color, brown. Is soluble in nitric acid. Is a sublimation product from Mt. Vesuvius.

DOMEYKITE. Cu_3As. A copper arsenide carrying 71.7% copper. Common name, arsenical copper. Structure, reniform and botryoidal, also massive and disseminated. Fracture, uneven. Hardness, 3 to 3.5. Gravity, 7.2 to 7.75. Lustre, metallic, dulling on exposure. Color, tin-white to steel gray, tarnishing to iridescence. Is fusible in open tube, yielding a white sublimate of arsenic trioxide. Is soluble in nitric acid. Occurrence, Chile, Bolivia, Saxony, Mexico and Lake Superior.

DUCKTOWNITE. Apparently merely a mechanical mixture of chalcocite and pyrite.

DÜRFELDTITE. $3(Pb,Ag,Cu,Mn,Fe)S.Sb_2S_3$. A lead, silver, copper, manganese and iron sulphobismuthite. Occures in acicular crystals. Hardness, 2.5. Gravity, 5.4. Lustre, metallic. Color light gray. Is related to stylotypite. Found in Perú.

EHLITE. $5CuO.P_2O_5.3H_2O$. A hydrous basic copper phosphate con-

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taining 52 to 55% copper. Is closely related to dihydrite and pseudomalachite. Gravity, 4.2 to 4.4. Occurrence, Cornwall, England and Nijni Tagilsk, Perm, Russia.

EMERALD COPPER. Common name for dioptase.

EMERALD MALACHITE. Common name for dioptase.

EMPLECTITE. $Cu_2S.Bi_2S_3$. A copper sulphobismuthite containing 18.9% copper and 62% bismuth. Crystallization, orthorhombic. Tenacity, brittle. Hardness, 2. Gravity, 6.3 to 6.5. Lustre, metallic. Color, tin-white. Occurrence, Chile, Saxony and Norway.

ENARGITE. $3Cu_2.As_2S_5$. A copper sulphoarsenite containing 48.3% copper. Crystallization, orthorhombic; also occurs massive and granular. Fracture, uneven. Tenacity, brittle. Hardness, 3. Gravity, 4.45. Lustre, metallic. Color and streak, grayish black to iron-black. Is soluble in aqua regia and fusible on charcoal. Occurs in many copper fields, notably at Butte, Montana, where it is a common and valuable ore.

EPIGENITE. Formula probably $4Cu_2S.3FeS.As_2S_5$. A copper and iron sulphoarsenite, carrying circa 41% copper. Crystallization, orthorhombic. Fracture, uneven. Hardness, 3.5. Lustre, metallic. Color, steel-gray. Streak, black. Is soluble in nitric acid. Occurrence, Wittichen, Baden, Germany.

ERINITE. $5CuO.As_2O_5.2H_2O$. A hydrous basic copper arsenate, containing 47.8% copper. Occurs in mamillated concentric crystalline groups, also fibrous and rough. Tenacity, brittle. Hardness, 4.5 to 5. Gravity, 4.04. Lustre, slightly resinous. Color, emerald-green. Streak, grass-green. Is opaque to subtranslucent. Is soluble in nitric acid. Occurrence, Cornwall and Utah.

ERYTHROCALCITE. $CuCl_2+nH_2O$. A hydrated copper chloride. Is an alteration product from Mt. Vesuvius.

EUCAIRITE. $Cu_2Se.Ag_2Se$. A silver and copper selenide carrying 25.3% copper and 43.1% silver. Crystallization, isometric; also occurs massive and granular. Hardness, 2.5. Gravity, 7.5. Lustre, metallic. Color, silver-white to lead-gray. Streak, shining. Occurrence, Småland, Sweden, and Copiapó, Chile.

EUCHLORINE. A compound of copper sulphate and cuprous chloride, from Mt. Vesuvius.

EUCHROITE. $4CuO.As_2O_5.7H_2O$. A hydrous basic copper arsenate containing 39.7% copper. Crystallization, orthorhombic. Fracture, subconchoidal. Tenacity, brittle. Hardness, 3.5 to 4. Gravity, 3.39. Lustre, vitreous. Color, emerald-green to leek-green. Is translucent to transparent. Occurrence, Libethen, Hungary.

FAHLORE. Common name for tetrahedrite or tennantite.

FALKENHAYNITE. $3Cu_2S.Sb_2S_3$. A copper sulphoantimonite carrying 39.5% copper. Apparently is related to stylotypite. Structure, massive. Gravity, 4.83. Color, gray-black. Occurrence, Joachimsthal, Bohemia, Austria.

FAMATINITE. $3Cu_2S.Sb_2S_5$. A copper sulphoantimonite carrying 43.3% copper. Crystallization, orthorhombic; is isomorphous with enargite;

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also occurs massive. Fracture, uneven. Tenacity, brittle. Hardness, 3.5. Gravity, 4.57. Color, gray with copper-red tinge. Streak, black. Is fusible on charcoal. Decrepitates in closed tube. Occurrence, Sierra de Famatina, Rioja, Argentina and Cerro de Pasco, Junín, Perú.

FIELDITE. A zinciferous variety of tetrahedrite.

FOOTEITE. $8Cu(OH)_2$. $CuCl_2+4H_2O$. A hydrous basic copper oxychloride containing 55.3% copper. Is closely related to tallingite. Crystallization, monoclinic. Color, deep blue. Occurrence, Bisbee, Arizona.

FOURNETITE. Apparently merely a mechanical mixture of tetrahedrite and galena.

FREDRICITE. An argentiferous, plumbiferous and stanniferous variety of tennantite, from Sweden.

FREIBERGITE. An argentiferous tetrahedrite carrying variable percentages of silver as a replacement of the copper found in the normal tetrahedrite.

FRIGIDITE. A ferruginous and nickleiferous variety of tennantite.

GERHARDITE. $4CuO.N_2O_5.3H_2O$. A basic copper nitrate containing 52.9% copper. Crystallization, orthorhombic. Cleavage, yields flexible laminae. Tenacity, fragile and sectile. Hardness, 2. Gravity, 3.426. Lustre, vitreous, brilliant. Color, deep emerald-green. Streak, light green. Is transparent. Is soluble in dilute acids. Occurrence, Jerome, Arizona.

GERSDORFFITE. Empirically nickel sulphoarsenite, but occasionally slightly cupriferous.

GLANCE. Common name for sulphide ores with dark metallic lustre. Copper glance is chalcocite.

GLASBACHITE. Zorgite.

GLAUCOPYRITE. An iron and cobalt diarsenide, occasionally slightly cupriferous.

GRAY COPPER. Common name for tetrahedrite; name also is applied to tennantite, which shades into tetrahedrite.

GREEN COPPER. Common name for malachite.

GRÜNAUITE. An impure nickel sulphide (polydimite) carrying copper, lead, cobalt, iron and bismuth, copper ranging 1.68 to 11.56% in tenor in published assays.

GUEJARITE. $Cu_2S.2Sb_2S_3$. A copper sulphoantimonite containing 15.2% copper. Crystallization, orthorhombic. Tenacity, brittle. Hardness, 3.5. Gravity, 5.03. Lustre, metallic. Color, steel-gray, with bluish tinge. Streak, black. Occurrence, Andalusia, Spain.

HARRISITE. A pseudomorph of chalcocite after galena.

HENWOODITE. Chemical formula uncertain. A hydrous aluminum and copper phosphate carrying circa 5.6% copper. Occurs in botryoidal, globular masses. Fracture, conchoidal. Hardness, 4.4 to 4.5. Gravity, 2.67. Color, turquoise-blue. Streak, bluish to greenish white. Occurs in Cornwall, England.

HERMESITE. An imperfectly established variety of schwatzite.

HERRENGRUNDITE. $CaO.4CuO.2SO_3.6H_2O$. A hydrous basic cop-

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per and calcium sulphate carrying 39.5% copper. Is related to brochantite. Crystallization, monoclinic. Tenacity, rather brittle. Hardness, 2.5. Gravity, 3.13. Lustre, vitreous. Color, emerald-green to bluish-green. Streak, light green. Is transparent. Occurrence, Herrengrund, Hungary.

HOMICHLINITE. Chemical formula uncertain. A copper and iron sulphide carrying circa 43.8% copper. Apparently is chalcopyrite partly altered to bornite, and close to barnhardtite. Crystallization, tetragonal; also occurs massive. Hardness, 4 to 5. Gravity, 4.48. Color, brassy bronze. Streak, black. Occurrence, Chile, Germany, Japan, etc.

HORSEFLESH ORE. Common name for bornite.

HORSFORDITE. Cu_5Sb. A copper antimonide carrying 76% copper. Structure, massive. Is brittle. Hardness, 4 to 5. Gravity, 8.8. Lustre, metallic. Color, silver-white, tarnishing easily. Is said to occur in large deposits on the Island of Mitylene, Asia Minor.

HYDROCIANITE. CuO. SO_3. A copper sulphate carrying 39.6% copper. Crystallization, orthorhombic. Is soluble in water. Is an alteration product from Mt. Vesuvius.

HYDROCUPRITE. Apparently a hydrated cuprite. Is amorphous, occurring in very thin coatings on magnetite. Color, orange-red to orange-yellow. Found at Schapbach, Baden, Germany, and at Cornwall, Pennsylvania.

INDIGO COPPER. Common name for covellite.

ISOPYRE. Apparently an impure opal, carrying about 1.6% copper, found at St. Just, Cornwall, England.

JALPAITE. $3Ag_2S.\ Cu_2S$. A silver and copper sulphide, carrying 13.1% copper and 71.5% silver. Apparently is a cupriferous argentite. Crystallization, isometric. Tenacity, malleable. Gravity, 6.89. Color, blackish lead-gray. Occurrence, Jalpa, Mexico.

JAMESONITE. A lead sulphoantimonite, sometimes cupriferous to the extent of about 3.5%.

JOHANNITE. Chemical formula uncertain. A hydrous uranium and copper sulphate, containing circa 4.8% copper. Crystallization, monoclinic. Hardness, 2 to 2.5. Gravity, 3.19. Lustre, vitreous. Color, emerald-green to apple-green. Streak, paler green. Is translucent to transparent. Taste, bitter. From Joachimsthal, Bohemia.

JULIANITE. A slightly argentiferous and ferruginous variety of tennantite, from Silesia, Germany.

KAMAREZITE. $(CuOH)_2SO_4.Cu(OH)_2+6H_2O$. A hydrated copper sulphate. Crystallization, probably orthorhombic. Occurrence, Laurium, Greece.

KARAMSINITE. Chemical formula uncertain. As determined is a weird silicate of aluminum, iron, manganese, copper, calcium, magnesium and potassium, containing circa 1.85% copper. Occurrence, Finland.

KEWEENAWITE. $(Cu,Ni)_2As$. A copper and nickel arsenide, related to mohawkite, carrying 39 to 54% copper and 9.7% to 20% nickel, with cobalt replacing nickel to extent of about 0.9%. Structure, massive. Cleavage, subconchoidal. Fracture, uneven. Tenacity, slight. Hardness, 4. Gravity, 7.7. Lustre, metallic. Color, pale red, tarnishing to

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darker red. Is soluble in nitric acid. Occurrence, Mohawk mine, Keweenaw county, Michigan.

KLAPROTHOLITE. $3Cu_2S.\ 2Bi_2S_3$. A copper sulphobismuthite containing 25.3% copper and 55.4% bismuth. Crystallization, orthorhombic. Fracture, uneven. Tenacity, brittle. Hardness, 2.5. Gravity, 4.6. Lustre, metallic. Color, steel-gray, tarnishing to iridescent brass-yellow. Occurrence, Baden, Germany.

KOBELLITE. A lead sulphoantimonite, usually cupriferous to the extent of about 1%.

KRÖHNKITE. $CuSo_4.Na_2SO_4+2H_2O$. A hydrous copper and sodium sulphate carrying 18.8% copper. Crystallization, monoclinic. Fracture, conchoidal. Hardness, 2.5. Gravity, 1.98. Lustre, vitreous. Color, azure-blue. Occurrence, Cobija, Atacama, Chile.

LAMPADITE. A cupriferous wad containing 3 to 15% copper.

LANGITE. $4CuO.SO_3.4H_2O$. A hydrous basic copper sulphate containing 53% copper. Is closely related to brochantite. Crystallization, orthorhombic. Hardness, 2.5 to 3. Gravity, 3.5. Lustre, vitreous on crystals, silky on crusts. Color, greenish blue. Is translucent. Occurrence, Cornwall, England.

LAUTITE. An imperfectly determined copper sulphoarsenite, of the enargite family, from Marienberg, Saxony.

LAVENDULAN. Chemical formula probably $3(Cu,Co,Ni)O.\ As_2O_5+3H_2O$. A hydrous copper, cobalt and nickel arsenate, containing about 32% copper, 2.5% cobalt monoxide and 1.35% nickel monoxide. Is related to trichalcite. Structure, amorphous. Fracture, conchoidal. Hardness, 2.5 to 3. Gravity, 3.01. Lustre, greasy to vitreous. Color, lavender blue. Streak, pale lavender blue. Diaphaneity, translucent. Is soluble in warm hydrochloric acid. Occurrence, Chile and Saxony.

LAXMANNITE. Vauquelinite.

LEPIDOPHAEITE. A varietal form of lampadite.

LETTSOMITE. Cyanotrichite.

LEUCOCHALCITE. $4CuO.As_2O_5.\ 3H_2O$. A hydrous basic copper arsenate, carrying about 39.8% copper. Structure, acicular. Lustre, silky. Color, light greenish white.

LIBETHENITE. $4CuO.P_2O_5.H_2O$. A hydrous copper phosphate carrying 51.1% copper. Common name, copper phosphate. Crystallization, orthorhombic. Fracture, subconchoidal to uneven. Tenacity, brittle. Hardness, 4. Gravity, 3.6 to 3.8. Lustre, resinous. Color and streak, olive-green. Diaphaneity, subtranslucent. Is soluble in nitric acid. Occurrence, Chile, Bolivia, England, Germany and Hungary.

LILIANITE. A lead sulphobismuthite, sometimes cupriferous to the extent of about 1.5%.

LIME-MALACHITE. Apparently merely a malachite carrying gypsum or calcite, or both, as impurities.

LINARITE. $PbO.CuO.SO_3.H_2O$. A basic lead and copper sulphate carrying 15.8% copper and 55.7% lead oxide. Crystallization, monoclinic. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5. Gravity, 5.3 to

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5.45. Lustre, vitreous to adamantine. Color, deep azure-blue. Streak, pale blue. Diaphaneity, translucent. Occurs in many lead and copper districts.

LINDACKERITE. Chemical formula probably $3NiO.\ 6CuO.\ SO_3.\ 2As_2O_5.\ 7H_2O$. A hydrous copper and nickel sulphoarsenate containing 27.8% copper. Crystallization, orthorhombic. Hardness, 2 to 2.5. Gravity, 2 to 2.5. Lustre, vitreous. Color, verdigris-green to apple-green. Streak, pale green to white.

LINNAEITE. A cobalt sulphide in which cobalt frequently is replaced partially by nickel, iron or copper, latter to the extent of 1 to 8%.

LIROCONITE. $18CuO.\ 4Al_2O_3.\ 5As_2O_5.\ 55H_2O$. A hydrous basic copper and aluminum arsenate carrying 28.7% copper. Crystallization, monoclinic; also occurs rarely, granular. Cleavage, subconchoidal. Is imperfectly sectile. Hardness, 2 to 2.5. Gravity, 2.88 to 2.98. Lustre, vitreous. Color and streak, sky-blue to verdigris-green. Is soluble in nitric acid. Occurrence, Hungary and Cornwall, England.

LITHIDIONITE. A copper, iron, potassium and sodium silicate carrying circa 5.2% copper. Is an alteration product from Mt. Vesuvius.

LUNNITE. A name proposed for dihydrite, pseudomalachite and their varietal forms.

LUZONITE. A dimorphous form of enargite, found in the Mancayan-Suyoc district, Lepanto, Luzon, Philippines.

LYELLITE. Langite.

MALACHITE. $2CuO.\ CO_2.\ H_2O$. A basic copper carbonate carrying 57.5% copper. Common names, green copper carbonate, basic cupric carbonate. Crystallization, monoclinic. Commonly massive, but frequently incrustive and sometimes granular or earthy, and disseminated as stains. Fracture, subconchoidal to uneven. Tenacity, brittle. Hardness, 3.5 to 4. Gravity, 3.9 to 4.03. Lustre, of crystals, adamantine, frequently with concretionary bands of varying shades from pistachio-green to bluish green. Streak, green. Is opaque to translucent. Is soluble in nitric acid. Occurs in most copper districts, in the upper portions of the oxidized zones of ore bodies, and frequently is an important commercial ore. When massive and beautifully marked is a semi-precious stone, used for table tops, etc.

MALINOWSKITE. A plumbiferous and usually argentiferous variety of tennantite.

MARCYLITE. An imperfectly determined alteration product from copper sulphides, consisting of hydrated copper oxides and sulphides. Occurrence, Perú and Arkansas, U. S. A.

MARSHITE. Cu_2I_2. A copper iodide containing 33.4% copper. Crystallization, tetragonal. Fracture, subconchoidal. Tenacity, brittle. Lustre, adamantine. Color, oil-brown. Streak, orange-yellow. Is translucent. Occurrence, Broken Hill mines, New South Wales, Australia.

MELACONITE. Tenorite.

MELANOCHALCITE. $Cu_2(Si,C)O_4.Cu(OH)_2$. A copper silicate containing 61.4% copper. Structure, amorphous or cryptocrystalline, habit of crystals being undetermined. Hardness, 4. Gravity, 4.14. Lustre, vitreous. Color, jet black, powder is coffee-brown. Fine particles are translucent under high power of microscope, light passing through as yellowish brown.

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Is decomposed by dilute hydrochloric acid, even a 3% solution changing a fragment into a white silicious mass retaining the original outlines, only cupric chloride being produced. Heated in a closed tube loses water and carbon dioxide, and powder changes in color from coffee-brown to brownish black. Heated with borax gives the sky-blue color of copper. With salt of phosphorous gives a skeleton of silica on the blue glass. SiO_2 and CO_2 replace each other within certain limits. From this fact, and the behavior of the mineral under dilute hydrochloric acid, it is deduced by Dr. Geo. A. Koenig, the discoverer, that there exists in it a compound orthoacid, $H_4(Si,C)O_4$, with the hydrogen replaced by copper. Viewed in this light melanochalcite represents the basic copper salt of the orthoacid. Occurs in the Calumet & Arizona mine, Bisbee, Arizona, the mineral surrounding cuprite as a black band, and being overlaid, in turn, by chrysocolla and malachite.

MELANOTHALLITE. Chemical formula probably $CuCl_2.CuO.3H_2O$. A copper oxychloride. Is an alteration product of Mt. Vesuvius.

MIARGYRITE. A silver sulphoantimonite, frequently cupriferous to the extent of one-half to one per cent.

MIXITE. Chemical formula probably $20CuO.Bi_2O_3.5As_2O_5.22H_2O$. A hydrated basic copper arsenobismuthite, carrying 35.2% copper. Occurs in acicular crystals. Hardness, 3 to 4. Gravity, 3.79. Color, whitish green to emerald-green or bluish green. Streak, lighter green. Is translucent, and, in fine particles, transparent. Occurrence, Baden, Germany, and Utah.

MOKAWKITE. $(Cu, Ni, Co)_3As$. A copper, nickel and cobalt arsenide, carrying 63 to 69% copper, 3 to 7% nickel and 0.5 to 2% cobalt, usually somewhat argentiferous. Crystallization, hexagonal, by synthesis, no crystals being found in nature. Cleavage, indistinct. Fracture, uneven. Tenacity, slight. Hardness, 4. Gravity, 8.05. Color, light gray on fresh fractures, tarnishing to purple or brassy yellow. Streak, gray. Is soluble in nitric acid. Occurrence, Mohawk mine, Keweenaw county, Michigan.

MOHAWK-WHITNEYITE. Cu_3As. A copper arsenide, carrying 83 to 87% copper. Is a mere name of convenience for an intimate blending of mohawkite and whitneyite, or keweenawite and whitneyite, indistinguishable to the eye but determined chemically. Cleavage, none. Fracture, hackly. Tenacity, is malleable, to only a slightly less extent than copper. Hardness, about 5. Gravity, 8.6. Color, gray, with a yellowish tinge, tarnishing to coffee-brown. Streak, gray. Is soluble in nitric acid, with a small residue of gray powder. Occurrence, at Mohawk mine, Keweenaw county, Michigan.

MOTTRAMITE. Chemical formula undetermined. A hydrous basic lead and copper vanadate containing about 16.3% copper. Is very closely related to psittacinite.

MOUNTAIN BLUE. Common name for azurite.

MOUNTAIN GREEN. Common name for malachite. Name sometimes is applied to chrysocolla also.

MYSORIN. An impure malachite from Mysore, India.

NAMAQUALITE. Chemical formula probably $2CuO.Al_2O_3.4H_2O$. A hydrated copper and aluminum oxide, carrying 35.8% copper. Occurrence, Little Namaqualand, Cape Colony.

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NANTOKITE. Cu_2Cl_2. A copper chloride, carrying 84.1% copper. Crystallization, isometric; also occurs massive and granular. Cleavage, cubic. Fracture, conchoidal. Hardness, 2 to 2.5. Gravity, 3.9. Lustre, adamantine. Color, grayish white to colorless. Is translucent to transparent. Is soluble in nitric or hydrochloric acids, and in ammonia. Yields chlorine when sharply struck. Oxidizes readily on exposure to atmosphere. Occurrence, Carmen Bajo mine, Chile, and Broken Hill mines, New South Wales.

OCTAHEDRAL COPPER ORE. Common name for cuprite.

OLIVE GREEN COPPER ORE. Common name for olivenite.

OLIVENITE. $4CuO.As_2O_5.H_2O$. A hydrous basic copper arsenate, carrying 44.8% copper. Common name, olive green copper ore. Crystallization, orthorhombic, with prismatic and acicular crystals; also occurs globular and granular. Fracture, conchoidal to uneven. Tenacity, brittle. Hardness, 3. Gravity, 4.1 to 4.4. Lustre, adamantine to vitreous. Color, olive-green to blackish green. Is opaque to subtransparent. Is soluble in nitric acid. Occurrence, Nijni Tagilsk, Perm, Russia, Cornwall and Devon, England, Chile, Utah, etc.

ORILEYITE. $(Cu_2, Fe)_3 (As, Sb)_2$. A copper and iron arsenoantimonite, carrying 12.13% copper. Is related to stibiodomeykite. Structure, massive. Hardness, 5.5. Gravity, 7.4. Lustre, metallic. Color, steel-gray, with purplish tinge on fresh fracture. Streak, dark gray. Occurrence, Burmah.

PARAMELACONITE. CuO. A copper oxide carrying 79.3% copper. Is a dimorphous form of melaconite. Crystallization, tetragonal. Hardness, 5. Gravity, 5.83. Lustre, brilliant. Color, purplish black on faces, pitch-black on fractures. Occurrence, with footeite, at Bisbee, Arizona.

PARTZITE. Chemical formula undetermined. A hydrous copper antimonite, carrying circa 28.7% copper. Fracture, conchoidal. Hardness, 3 to 4. Gravity, 3.8. Color, yellowish green to blackish green. Occurrence, Mono county, California.

PEACOCK ORE. Common name for bornite. Sometimes is applied also to chalcopyrite when showing an iridescent tarnish.

PEARCEITE. Chemical formula probably $9(Ag,Cu)_2S.As_2S_3$. A silver and copper sulphoantimonite. Crystallization, rhombohedral; also occurs massive. Cleavage, none. Fracture, conchoidal. Tenacity, brittle. Hardness, 3. Gravity, 6.125. Lustre, metallic. Color and streak, black. Occurrence, Aspen, Colorado.

PELOCONITE. A varietal form of lampadite.

PENTLANDITE. An iron and nickel sulphide carrying up to 1.75% copper.

PERCYLITE. Chemical formula probably $PbCuO.Cl_2.H_2O$. A hydrous lead and copper oxychloride carrying circa 17% copper. Crystallization, isometric. Hardness, 2.5. Color and streak, sky-blue. Occurrence, Chile, Bolivia, South Africa and Mexico.

PHILLIPITE. $CuSO_4.Fe_2(SO_4)_3+nH_2O$. A hydrous copper and iron sulphate, carrying 11.5% copper. Structure, granular and fibrous. Lustre, vitreous. Color, azure-blue. Diaphaneity, translucent. Taste, astringent. Is soluble in water. Occurrence, Los Condes, Santiago de Chile.

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PHOSPHOROCHALCITE. $6CuO.P_2O_5.3H_2O$. A hydrous basic copper phosphate, closely related to dihydrite and pseudomalachite.

PHOSPHOCHROMITE. Vauquelinite.

PILARITE. An aluminous variety of chrysocolla, from Chile.

PISANITE. $(Fe,Cu)SO_4+7H_2O$. A hydrous iron and copper sulphate, carrying variable percentages of copper. Practically is a cupriferous melanterite, or copperas. Crystallization, monoclinic. Lustre, vitreous. Color, bright blue. Occurrence, Italy and Turkey.

PLANERITE. A hydrous aluminum, copper and iron phosphate, carrying circa 2.8% copper. Occurrence, Gumishevsk, Perm, Russia.

PLUMBOCUPRITE. Cuproplumbite.

PLUSH COPPER ORE. Common name for cuprite.

POLYBASITE. $9(Ag,Cu)S.Sb_2S_3$. A silver and copper sulphoantimonite carrying 3 to 10% copper and 62 to 72% silver. Crystallization, orthorhombic. Fracture, uneven. Hardness, 2 to 3. Gravity, 6 to 6.2. Lustre, metallic. Color, iron-black, in thin splinters cherry-red. Streak, black. Is nearly opaque. Occurrence, Guanajuato, Mexico, Colorado, etc.

PRASINE. A varietal form of dihydrite, containing alumina, silica and arsenic in small amounts, apparently merely as impurities.

PSEUDOBOLÉITE. Cumengite.

PSEUDOLIBETHENITE. Libethenite.

PSEUDOMALACHITE. $6CuO.P_2O_5.3H_2O$. A hydrous basic copper phosphate containing 53.5% copper. Is closely related to dihydrite, but has one extra unit each of cupric oxide and water. Structure, massive, reniform and botryoidal. Hardness, 4.5 to 5. Gravity, 3.4 to 4.4. Lustre, vitreous. Color, emerald-green to blackish green. Streak, paler green.

PSITTACINITE. Chemical formula probably $4(Pb, Cu).V_2O_5.2H_2O$. A hydrous basic lead and copper vanadate, containing circa 15.4% copper. Structure, pulverulent. Color, olive-green. Occurrence, Argentina and Montana.

PURPLE COPPER ORE. Common name for bornite.

PYRITES OF COPPER. Common name for chalcopyrite.

RABDIONITE. Chemical formula uncertain. A hydrated iron, manganese and copper oxide, containing 11.2% copper. Is very soft. Gravity, 2.8. Lustre, dull. Color, black. Streak, dark brown. Occurrence, Nijni Tagilsk, Perm, Russia.

RAHTITE. An impure cupriferous sphalerite.

RAMIRITE. Cuprodescloizite.

RED COPPER ORE. Common name for cuprite.

RED GLASSY COPPER ORE. Common name for cuprite.

REDRUTHITE. Chalcocite.

REGNOLITE. $5CuS.FeS.ZnS.As_2S_3$. A copper, iron and zinc sulphoarsenite containing 32.6% copper. Is closely related to sandbergerite. Crystallization, tetragonal. Occurrence, Cajamarca, Perú.

RESANITE. Chemical formula uncertain. A hydrous copper and iron silicate, containing circa 18.5% copper. Structure, massive. Color, olive-

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green. Is soluble in hydrochloric acid. Occurence, Luquillo, Porto Rico, associated with chrysocolla and malachite.

REZBANYITE. A lead sulphobismuthite, usually cupriferous to the extent of 1.75 to 3.75%.

RICHMONDITE. A cupriferous variety of beegerite, which is, normally, a lead sulphobismuthite.

RICKARDITE. $Cu_2Te.2CuTe$. A copper telluride containing 40.5% copper. Structure, massive. Fracture, irregular. Hardness, 3.5. Gravity, 7.54. Color, brilliant purple, rivaling bornite tarnish, even on a fresh fracture, and showing deep color when pulverized. Is fusible on charcoal and soluble in nitric acid. Occurrence, Good Hope mine, Vulcan, Colorado.

RIONITE. A bismuthiferous variety of tennantite.

RIVOTITE. Chemical formula uncertain. A copper and antimony carbonate carrying circa 31.6% copper. Structure, amorphous, compact. Fracture, uneven. Tenacity, fragile. Hardness, 3.5 to 4. Gravity, 3.55 to 3.62. Color, yellowish green to grayish green. Streak, grayish green. Occurrence, Lerida, Spain.

RUBY COPPER. Common name for cuprite.

SAFFLORITE. A cobalt diarsenide, usually capriferous to the extent of 0.25 to 4.25%.

SALVADORITE. $FeSO_4.7H_2O.2(CuSO_4).7H_2O$. A hydrous copper and iron sulphate carrying circa 14.5% copper. Is near pisanite. Crystallization, monoclinic. Lustre, vitreous. Color, bluish green. Occurrence, Calama, Antofagasta, Chile.

SANDBERGERITE. A ferruginous, plumbiferous and zinciferous variety of tennantite, from Perú.

SCHULZENITE. Chemical formula probably $CuO.\ 2CoO.\ Co_2O_3+4H_2O$. A hydrous copper and cobalt oxide. Structure, amorphous. Fracture, conchoidal. Hardness, 3.5. Gravity, 3.39. Color and streak, black. Occurrence, Chile.

SCHWATZITE. A mercurial tetrahedrite, in which mercury replaces copper variably, usually to the extent of about 15% of the total. Gravity, 5.10. Lustre, dull. Color, dark gray to iron-black.

SERPIERITE. $3(Cu,Zn,Ca)SO+3H_2O$. A hydrous basic copper, zinc and calcium sulphate, containing 28.8% copper. Crystallization, orthorhombic. Color, bluish green. Is transparent. Occurrence, Laurium, Greece.

SIEGENITE. A nickeliferous variety of linnæite, frequently carrying small percentages of copper.

SMALTITE. Empirically cobalt disulphide, but frequently carrying copper in quantities from a mere trace to 3.25%.

SOMERVILLITE. $CuSiO_3.4H_2O$. A hydrous copper silicate, corresponding in formula with chrysocolla and asperolite, except as to excess of water. From Somerville, Somerset county, New Jersey.

SPANGOLITE. Chemical formula probably $(AlCl)SO_4.6Cu(OH)_2+3H_2O$. A basic copper and aluminum chlorosulphate, carrying circa 47.7% copper. Crystallization, rhombohedral. Fracture, conchoidal. Hardness, 2 to 3.

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Gravity, 3.14. Lustre, vitreous. Color, dark green. Occurrence, Cochise county, Arizona.

SPANIOLITE. An imperfectly established variety of **schwatzite.**

STANNITE. Chemical formula probably $Cu_2S.FeS.SnS_2$. A copper, iron and tin sulphide, containing 29.5% copper, 13.1% iron and 27.5% tin. Structure, massive, granular and disseminated. Cleavage, cubic, indistinct. Fracture, uneven. Tenacity, brittle. Hardness, 4. Gravity, 4.3 to 4.5. Lustre, metallic. Color, steel-gray when pure, ranging to iron-black when impure, latter with bluish to yellowish tarnish. Streak, blackish. Occurrence, County Wicklow, Ireland, and Cornwall, England.

STELZUERITE. Chemical formula uncertain. A basic copper sulphate, closely related to brochantite. Crystallization, orthorhombic. Hardness, 3.5 to 4. Gravity, circa 3.9. Lustre, vitreous. Color, dark emerald-green to blackish green. Streak, lighter green. Is translucent to transparent. Occurrence, Chile, associated with brochantite and atacamite, and frequently mistaken for both.

STETEFELDTITE. A hydrous copper antimonite, carrying circa 12.8% copper. Structure, massive. Hardness, 3.5 to 4.5. Gravity, 4.12 to 4.24. Color, brown to blackish. Streak, shining. Occurrence, Nevada.

STIBIODOMEYKITE. $Cu_3(As,Sb)$. A copper arsenoantimonite containing circa 65% copper. Apparently is an antimonial domeykite. Crystallization, hexagonal in synthetic crystals, none being found in nature. Cleavage, none. Fracture, uneven. Tenacity, very slight. Hardness, 4. Gravity, 8.1. Lustre, metallic. Color, gray, with yellowish tinge, like domeykite. Streak, gray. Is soluble in nitric acid, with small residue of gray powder. Occurrence, Mohawk mine, Keweenaw county, Michigan.

STYLOTYPITE. $3(Cu_2Ag_2Fe)S.Sb_2S_3$. A copper, silver and iron sulphobismuthite carrying 28.3% copper and 8.1% silver. Apparently is an argentiferous and ferruginous bournonite. Crystallization, orthorhombic. Fracture, imperfectly conchoidal. Tenacity, brittle. Hardness, 3. Gravity, 4.8. Lustre, metallic. Color, iron-black. Streak, black. Occurrence, Copiapó, Chile.

STROMEYERITE. $(Ag,Cu)_2S$. A silver and copper sulphide, carrying 31.1% copper and 53.1% silver. Crystallization, orthorhombic. Fracture, subchonchoidal. Hardness, 2.5 to 3. Gravity, 6.15 to 6.3. Lustre, metallic. Color and streak, dark steel-gray. Occurrence, Chile, Peru, Siberia, Colorado, etc.

STÜBELITE. Chemical formula undetermined. A hydrous manganese, copper, iron and aluminum silicate, carrying circa 12% copper. Structure, massive, reniform and botryoidal. Fracture, conchoidal. Tenacity, brittle. Hardness, 4 to 5. Gravity, 2.22 to 2.26. Lustre, vitreous, brilliant. Color, velvet-black to pitch-black. Streak, dark brown.

STUDERITE. A varietal form of tennantite containing, as partial replacement of normal copper content, silver, lead, zinc and iron.

SUB-OXIDE OF COPPER. Cuprite in mineralogy; cuprous oxide in chemistry.

SYCHNODYMITE. $(Co,Cu,Ni)_4S_5$. A cobalt, copper and nickel sulphide, containing circa 14.5% copper. Crystallization, isometric. Gravity,

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4.95. Lustre, metallic. Color, steel-gray. Is soluble in nitric acid. Occurrence, Eiserfeld, Siegen, Germany.

TAGILITE. $4CuO.P_2O_5.3H_2O$. A hydrous basic copper phosphate containing 49.4% copper. Crystallization, monoclinic; also occurs in spheroidal concretions with structure fibrous to earthy. Fracture, uneven. Tenacity, brittle. Hardness, 3 to 4. Gravity, 4.08. Lustre, vitreous. Color, verdigris-green to emerald-green. Diaphaneity, substranslucent. Is soluble in nitric acid. Occurrence, Coquimbo, Chile and Nijni Tagilsk, Perm, Russia.

TALLINGITE. Chemical formula probably $Cu_5(OH)_8Cl_2+4H_2O$. A hydrated copper oxychloride containing circa 64% copper. Structure, subcrystalline. Hardness, 3. Gravity, circa 3.5. Color, greenish blue. Streak, white. Is subtranslucent. Occurrence, Botallack, mine, Cornwall, England.

TARGIONITE. Apparently merely an impure galena carrying circa one per cent each of copper, silver and zinc, from Tuscany, Italy.

TENNANTITE. $4Cu_2S.As_2S_3$. A copper sulphoarsenite containing 57.5% copper when pure, but shading into a great number of varietal forms. Common name, gray copper ore, in common with tetrahedrite, to which tennantite is closely related and joined by a chain of rather obscure minerals shading gradually from tennantite into tetrahedrite. The many varietal forms of this mineral are brought about by partial replacement of copper by silver, lead, zinc, iron, mercury, cobalt, nickel, tin and platinum, with a marked tendency toward mutual substitution of the antimony of tetrahedrite for the arsenic of tennantite, and vice versa, rendering the tetrahedrite-tennantite group unusually prolific. Crystallization, isometric; also occurs massive and granular, compact. Cleavage, none. Fracture, subconchoidal. Tenacity, brittle. Hardness, 3.5 to 4.5. Gravity, 4.4 to 5.1. Lustre, metallic. Color and streak, flint-gray to iron-black. Diaphaneity, opaque to subtranslucent in small splinters. Is soluble in nitric acid and fusible on charcoal. Occurrence, at numerous points, being found in greater or less profusion in most copper districts. Is not regarded usually as a commercial ore, except where argentiferous, which is quite commonly the case.

TENORITE. CuO. A copper oxide, containing 79.8% copper. Common names, black copper, black oxide of copper. Chemical names, copper monoxide, copper peroxide, cupric oxide. Crystallization, monoclinic; also occurs massive, pulverulent and earthy. Fracture, conchoidal to uneven. Hardness, 3 to 4. Gravity, 5.8 to 6.25. Lustre, metallic. Color, dull grayish-black when massive, steel-gray in flakes. Is soluble in nitric and hydrochloric acids. Is found in most copper districts, and is a valuable ore of copper when occurring in quantities, but much of what has been considered tenorite in the past really was chalcocite, for which it is easily mistaken when disseminated.

TETRAHEDRITE. $4Cu_2S.Sb_2S_3$. A copper sulphoantimonite containing 52.1% copper. Shades into tennantite, which see, for reference to protean forms of these two closely related and frequently indistinguishable minerals. Common name, gray copper ore. Crystallization, isometric; also occurs massive and granular, coarse to fine, compact. Cleavage, none. Fracture, subconchoidal to uneven. Tenacity, brittle. Hardness, 3.5 to 4.5. Gravity, 4.4 to 5.1. Lustre, metallic, brilliant. Color, flint-gray to

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iron-black. Streak, grayish-brown to cherry-red. Opaque in quantity, but occasionally subtranslucent in very thin splinters, giving cherry-red transmitted light. Is soluble in nitric acid and fusible on charcoal. Occurrence, in most copper districts, but commonly is not regarded as a commercial ore, except when argentiferous, which frequently is the case.

THROMBOLITE. An imperfectly determined hydrous copper antimonate, carrying circa 31.5% copper. Structure, amorphous. Color, emerald-green. Occurrence, Rezbánya, Hungary.

TIEMANNITE. An imperfectly determined silver, mercury and copper selenide, carrying circa 8.8% copper. Occurrence, with eucairite and umangite, in the Sierra de Umango, Rioja, Argentina.

TORBERNITE. $CuO.2UO_3.P_2O_5.H_2O$. A hydrous uranium and copper phosphate, carrying 6.9% copper. Common name, uranium mica. Crystallization, tetragonal. Cleavage, micaceous, with brittle laminae. Hardness, 2 to 2.5. Gravity, 3.4 to 3.6. Lustre, pearly on cleavage planes and subadamantine on other faces. Color, emerald-green to grass-green. Streak, apple-green. Diaphaneity, translucent to transparent. Is soluble in nitric acid. Occurrence, Cornwall, Saxony, etc.

TRICHALCITE. $3CuO.As_2O_5+5H_2O$. A hydrous copper arsenate containing 34% copper. Structure, in radiated groups, columnar, also dendritic. Hardness, 2.5. Lustre, silky. Color, verdigris-green. Is soluble in hydrochloric acid. Occurrence, Russia.

TRIPPKEITE. ($nCuO.As_2O_3$) A copper arsenite. Crystallization, tetragonal. Color, bluish-green. Is soluble in acids. Occurrence, Copiapó, Chile, in druses.

TRITOCHORITE. Cuprodescloizite.

TURQUOISE. A gemstone, essentially a hydrous aluminum phosphate, colored by 2 to 6% of copper, which probably is included as a hydrous basic copper phosphate.

TYROLITE. $CuO.As_2O_5.9H_2O$. A hydrous basic copper arsenate carrying 40.1% copper. Crystallization, orthorhombic. Cleavage, micaceous. Tenacity, highly sectile and flexible in thin laminæ. Hardness, 1 to 1.5. Gravity, 3.02 to 3.1. Lustre, pearly to vitreous. Color, verdigris-green to apple-green. Diaphaneity, subtranslucent to translucent. Occurrence, Libethen, Hungary, Utah, etc.

UMANGITE. Cu_3Se_2. A copper selenide containing 54.6% copper. Structure, massive. Cleavage, none. Fracture, subconchoidal to uneven. Hardness, 3. Gravity, 5.62. Lustre, metallic. Color, dark cherry-red, with violet tinge on fresh fracture, soon tarnishing to violet-blue. Streak, black. Occurrence, with tiemannite and eucairite, in the Sierra de Umango, Rioja, Argentina.

URANIUM MICA. Common name for torbernite.

URANOCHALCITE. Chemical formula undetermined. A hydrous basic uranium and copper sulphate carrying circa 5% copper. Occurs in acicular crystals. Hardness, 2 to 2.5. Color, grass-green. Occurrence, Joachimsthal, Bohemia.

VALLERIITE. A sulphate of copper, iron, aluminum and magnesium.

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Apparently is a mixture of covellite, pyrrhotite and several aluminous and magnesian minerals. Occurrence, Nya Kopparberg, Sweden.

VARIEGATED COPPER ORE. Common name for bornite.

VAUQUELINITE. Chemical formula probably $2(Pb,Cu)CrO_4.(Pb,Cu)_3P_2O_8$. A lead and copper phosphochromate carrying 3.9 to 10% copper. Crystallization, monoclinic; also occurs amorphous. Fracture, uneven. Tenacity, brittle. Hardness, 2.5 to 3. Gravity, 5.8 to 6.1. Lustre, adamantine to resinous. Color, apple-green to liver-brown. Streak, greenish to brownish. Diaphaneity, opaque to faintly translucent. Occurrence, Berezov, Russia.

VELVET COPPER ORE. Common name for cyanotrichite.

VENERITE. A hydrous copper, aluminum, iron and magnesium silicate containing circa 14% copper. Occurrence, Springfield, Berkshire county, Pennsylvania.

VERDIGRIS. Copper carbonate. Is formed from metallic copper by the action of carbon dioxide and moisture in the atmosphere. The verdigris of the pharmacist is a copper acetate and care should be taken not to confuse these widely varying compounds bearing the same name.

VESZEYLITE. Chemical formula probably $7(Cu,Zn)O.(P,As)_2O_5.9H_2O$. A hydrous copper arsenophosphate carrying circa 30% copper. Crystallization, monoclinic. Hardness, 3.5 to 4. Gravity, 3.53. Color and streak, greenish blue. Occurrence, Moravitza, Hungary.

VOGLITE. Chemical formula uncertain. A hydrous uranium, calcium and copper carbonate carrying circa 6.9% copper. Occurs in aggregations of crystalline scales. Lustre, pearly. Color, emerald-green to bright grass-green.

VOLBORTHITE. Chemical formula probably $(Cu,Ca,Ba)_3(OH)_2VO_4+6H_2O$. A hydrous basic copper, calcium and barium vanadate carrying circa 30.9% copper. Hardness, 3 to 3.5. Gravity, 3.55. Lustre, pearly to vitreous. Color, olive-green to citron-yellow. Streak, greenish yellow. Is translucent in thin splinters. Occurrence, Perm, Russia.

WARRINGTONITE. A varietal form of brochantite.

WHITNEYITE. Cu_2As. A copper arsenide containing 88.4% copper. Structure, massive, crystalline, very finely granular. Tenacity, malleable. Hardness, 3.5. Gravity, 8.4 to 8.6. Lustre, dull and submetallic on fresh fracture, strongly metallic when scratched, soon tarnishing. Color, pale reddish to grayish white, pale reddish white on a rubbed surface, tarnishing to yellowish bronze, brown and brownish black, sometimes with iridescence. Is soluble in nitric acid. Occurrence, Houghton, Michigan, Sonora, Mexico, and Chile.

WINKLERITE. Chemical formula uncertain. A hydrous cobalt, nickel and copper arsenate carrying circa 11 to 12% copper. Structure, amorphous, massive. Fracture, conchoidal. Hardness, 3. Gravity, 3.43. Lustre, dull. Color, bluish black to violet black. Streak, dark brown. Occurrence, Almería, Spain.

WITTICHENITE. $3Cu_2S.Bi_2S_3$. A copper suphobismuthite carrying 38.4% copper. Crystallization, orthorhombic. Fracture, conchoidal. Hardness, 3.5. Gravity, 4.3 to 5. Color, steel-gray to tin-white, tarnishing to

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pale lead-gray. Streak, black. Is soluble in nitric or hydrochloric acids. Decomposes easily on charcoal. Occurrence, Wittichen, Baden, Germany.

WÖLCHITE. A varietal form of bournonite.

WOLFSBERGITE. Chalcostibite.

WOOD COPPER. Common name for olivenite.

WOODWARDITE. Chemical formula uncertain. An aluminum and copper sulphate containing circa 38.4% copper. Is closely related to langite.

YELLOW COPPER ORE. Common name for chalcopyrite.

YPOLÉIME. Chemical formula perhaps $5CuO.2P_2O_5.5H_2O$. A doubtful hydrous basic copper phosphate of the dihydrite-pseudomalachite group.

ZEUNERITE. $CuO.2UO_3.As_2O_5.8H_2O$. A hydrous uranium and copper arsenate containing 6.1% copper. Crystallization, tetragonal. Fracture, uneven. Tenacity, brittle. Hardness, 2 to 2.5. Color, grass-green to emerald-green. Occurrence, Saxony and Cornwall, England.

ZINKAZURITE. Apparently merely a hydrous mixture of copper carbonate and zinc sulphate, from the Sierra Almagrera, Spain.

ZINKENITE. A lead sulphoantimonite, usually slightly cupriferous.

ZIPPEITE. Chemical formula undetermined. A hydrous basic uranium, copper and calicum sulphate. Occurs in acicular crystals and crusts. Hardness, 3. Color, lemon-yellow to orange-yellow. Occurrence, Joachimsthal, Bohemia.

ZORGITE. Chemical formula uncertain. A lead and copper selenide, carrying 4 to 15.5% copper and 41 to 64% lead, with traces of silver, mercury and iron. Structure, massive and granular. Tenacity, brittle. Hardness, 2.5. Gravity, 7 to 7.5. Lustre, metallic. Color, lead-gray. Streak, darker lead-gray. Occurrence, Cacheuta, Mendoza, Argentina.

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CHAPTER IV.

THE MINING OF COPPER.

Large volumes have been written and printed regarding the general subject of ore extraction, and many smaller books have been issued on single branches of mining practice, such as timbering, pumping, use of explosives, etc. Under these circumstances it is obvious that merely an outline can be given, in a single short chapter on the subject of the actual extraction of copper and copper ore. In its main features copper mining is much the same as other branches of metalliferous mining, but there are some special features of interest.

Title to mining lands is secured and held in different ways in different countries. In England and her colonies, mining property usually is held either as freehold, when owned in fee, or as leasehold, when operated by other than the owner of the land. In most of the colonies, especially in the Australian states and in British Columbia, public lands are available for location, on terms favorable to mining operations. In the United States practically all of the land east of the Mississippi River is held by private owners, to whom pertain the mineral rights, as well as the ownership of the surface of the land. In the states and territories from the Rocky Mountains westward to the Pacific coast there are immense areas of mountainous mineral lands, owned by the government, and available for the location of mining claims. The full mining claim allowed by the United States laws is a parallelogram of 600 by 1,500 feet, with its longest dimension practically coincident with the axis of strike of some mineral body. Claims may be fractional, where the full size permitted cannot be secured because of surrounding claims previously located. The locator of a claim must make affidavit that he has found mineral in place, but this requirement is more honored in the breach than in the observance. There is no limit to the number of claims that may be located by a single person, firm or corporation. Neither is there anything to prevent other locators staking out claims impinging upon or covering claims previously located. In many mineral districts there is much litigation, owing to infringing claims. United States mineral claims are of two varieties, one known as a quartz or lode claim, previously referred to, and a second variety, of greater area, known as a placer claim, located for placer gold. The locator of a mineral claim on United States government land is required to do annual work, usually called assessment work, to the value of $100 on each claim, until the end of five years, when, upon satisfactory proof to the land office that $500 worth of work has been done, a government patent will issue for such lands. In the case of a group of contiguous claims, assessment work may be done, by shaft or tunnel, on a single claim of the group, instead of being divided among the individual claims. In actual practice a 10-foot tunnel or a 10-foot pit is considered equivalent to $100 worth of work, though ranging in cost from $35 to $50, as a rule. In Mexico and several others among the Latin-American coun-

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tries, surface title does not carry the ownership of mineral values, which pertain to the state. No permanent titles to mineral properties are given in Mexico, but these are held subject to the payment of regular taxes of 10 pesos per pertenencia of one hectare area, and upon non-payment of taxes title to the lands is forfeited automatically.

The law of the apex in the United States is that the owner of a vein that outcrops at surface may follow such vein to any depth, at any dip, regardless of side boundary lines at surface. This law is the cause of endless confusion, and in some of the best mining camps, notably at Bisbee and Leadville, side-line agreements are made between the owners of different claims, by which they agree mutually that the law of the apex shall be waived. The law of the apex holds only in the mining states west of the Mississippi river, and is unknown in the Lake Superior district and other eastern mining fields.

Ore may outcrop at the surface, or may be overlaid by alluvium consisting of sand, gravel and boulders to depths ranging from a few feet to hundreds of feet. Ore bodies also may be overlaid by eruptions of rhyolite or similar flows laid down after the deposition of mineral values. Every property must be a prospect before it can be a mine, and prospects divide naturally into two classes, one showing outcrops and the other having its ore bodies covered by dirt or rock. Ore bodies not outcropping at surface may be proven by the use of the churn drill or diamond drill. The diamond drill has a hollow cylindrical bit, set on its inner and outer edges with black diamonds. This bit is rotated by means of pipes connecting with the machine above, and bores a hole of hundreds, or if necessary, of thousands of feet, in depth, cutting a core that gives a complete record of the formation penetrated. In soft ground no solid cores can be secured, and in such cases it is necessary to collect rock cuttings from the sludge that falls from the mouth of the hole, water being forced into the bottom of the hole under pressure to remove the chips and rock dust. The churn drill cuts no core, but is valuable for exploratory purposes, in most cases being cheaper than the diamond drill for shallow borings.

Unknown ground may be proven also by test-pits or trenches. Test-pits, usually shallow, sometimes are sunk for several hundred feet in depth, and may be made into permanent shafts. In the Lake Superior district, where nearly all of the shafts are sunk on inclines, at the angles of dip of the cupriferous beds, it is customary, in opening mines on beds covered with heavy drift, to sink temporary vertical shafts through the alluvium and from twenty to fifty feet into the solid rock. From the bottom of such a temporary shaft a crosscut is run to the desired bed, and the permanent shaft frequently is opened to surface by means of an upraise, after which the permanent shaft is deepened on the bed. A sand shaft is a shaft sunk through sand to the rock ledge, and frequently is very difficult in sinking. A drop shaft is one that is sunk through sand or alluvium by weights piled on the top of the timbering. The bottom is shod with steel, to facilitate its descent through the soft material, and new timbers are framed in at the top, until the solid rock is reached.

Copper mines may be divided into two classes, according to their system of opening. The first of these is the quarry or open-cast mine, while the other is a mine proper, with subterranean openings. In working

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mines open-cast it frequently is necessary to remove the overburden of alluvium, sometimes of considerable depth, preparatory to quarrying the ore. Some of the open-cast mines are worked exclusively as quarries, and others in combination with underground openings, where ore broken down in large open pits is milled through winzes to tunnels beneath, for removal in tram-cars. The mine of the Utah Copper Company, in Bingham, Utah, is worked in benches, by steam shovels, this plan being rendered possible by the enormous size of the ore body, which is a mountain of cupriferous monzonite.

By far the greater number of copper mines, as well as mines of nearly all other minerals, are developed by strictly underground openings. The underground mines fall into two classes, the first being those opened by adits or tunnels, and the second those that depend upon shafts for ore extraction. Tunnel mining, so called, is where the principal avenue of ore extraction is through a practically horizontal opening, commonly called a tunnel, though more properly termed an adit, as, strictly speaking, a tunnel opens to the surface at both ends. The tunnels are given a slight rise from the portal, to provide drainage, and also to obtain the aid of gravity in removing loaded cars. The principal advantage of tunnel mining is that it permits cheap development and extraction, by reason of requiring no pumps or costly machinery for hoisting. In mountainous districts tunnels frequently give good backs—that is large ore bodies above the tunnel level. A disadvantage of development by tunnel is that it sometimes operates to restrain development at a greater depth, because of the hesitation of the mine managment in making the heavy outlay required for hoisting machinery and pumps. Many copper mines are combinations of tunnel and shaft mines, having been opened by tunnel originally, and deepened later by shaft.

All underground openings in a mine may be divided into three classes, of which the first includes the openings made upon a practically horizontal plane, while the second includes the openings that range from a very flat dip to vertical. The third class includes stopes and chambers of varying size and trend.

The horizontal openings include not only the adits and tunnels previously referred to, but also plats, drifts and crosscuts. A plat is the beginning of a drift, cut out beside a shaft. A drift is like a tunnel, except that it starts from some underground opening and usually is smaller in size than a tunnel. A crosscut is an opening on a horizontal plane, like a drift, except that it runs across an ore body instead of with it. The word level is more comprehensive than the word drift and includes all horizontal openings on that particular plane, such as adits, tunnels, plats, drifts, crosscuts, stopes and chambers.

The second class of openings, includes shafts and winzes, the winze being a connection, or the beginning of a connection, between levels. In the old system of mining levels usually were 10 fathoms or 60 feet apart, and sometimes even closer. Modern mining practice usually provides levels at 100 foot intervals, and occasionally levels are placed 150 feet apart, in which case sub-levels are driven when necessary.

Of the third class of mine openings, a stope is any ore body developed by horizontal openings that is available for ore extraction, and the term

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is applied also to the chamber left by extraction of the ore. Stoping is the actual mining of ore, as distinguished from opening work, which merely provides the preliminary underground passages necessary to actual ore extraction on a considerable scale.

The reopening of an old mine is a task that is both nasty and dangerous, owing to rotten timbers and mine openings filled with water, usually with considerable rubbish at the bottom of the shafts. Frequently such reopening work must be done by the aid of defective mine maps, or without any maps whatever. Old shafts frequently are cut down to larger size, the cutting down being a process of enlargement and retimbering.

Shafts frequently are vertical, and may be sunk at any angle corresponding with the dip of the ore body that is being developed, though in actual practice shafts rarely are sunk flatter than an angle of 25° with the horizon. Shafts usually are divided into compartments by timber cribbing. Sometimes the cribbing is open, and again very close. The various compartments are utilized for hoisting, for ladders providing ingress and egress, and for air-pipes, water-pipes and wires. The ladderway usually is timbered off solidly from the other compartments, and usually has sollars, or landings, at stated intervals, for both convenience and safety. At all levels there usually are platforms with openings just large enough for the cages, or skips, to pass through. An air-shaft is one that is used for purposes of ventilation only, being either a shaft sunk for that sole purpose, or an old shaft otherwise useless. A blind shaft is one that does not come to the surface, usually connecting with a tunnel. An upraise is a winze or shaft, or the beginning of either, made by working upward. The upper workings of a mine frequently are in soft rock, or ore softened by oxidation, and such openings require heavy timbering for safety. In the case of mines opened on soft veins having strong walls there is considerable advantage in sinking the incline shaft in the footwall, at a depth of 25 to 75 feet under the ore, the shaft following the same dip as the vein and running parallel therewith. In the case of a vertical shaft there is a similar advantage in sinking in the footwall and crosscutting for the ore body, unless the depth and dip are such that this plan necessitates crosscuts of prohibitory lengths.

Vertical shafts have guides in each compartment, along which the cage travels. The cage is merely a rough elevator, and hoisting commonly is done in counterbalance. This may be accomplished by the use of a single drum with a fleet-gear, or by hoisting with a split drum. In the case of a very deep vertical shaft with hoisting done by cages in counterbalance, tail-ropes running from the bottom of each cage around a sheave-wheel in the bottom of the shaft prevent excessive vibration. Hoisting in vertical shafts usually is done in cages, which raise the loaded tramcars and lower the empty cars from surface, but a comparatively recent development is the Kimberly skip, which is swung under the cage. The Kimberly system calls for one, two or even three skips, swung under the cage. The skips discharge automatically into bins, on reaching the surface. The utilization of the Kimberly system of hoisting in deep vertical shafts increases their capacity by 25 to 50 per cent., according to circumstances.

As a rule incline shafts sould be sunk at a constant angle, while

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drifts should follow the ore, as far as practicable. Hoisting from incline shafts is done in skips, which are iron boxes with square bottoms and tops built at such an angle that the mouth of the skip is approximately level while on the skip-track. The skip-track is of steel rails, usually laid on wooden cross-ties, the weight of the rails depending on the size and capacity of the skip.

At the surface of a shaft the first equipment may be an "armstrong" windlass—that is, one worked by hand power. The next stage is a horse-whim or whip, followed by a pony hoist, operated by steam or gasoline, and the last stage calls for permanent hoists, these ranging up to thousands of horse-power in capacity in some large and deep mines. For an open pit a derrick with mast and boom may be used for hoisting ore in a bucket. The simplest headgear over a shaft is a tripod of three sticks of timber. The next stage is a gallows-frame, which may be small or large, and of wood or steel, the tendency at the larger mines being strongly toward building all important surface structures with steel frames. Shaft-houses, which are enclosed structures, may be of wood or steel, with a decided preference for steel. In the Lake Superior district the shaft-houses usually have in connection rock-houses, where the preliminary crushing is done. In hoisting with a bucket this swings free in a vertical shaft, while in an incline shaft the bucket rides skids, or, preferably, a trolley cable. The present maximum capacity of skips and cages is about twelve tons of cargo. In deep shafts the weight of a skip or cage and the cable attached thereto is fully equal to the weight of the load hoisted, but by working in counterbalance the disadvantage of these excessive weights is reduced greatly. Hoisting is done mainly by steel cables, composed of strands, each built up of numerous steel wires, slightly twisted. In some districts flat steel cables are used. Cables should be inspected at regular and frequent intervals, and all defective ropes removed, as the constant strain of torsion ruins the strength of the best of cables in time. Care should be exercised in preventing short turns, as these are very damaging to the life of the wire. Large sheaves and drums of large diameter, with minimum changes of direction, add greatly to the life and safety of steel cables. The engine-houses containing the hoists almost invariably are set on the footwalls of the mines, partly for safety and partly to obviate short bends in the hoisting cables.

In shallow mines the workmen go up and down on the ladderways, while in deep mines the men ride in the cages of the vertical shaft, or in the case of incline shafts, ride to and from their work in skips, or, in some mines, on man-cars especially built for carrying mine-workers. The old style of man-engine, which was highly efficient in its day, has gone out of use.

A competent engineer is as necessary to a mine as to a railroad, and good maps are equally important. While a competent civil engineer can do fair work in mine surveying, and some excellent mining men have had merely the training of civil engineers, a special course in mining engineering is much to be preferred. The work of a competent chemist also is of great importance in most copper mines, and in small mines the engineer usually serves as chemist also. Any mine that can employ a dozen men can afford the services of an engineer and chemist combined—in fact cannot afford to do without. In many small mines the superintendent is

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chemist and engineer, and possibly also bookkeeper and supply clerk, and there are cases on record where to these accomplishments the mine manager added the blacksmith's trade as well, but that is almost too much talent for one man to possess. The records of old mines usually are deficient in reliable maps, but modern practice is very thorough as to engineering and mapping, and blueprints are extended monthly, from accurate data obtained underground.

While the general public uses the term miners for all underground workmen, this term is reserved in actual practice for the skilled workmen who do the drilling and blasting. Mine timbering is skilled work that is done sometimes by the miners, and sometimes by special timber gangs. The muckers, or trammers, are the men who do the shovelling and rough labor of the mine. Some large properties have special shot-firers for blasting. Miners may work by the day or on contract, contracts being divided into two general classes, the first being opening work, which consists mainly of shaft-sinking and running drifts. The second class of contract work is stoping, the latter being the actual breaking down and extraction of ore in considerable quantities. Contract work is preferable in nearly every case where possible, and gives more satisfactory results to both miners and mine-owners, as it secures more work to the owners for the money paid, and also gives larger earnings to the good workmen. In the case of contract miners the supplies furnished by the mine, such as candles, detonators, fuse, dynamite, etc., usually are charged at much more than cost, such prices sometimes running two or three times the actual cost to the mine. On the face of it this practice is a great injustice to the miners, but in actual work is defensible on the ground of results. It has been shown by actual trial that the average contract miner is careful or careless of supplies in proportion to their cost, and as the excessive use of supplies is a dead loss that eventually must be shared between the miners and the owners, anything that operates to bring about economy is an advantage to both parties.

Most copper mines work two or three shifts. The double shift mines usually work shifts of ten hours each, but in mines giving the eight-hour day it is customary to work three shifts, thus utilizing the entire twenty-four hours. There is economy in keeping underground work going at top speed, with double or triple shifts, the fixed charges and many of the heavy expenses on surface being the same in either case.

Mining, at best, is a dangerous calling, and when not surrounded by proper safeguards is extra hazardous. The copper mines make a good showing among the metalliferous mines of the world, in their proportion of fatalities, and in the leading districts the precautions taken result in keeping down the percentage of mortality to a fairly low basis. The principal cause of accidents, responsible for more than half of all the deaths, is the carelessness of the miners themselves. Human nature is so constituted that the average man becomes habituated to danger that is met with in the course of his daily work, and miners fall into shafts and winzes, or step from stagings through sheer carelessness. Of the semi-avoidable sources of accidents, falling ground is responsible for more than half the deaths. This source of trouble is called semi-avoidable for the reason that, with care, accidents from this cause can be greatly reduced, though not

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entirely eliminated by even the utmost vigilance on the part of both men and management. Missed holes or premature explosions are responsible for many horrible accidents and deaths. Poor fuse is more dangerous to miners than dynamite, and wise managers scrutinize the quality of their fuse as closely as they investigate the safety of their hoisting cables. Accidents through riding in skips are unpleasantly common. In many mines there is a rule that miners shall not ride to or from their work in skips, but this rule seems made to be broken, and serves merely as an excuse to the management when accidents occur. It is much better to shoulder the responsibility, as many managements have done, and permit the men to ride in the skips with such safeguards as can be furnished.

Ankylostomiasis, or the hook-worm disease, is found in but few copper mines, but seems to be spreading, and should be guarded against. The spread of this disease is greatly facilitated by dampness.

The methods by which ore is extracted vary greatly, the principal factors determining the method to be used being the nature and size of the ore deposits, and the character of the walls. Most mines are irregular as to both the size and value of their ore bodies, which vary from point to point, in dip, strike and tenor, and the walls of ore bodies frequently are poorly defined. Sometimes there is a selvage of fluccan, very soft clayey material, along either or both walls. Faults are noted frequently, and the ore body may be thrown in any direction by a fault, or series of faults, or may be cut out temporaily by a dyke, or may be divided by a horse, or may come to a final end against a different formation. In other cases the ore body may continue as a vein, while losing its mineral values when passing into a different country rock. Veins also fork and come together. Superincumbent strata are apt to creep, especially in a limestone formation, on a mountain side where the strata are deeply tilted, such mines requiring heavy timbering and constant care. Heavy pillars of vein rock usually are left standing beside the shafts, and sometimes elsewhere in the mine, as supports for the rock above. When a mine is considered worked out it is customary to rob the ore from the pillars and permit the mine to cave in, but sometimes nature caves in the mine before the owners get around to the job.

By the caving system of mining superincumbent rock and drift are permitted to fall into the mine, a litle at a time, the process being practically continuous. The shafts are protected by heavy pillars, or, preferably, are sunk in the solid footwall and the ore body reached by crosscuts. Mining is begun on the top level, which is timbered lightly, being secured just enough to permit the safe extraction of ore values. While stoping is in progress on the upper level, drifts are being run on the level below, and a plat cut from the shaft for a third level. The various levels are stoped in order, from the top down, no reserves being left in the levels that are stoped, as these begin caving almost as soon as the work of stoping is finished, and sometimes before. In a mine worked on the caving system the stoped out levels above are constantly coming in, and the miners at all times are working under caving ground. Notwithstanding the apparent danger of this plan, the mines worked on the caving system average fully as safe as those worked by the older methods, and the plan has decided advantages for many mines. It is not, however, adapted to all mines, and

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a modified system, in use at a few properties, bids fair to increase, especially in the Lake Superior district, where some of the older and deeper mines are experiencing much trouble from air-blasts and similar troublesome phenomena coincident with very deep mining. This modified plan of the caving system calls for the sinking of shafts, preferably in the solid footwall, and drifting on each level to the extreme length of the territory to be exploited. A seven-by-seven drift, well timbered, is too small an opening to seriously endanger caving. Stoping is begun on the top level, at the extreme end of the drift, and stopes are timbered but lightly, stoping working backward toward the shaft, and the ground is permitted to cave behind the miners. By this plan of mining stoping must begin on the upper levels, and continue in steady order toward the bottom of the mine. This plan is thoroughly sound in theory, and, while not in general use, seems certain to grow in popularity, and to give satisfactory results in mines that would be dangerous to work on the old plan.

Ore is blocked out when it has been opened on three sides, and ore in sight, strictly speaking, is ore that has been blocked out, but this term is sadly misused, in many cases, and incidences are not lacking where small mining companies, with stock for sale, have claimed millions of tons of ore in sight, on the strength of a fair outcrop on the surface and a hundred feet or so of shaft or tunnel.

Timbering may be of wood, rock or concrete, but as a rule is of wood. The increasing scarcity of good timber, with consequent rise in price, in most parts of the world where copper mining is followed extensively, is causing vigilant mine managers to utilize other material to an increasing extent. The use of concrete and cement has reached the highest point in Germany, but is gaining ground in the mining fields of many other countries. Timbering may be heavy or light, according to circumstances. Some copper mines, like the Calumet & Hecla and Copper Queen, are forests of timbers, while others, like the Osceola, have but very little timber outside of that required for skip-roads and ladderways in the shafts. Heavy timbering is required from surface to the solid rock ledge, when passing through alluvium. There are many different methods of timbering with wood, but the one in most general use and favor is known as the square set system. A square set of timber has a bed-piece, two legs and cap of the same length, usually eight feet, mortised and tennoned. A similar set at eight feet distance is connected with bed-pieces and caps, and these cubicles may be extended indefinitely in any direction. Lagging usually is placed above the cap-pieces of a square set to prevent the falling in of rock from the roof, and in soft ground bulkheading is required, this necessitating the driving of heavy sticks of 8-foot timber into the ground on either side, to form a solid bulkhead. False sets are used at times, and sprags are utilized frequently. The use of dry-walling is increasing. Dry-walls are built of waste mine-rock, laid without mortar, and when carefully built are very effective in holding the ground above, and have the advantage of disposing of waste rock that otherwise must be hoisted. Ore is anything that will pay to extract for its metallic values, and varies greatly in different fields, and under different circumstances. In some of the Lake Superior mines rock carrying an average of one per cent. copper pays millions in dividends, and rock carrying even one-half of one per cent.

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metallic copper is treated at some properties, though the average of the mine necessarily is higher. In other fields ores that carry ten per cent. copper are unprofitable, because of narrow veins, lack of transportation or other serious drawbacks. In Australia the soft mullock broken in the mines is used for filling in cribs, by what is known as the pig-sty system. Concrete seems especially useful for finishing the collars of shafts, and has been tried for the sleepers of skip-tracks, but seems somewhat rigid for the latter use. Courses of brick have been used for finishing the collars of shafts in the Lake Superior district. Steel, mainly in the form of worn-out rails, cut down to short lengths, is used to a considerable extent for timbering in some mines. There is no question that concrete must be used to an increasing extent in mine timbering.

The matter of disposing of water is a problem of importance with most mines. Tunnel drainage is possible with properties opened exclusively above the adit level, and, with mines partly opened by shafts and partly by adits, the water is discharged through the lowest tunnel level. Occasionally large vugs are encountered underground, and small mines have been flooded from the waters contained in such cavities. Limestone, so often met with in copper mines, is readily permeable by water, and one mine may drain an entire basin of considerable area. Good mines are lost sometimes because of the excessive cost of keeping them free of water.

Where a mine must be kept unwatered otherwise than by natural drainage through adits or tunnels, the water may be removed by pumping or bailing. Mine pumps may be divided into two classes, these being movable and stationary. Station pumps usually are of large capacity, and are set permanently in underground stations prepared for them, while sinking pumps are placed on skids and lowered in the shafts by chains or steel cables as required. The great majority of both station pumps and sinking pumps are actuated by steam or compressed air, usually the latter, though steam may be used in shallow mines before the installation of air compression plants, or in a great emergency, but the carrying of steam to a considerable depth is impracticable, owing to excessive condensation. Electric pumps are increasing in numbers and efficiency, and with further improvements should prove the ideal variety of pump for most underground uses. Air-lifts and pulsometers are used to some extent, mainly for sinking purposes. Water also may be removed from mines that have filled through idleness or that have been flooded accidently, by bailing. The bailers, which replace buckets, cages or skips, usually are large cylindrical tanks, frequently old steam boilers, with a valve bottom, and, at a pinch, ordinary skips may be used. The method of unwatering mines by bailing is used only in emergencies, though some attempts have been made at utilizing bailing for regular mine drainage.

All mines show an increase of temperature with depth, after the first few hundred feet of the earth's crust is penetrated, but the rock temperature varies greatly in different fields. The Lake Superior copper mines, which are the deepest of any mines in the world, are not so hot at similar depths as the mines of most other fields. At the vertical depth of 4,920 feet the rock temperature in the Red Jacket shaft of the Calumet & Hecla was 87.6° Fahrenheit, but this has been reduced, by connection of the

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lower levels with other shafts, and by the utilization of compressed air exhaust from the rock-drills. Many sulphide ore mines are extremely hot, owing to the gradual oxidation of sulphur.

Copper mines contain neither choke-damp nor fire-damp, those deadly gases found in coal mines, but nitrous oxide fumes from dynamite are poisonous, and are difficult to dissipate in workings having only one open end. Powerful fans at surface sometimes aid in ventilating the dead workings of deep single shafts. The general use of power-drills, actuated by compressed air, assists materially, not only in furnishing fresh air in dead workings, but also in reducing the temperature in deep mines, as air yields up considerable latent heat when compressed, and robs all surrounding objects of heat when released from compression. In mines of more than a few hundred feet in depth nature provides a system of ventilation as soon as two shafts are connected underground, the shallower shaft becoming a downcast, through which the air is sucked down, with great force, while the deeper shaft—that is the one having its collar on the highest ground at surface—becomes an upcast. The deeper the shaft the stronger the draft, for the same reason that a high chimney gives a stronger draft than a low one. In deep shafts the air currents so called into being are so strong that it is necessary to provide air-doors in the connecting levels.

Fire is a danger to which practically all mines are subject. Even a fire on surface may endanger underground workmen, through the destruction of the hoisting plant, or headgear, and fire from a structure over the shaft may enter the mine by working down the timbering. Underground fires may be divided into two classes, the first occuring in sulphide mines where the ore itself furnishes the fuel, while the other class occurs in mines with heavy timbering that is liable to burn. Heavy damage to a mine, accompanied by serious loss of life, may occur through either form of fire. Timber fires are caused mainly by the carelessness of miners in disposing of candle-ends, lamp-wicks, matches and partially burned tobacco from pipes.

In the Calumet & Hecla mine, which has suffered losses aggregating millions of dollars through five serious mine fires in the past quarter century, great precautions are taken, not only to prevent the occurrence of fires, but to put out mine fires immediately after their inception, and to prevent the spreading of fire throughout the mines. Masonry bulkheads, fitted with fire-doors, permit the cutting off of different portions of the mine. Electric signals and telephones furnish the means for turning in prompt alarms, and water-pipes and fire-hose are kept at underground stations for the fighting of fires that have gained a foothold.

All mines containing large bodies of ore rich in sulphur are liable to spontaneous combustion, but this danger can be minimized by various precautions, though not obviated entirely. The danger of spontaneous combustion is enhanced by the fissuring caused by improper support of ground opened or stoped, as such fissuring produces considerable quantities of pulverized sulphides that are subject to unusually rapid oxidation, and are liable to spontaneous combustion. The St. Lawrence mine, at Butte, Montana, has been on fire for nearly a score of years. There also have been serious fires in the United Verde, Iron Mountain, Wallaroo & Moonta and

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other sulphide copper mines. A sulphide mine fire, while dangerous and costly, has the advantage of not destroying values to a large extent, as the copper contained in the ore is leached readily by the natural drainage of the mine, after the burning of part of the sulphur from the ore, and the values can be gained as cement copper on surface, by precipitation from the heavily charged mine waters. A mine fire may be drowned by water, or extinguished by shutting off the supply of oxygen. Carbon dioxide, which is heaver than air, also has been pumped into mines to extinguish flames. This can be generated in large quantites, in old boilers, by treating crushed limestone with dilute surphuric acid, but the process is slow. Perhaps the most successful method yet used in fighting a sulphide mine fire was devised in 1906, at the Iron Mountain mine, in California, where an exhaust ventilating fan was reversed, and used as a blower. The air-current from the blower drove the sulphureous acid gas, given off from the burning stopes, back into the broken ore, thus enabling the miners to remove the face of the ore on fire, ore being mined at temperatures of 160° to 450° Fahrenheit. This plan called for a very careful balance of air pressure, in order to clear the mine workings of foul gases to such an extent as to permit work to be carried on, while insufficient to fan the flames in the fissured ground unmined.

Air-blasts, noted in some of the older Lake Superior mines, are artificial earthquakes, caused in the older and deeper mines by the slipping of superincumbent strata insufficiently supported by mine pillars. One of these air-blasts, in 1906, was of sufficient severity to cause an earthquake that was felt over an area of some thousands of square miles. The liability of mines to this trouble increases with their age and depth. The first symptom of air-blasts usually is given by the violent decrepitation of small particles of rock from pillars that are subjected to excessive strains. Small masses of rock are thrown off violently, with detonations like pistol shots. Such troubles, when once begun, are liable to prove continuous and cumulative.

The lighting of copper mines is mainly by candles or lamps, the fuel in either case being stearic acid as a rule. Electric lights have been tried, but were not liked, the illumination being too powerful, and rendering the miners nervous by giving the roofs the appearance of danger, where careful inspection by the light of lamps or candles showed the ground to be perfectly safe.

The old system of mine signalling was limited to a single heavy wire, running down the shaft and connecting with a bell in the engine-room, which was rung by pulling levers attached to the wire, at the different levels of the mine. Electric signals are now in quite general use, in most mines of importance and telephone systems have been installed in many mines, while a beginning has been made in the use of electric signalling systems displaying semaphore arms and colored lights.

In the actual breaking and removal of rock or ore, the first step is that of drilling holes for explosives. In mines carrying ore in a decomposed talcose gangue it is possible to drill holes by hand, with a breast-auger, but in ordinary rock and ore, holes must be bored with steel drills. Such drills are of varying lengths, and are changed from time to time, as the hole is deepened. There is a considerable variety of cutting faces for

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drills, but that in most common use has two cutting faces crossed at right angles. Drills are dulled rapidly, and require frequent sharpening, for which purpose they must be taken to the smithy, on surface. Hand drilling has given way in most properties to power drilling, the machines being actuated by compressed air or electricity, the former agent being in very general use in most important mines. The water-drill is a form of drill, actuated by compressed air, in which a jet of water is fed through a hole in the centre of the steel bit, to lay the dust produced by the drill. The power drill is fixed on a tripod or pillar, to afford solidity, and power drills are worked frequently on timber stagings and rock ledges that would seem inaccessible to anyone but an experienced miner. Electric drills have given unsatisfactory results in many mines where tried, though working excellently in a few properties. The trouble with electric drills is due, probably, to inefficient designing in some makes, and to even a larger extent to inefficient handling, rather than to any inherent defect in the theory of the machine. A set of holes for one blast is known as a round. Much skill is shown by old miners in drilling such holes, which must be driven at such angles, to such depth, and in such number as to break the proper amount of rock with a minimum expenditure of labor in drilling, and with a minimum charge of dynamite for blasting. A skilled miner, who takes full advantage of cleavage, jointing and bedding planes, of varying strengths of different rock forms, and of fundamental principles of physics, will accomplish better results, with half the drilling and half the powder, than can be secured by a beginner or an ignoramus.

Ordinary gunpowder, commonly known to miners as black powder, is useful for blockholing, which is breaking up large masses of rock previously broken, and occasionally for other uses, but dynamite is the principal underground explosive. This consists of nitro-glycerine, taken up by some absorbent, usually wood-pulp, sawdust or diatomaceous earth. The strength of dynamite varies greatly, and should be gauged according to the nature of the rock. Some of the newer high explosives are used also, to a limited extent, in copper mines. In blasting, the dynamite cartridges, which slip easily into the holes bored for them, are placed at the bottom of the holes, in such quantities as required, and in the pasty top of the final cartridge is inserted a copper cap or detonator, holding a single drop of fulminate of mercury, with the end of a fuse firmly fixed within the end of the cap. The fuse is fired by a match or candle, it being timed by the length to which it is cut, and when the fire in the core of the fuse reaches the fulminate of mercury there is a sharp explosion, which in turn explodes the dynamite. Occasionally charges of dynamite fail to explode, and as a round of holes consist of five to a dozen borings, the dynamite in one or two holes may fail to explode. Such missed holes are highly dangerous, and frequently cause explosions later, when the dynamite is reached by the drill in boring other holes. When a mine is worked with a ten-hour shift, blasting is done twice per shift, as a rule, the blasting being timed at about a quarter-hour before the close of the half shift and full shift, this providing an hour and a quarter for the dynamite fumes to dissipate from the workings. Dynamite, fuse and detonators usually are kept underground in boxes, sometimes in large quantities, and carelessness in handling is responsible for very serious accidents at times.

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When broken, the ore, or rock, or both must be disposed of, usually by hoisting both ore and worthless rock to surface, except where underground selection is possible, in case waste-rock is used for dry-walling or fills. In the old system of mining the long-handled shovels in the hands of muckers were the main reliance, ore and rock being loaded into tram-cars of wood or steel, which were pushed from the face of the workings to the shaft on light T-rails or strap-rails. In modern practice rock frequently is sent down, through chutes, to bins on the level below the one where broken. The chutes may be of wood or iron, and chutes built of rock are used in some mines. Broken ore or rock usually will clear itself in a chute of 30° to 35° dip, and even with less dip in the case of an iron chute.

Underground haulage plants are used in a number of the larger and more progressive mines, though this system is suitable only to properties that have long hauls, and large ore bodies on the levels where such haulage plants are installed. Underground tramming by power is done by locomotives, actuated by compressed air or electricity, steam locomotives not being suitable, owing to the confined scope of operations, where smoke and gases from the boiler would poison the underground atmosphere. Underground loading-bins are coming into use, and these, which are installed at the shaft, on the various operating levels, permit the trammers to discharge their cars into the bins, and skips can be filled from the chutes of the bins as required. This system obviates delays both in tramming and hoisting, and has much to commend it. A hoisting system installed recently at the Wolverine mine provides for special workmen known as car-dumpers. The trammers leave loaded cars at the shafts, and the dumpers discharge these into the skips, beginning at the top hoisting level, and working down, level by level, to the bottom, then riding up in the skips and beginning anew. In sinking deep winzes the shovel is the main reliance in disposing of ore or rock, which must be shoveled up from stage to stage, in the most laborious manner, unless a donkey-hoist is installed to care for the dirt. For this reason upraises are preferable to sinking, in the opening of winzes, as a rule.

In early days the heavy mass copper of Lake Superior mines, ranging in weight from a ton to 500 tons per mass, was cut up into chunks not too heavy for hoisting, by the use of long-handled chisels, this process being laborious, slow and costly. The work of cutting up masses underground is now done with pneumatic chisels, at about a tithe of the former cost.

The span of life of any mine is a matter of vital importance to its owners, but no general rule can be given for gauging the life of copper mines, as each property is a problem with varying factors that must be worked out individually. The Rio Tinto is the oldest active mine of the world, and until the discovery of the monzonite-porphyry ore bodies at Bingham, had the largest proven ore reserves of any mine of any metal, notwithstanding its having been worked for some three thousand years. The Lake Superior copper mines, operating on stratified beds, will hold indefinitely in depth, but the depth to which successful mining may be done cannot be predicted with any degree of certainty.

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CHAPTER V.

The Milling and Concentration of Copper.

As native copper and copper ores usually occur disseminated in gangue rock, the first process of reduction after the ore is brought from the mine is one of concentration. Milling really should begin in the mine, and a little care on the part of the mine superintendent often eases the burden of the mill superintendent and brings about cheaper and closer extraction. The use of excessive charges of dynamite in blasting not only is a waste of explosives, but results also in the making of an unnecessary quantity of fines, causing an excess of slimes in the mill, with consequent labor and expense in extraction, and unnecesarily heavy losses. The mine superintendent also can aid the millman greatly by sending with his ore the minimum quantity of wood, drill-steel, hammer-heads and other material that is rather unpleasantly common in the average ore that reaches the average mill.

The general principles of milling are the same in the concentration of all ores, but local practice varies greatly, according to the nature of the ores of various districts. The practice in general use in the native copper mines of Lake Superior is given at the end of this chapter.

Mills usually are built as near the mines as possible, to save long hauls on ore, and frequently are located immediately at the mines, though at times it is necessary to build the mills at some distance from the workings in order to secure adequate water supply. As a rule mills are located in mountainous districts, where full advantage can be taken of the steep slopes, and modern mills are so planned and constructed that the raw ore is dumped into bins at the top of the structures, and passed gradually through the various processes, the final concentrates being discharged on the lowest terrace, thus taking full advantage of gravity. The elevation of material, once common in all mills, is reduced to a minimum in modern plants, which are nearly automatic, and require much smaller forces of workmen, who, as a rule, are skilled men that understand why as well as how. In most cases a ready-made mill is a serious mistake—the same sort of a mistake that would be made by the laying out of shafts and drifts for a mine by engineers who never had seen the property. Every mine has individual problems that can be solved satisfactorily only by the man on the ground, if he be a competent miner, and the same observation holds as true of the milling as of the mining, at most properties. Much of the trouble in mill practice arises from faulty designing, often where good mill men, either technical or practical, or both, plan mills to treat ores from an unfamiliar district. Local peculiarities require local adjustment in milling practice, and it frequently is the case that what is the best practice for the milling of ore from one mine is not exactly suitable for the milling of ore from even an adjacent property. This matter of local variations is one that cannot be treated except in the broadest outline, or in the fullest detail. The best modern mills are now designed, with great care, to treat the specific ore of an individual property, and careful de-

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signers frequently make extended mill-tests, and other experiments, before designing either the structure or equipment of a mill. As a result of this care, losses have been greatly reduced at the best mills, and tailings now run nearly as clean as the slags from a well managed smelter.

There is a general haziness regarding the matter of rating milling capacity. It would be well if this could be removed, and that it should come to be clearly understood that a 100-ton mill was designed and equipped to treat advantageously 100 tons of material daily, and that any considerable excess over this quantity of ore, while it might be run through, could not be handled so as to secure thoroughly satisfactory extraction. The average designer is apt to underrate the capacity of his mill, probably under the mistaken impression that a mill rated at 100 tons that proves capable of treating 125 tons satisfactorily is a credit to his professional reputation. The best results never are secured from any machinery that is run to the fullest limit of its capacity. In many cases a hundred-ton mill may be made to put through 150 tons of material, but the work will be slighted at nearly every stage, and the losses will be correspondingly heavy.

Too much stress cannot be laid upon the practical coördination of every process in the mill. Each particular department should have sufficient capacity to handle, to advantage, its due proportion of material, this capacity necessarily decreasing toward the end, as the ore becomes concentrated, and an increasingly large amount of gangue has been eliminated.

Occasionally there arise difficult problems in handling materials of widely varying specific gravity. As a case there may be cited the Shannon mill, in Arizona, which treats ores have the following specific gravities: chrysocolla, 2; azurite, 3.5 to 3.8; malachite, 3.7 to 4; chalcopyrite, 4.1 to 4.3; chalcocite, 5.3, and cuprite, 5.8 to 6.1, while the specific gravity of the quartz gangue is 2.64. While this is an extreme case, it is by no means uncommon for a mill to treat ores of two or three widely varying gravities. It is now possible to handle successfully mixed ores that were worthless even as recently as the close of the Nineteenth Century, because of the impossibility of satisfactory separation. Zinc, especially, is removed from copper ores much more readily than formerly.

In the concentration of ores, hand work is used exclusively at some of the smaller mines that are distant from smelters, where the ores must be brought to a high copper tenor by hand selection. Even in the case of mines having good mills, a limited amount of hand selection may be used to advantage, and hand-cobbing, by which worthless gangue rock is separated from valuable ore, may relieve the mill of considerable work. Many mills have picking-tables or picking-belts. The best form of picking belt is one that carries the material past the workmen, who remove the valuable ore for further treatment, while the worthless material remains on the belt and is dumped automatically at the end, or vice versa. Magnetic separation is used, with success, in a number of copper mills, where the material to be removed is magnetic, or can be made magnetic by roasting.

For almost every milling operation there is a choice of machinery, or process, or both, and advocates of these different processes or devices usually are loud in the praises of their pets. While some machines are better adapted than others to certain uses, more depends upon the entire milling system being planned with a view to treatment of the particular ore

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handled, and the intelligent carrying out of the theory into practice, than upon the make of the machine that is employed, though this is by no means unimportant. A good millman will secure fair results from indifferent machinery, while an inefficient millman will obtain poor results from good machinery, either through poor grouping or inefficient handling. Only the man on the ground, and he only after repeated experiments, can intelligently adjust even a good mill to fully satisfactory work.

Owing to scarcity of water in many copper mining districts, where it must be used and husbanded with great care, settling ponds are provided, and some great economies are effected, not only in repeated usings of the water, after clarification, but also in minimizing the gross amount of water required for milling ore. The Detroit mill, at Clifton, Arizona, makes extensive use of settlers, and requires only about 300 gallons of fresh water per ton of ore treated.

Large storage-bins for ore are of much advantage to a mill, and the disadvantage of small storage-bins becomes apparent, shortly, to the superintendent of every mill that is so unfortunate as to have them. Large storage capacity for raw ore affords a balance wheel, and takes up slack that otherwise results in occasional mill stoppages, due to temporary mine stoppages, or even to a decrease in the day's output of the mine. Large storage capacity for concentrates is desirable also, in some cases, though not so important as storage capacity for raw ore.

Modern milling practice pays greater attention than formerly to both extremes, beginning with the coarse concentrates and ending with the slimes, and the classification of ore is carried out far more thoroughly than formerly. The advantage of removing concentrates as coarse as possible is that by so doing extensive sliming is obviated. At every operation by which ore is reduced in size, slimes are produced. Some ores slime much more readily than others, according to their structures, but all ores are more or less susceptible to sliming, and sliming easily can be carried to excess by poorly devised milling processes.

Crushing may be done either wet or dry. Where dry crushing is in use a great deal of fine dust gets into the air, and this should be removed by an exhaust fan. On very heavy material it is advisable to divide the crushing into two, and possibly three, operations, as no jaw-crusher can break masses of rock or ore to minimum size advantageously. Crushers are of many makes, but are essentially of two classes, one being the jaw-crusher and the other the gyratory crusher. There is a difference of opinion as to which causes the most sliming, but it is probable that a smaller percentage of slimes is caused by gyratory crushing, in most cases. The jaw-crusher is in more general use, however, than the gyratory. Rolls are used to a considerable extent in milling copper ores, but are not employed so generally as in the reduction of lead and zinc ores.

It is advisable to use a grizzly or trommel between each process of reduction, and the use of a grizzly before the first crushing will remove a considerable percentage of fines from average ore. The intelligent use of grizzlies or trommels not only obviates excessive sliming, but also saves the labor and power that otherwise would be used in unnecessary crushing of fine material. Revolving screens or trommels are of different styles and makes. These usually are of the same diameter throughout, but occasion-

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ally are built tapering, though the uniform size seems more satisfactory, as a rule. The material delivered to such screens is carried to the lower end of the trommel by gravity, aided by the rotary motion of the screen. The openings in the screen, through which ore falls, may be of uniform size, from end to end, or may be divided into two or even three sizes of openings, giving the same number of sizes of concentrates. More inclination is required on coarse material than on fine, and more in dry screening than wet. Revolving trommels will handle ore satisfactorily down to particles of two to three millimeters in size, and impact screens will do good work on lumps of ore as small as one millimeter in size. Perforated metal is preferable to woven wire for screens, as the perforations are very slow in wearing, while the woven wire is quite certain to give openings of irregular dimensions after the screen has been used for a short time.

After crushing the ore is passed over jigs, of which there are a great many different designs, though the essential principle is the same in all, the gangue, which is lighter than the ore, being driven off by rapid oscillatory or vibratory movements of the bed of the jig, aided by the force of running water, the vibration and water jets being so carefully regulated as to permit the ore to remain on the bed of the jig while the worthless gangue rock is washed away. No matter how carefully this work may be done a little ore is lost in the tailings and a little rock remains with the concentrates. The Hancock jig has the greatest capacity of any make, and its use is increasing outside of Australia, where it was invented. While not suited to all grades of ore, there are many copper ores on which it can be used to advantage. The jigs usually are worked in series, and are divided for the handling of two or three different sizes of material, these being known as roughing jigs, middling jigs and finishing jigs, or having other names, according to different local usages, for the coarse ore, middlings or raggings, and fines. There is much more regrinding of both middlings and tailings than formerly, and there is much better machinery available for this purpose than even a few years ago.

The treatment of slimes varies greatly, in different mills, but, as a rule, the slimes are put over patented concentrators or tables, of which the Wilfley seems the most effective and in most general use. The Wilfley grades the fine ores and separates them from the finely crushed gangue rock by means of an inclined table having riffles covering about one-half of the surface, these being arranged along a diagonal line from corner to corner, the table having a slight oscillatory movement. Circular tables also are used to some extent. Screen sizing usually is stopped at about three millimeters, and hydraulic sizing begun. This is very effective, in most cases, but is not suitable for fine slimes that already contain an excess of ore, these requiring settling tanks. There is one make of hydraulic classifier, of considerable promise, that utilizes air-jets in connection with water. Hydraulic classifiers are of considerable variety in form, but usually have "V" or "W" shaped bottoms, whence the settled fines are drawn off, through plugs, for further treatment. Slime tanks also are in use in many mills for the final collection of fines. Filter presses are used but slightly for copper milling, though in common use in many gold mills. One of the greatest advances made in milling practice, since the beginning of the century, lies in the far greater saving of slimes, as compared with the older practice.

In the matter of sampling, the old and highly inefficient rule-of-thumb

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plan has been discarded, in all modern mills. There are several excellent makes of automatic samplers, that do very accurate work, but, of course, these samples must be assayed both honestly and carefully in order to take advantage of the information that they offer regarding losses in tailings. It is probable that the losses in tailings in old mills were considerably greater than ever were shown by the grab-samples taken under the old methods.

The fines and slimes from the mill are finely comminuted, hence usually require briquetting before smelting, as otherwise a large proportion would be blown out of the furnace as flue-dust. A small quantity of lime, or some other suitable material, may be used for a binder, in briquetting, but this is not necessary in all cases, and in some instances fines and slimes from the mill are briquetted in connection with flue-dust from the smelter, preliminary to furnace treatment.

Oil concentration has been experimented with extensively, but is not yet fully accepted in milling practice, though some excellent results have been secured. In nearly every instance where oil concentration has been carefully tested, the technical results have been very satisfactory, but in many cases the process has not proven commercially available. Given a fairly steady and copious supply of material suitable for oil concentration, there seems no sound reason why the process should not prove a commercial success. There are several processes of oil concentration, but the original and most important is the Elmore system. By this process the ore is first pulped, then passed through a horizontal rotary drum, provided with cross-blades that lift and drop the pulp while propelling it along the drum. With the pulp is admitted a small quantity of viscous oil, left as a residue from the refining of petroleum. This oil, which is the best for the purpose, and also possesses the advantage of cheapness, selects the ore while rejecting the gangue rock. The oiled pulp is discharged, automatically, into spitzkasten, in which the tailings of gangue rock settle down and flow off, while the oil containing the fine ore floats and is drawn off from the top of the spitzkasten, into a centrifugal extractor that removes the oil, which is again used, the loss of oil in the process being quite small.

Various forms of pneumatic concentrators have been devised, from time to time, but none seem to have scored a marked success, though the theory seems good, and pneumatic concentration may become a success, eventually.

Electric concentration has been attempted, at various times and in various ways. The most promising of the electric processes, to date, provides for the utilization of static electricity. Finely crushed ore and gangue come into contact with a metallic surface, charged statically, which repels the particles of high conductivity, while those of low conductivity are retained for a sufficient length of time to be drawn aside and discharged into a separate receptacle. This process, while it does not appear to have come into use, would seem to possess intrinsic merit, for the separation of mixed ores of chalcopyrite, sphalerite and galena, which are of such common occurrence, intimately intermixed, in many fields.

In the Lake Superior district, where copper is found native, the milling process differs somewhat from any in use elsewhere, the principal feature of difference being in the crushing of ore by steam stamps. The native

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metal occurs mainly disseminated in small particles through amygdaloidal or conglomerate rock, in quantities averaging only 15 to 30 pounds of copper to the short ton of rock in the amygdaloid mines, and averaging only 45 pounds of copper in the richest conglomerate mine. The metal sometimes occurs in masses that weigh from a few pounds up to hundreds of tons each. The larger masses are cut underground into pieces sizeable for hoisting, and when arrived at surface, are hand-cobbed, to eliminate as much as possible of the adhering gangue, and then put directly into the reverberatory furnaces for smelting.

The preliminary work of a stamp-mill, in the Lake Superior district, is done in the rock-house at the mine. This usually is built in connection with the shafthouse, though one rock-house may care for the production of two shafts. The ore is dumped from the skips, or cages, onto the upper floor of the rock-house, where the small masses are cobbed under steam-hammers, and the balance of the ore, containing fine copper disseminated through gangue rock, is passed over a grizzly, the larger masses going through a powerful jaw-crusher, the product of which descends to the next floor and there is put through smaller crushers, going thence to bins, from whence it is drawn into railroad cars and taken to the stamp-mills.

The modern stamp-mills are of fireproof construction, having steel frames, with cement floors, and are liberally supplied with windows for lighting. The buildings are terraced, so as to take full alvantage of gravity in handling the material treated. The storage bins at the tops of the mills, are connected with trestles, which permit the access of loaded trains, and the bins are of great capacity, holding thousands of tons of rock in the larger mills. Picking-belts are used to some extent in some of the mills.

The first stamps in the mills of the Lake Superior district were of the old Cornish style, crushing by gravity alone. The Ball head is a single stamp, operated by steam, and the entire stamp, including mortar-box, is one machine, set upon a very heavy foundation. Formerly heavy timbers were placed between the foundation and the mortar-box to furnish vibration, but these were found undesirable, and the practice has been discontinued. The ordinary steam-stamp has a piston of 18 to 20 inches diameter, with stroke of about 24 inches, the piston developing a velocity of about 25 feet per second and striking blows of three to four tons, at the rate of 90 to 110 strokes per minute, under a steam pressure of 95 to 120 pounds per inch, in the case of the simple heads, which are driven by engines of 150 to 250 horse-power each. The weight of the reciprocating parts of a steam stamp averages about 5,500 pounds. The economy in steam consumption possible through compounding the simple stamps being readily apparent, cross-compounding was tested thoroughly at the Champion mill for about a year. The results proved a large economy in steam consumption, but the very considerable disadvantages inherent in working four 500-ton stamps as a unit proved too great, and the system was abandoned. The cross-compound stamp was followed by the Nordberg steeple-compound stamp. This has high and low pressure cylinders, mounted tandem one above the other, and in actual practice the steeple-compound stamp has given an increased capacity averaging about 25 per cent., with a saving of about 25 per cent. in fuel. At the beginning of the last decade of the

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Nineteenth Centeury the average crushing capacity of the simple steam-stamp in the Lake Superior district was 350 tons per 24 hours. This has been increased by heavier parts, greater power and the discarding of timber foundations, to 500 and even 600 tons per diem. The steeple-compound stamp is of much greater capacity, one stamp in the Osceola mill having crushed 779 tons of amygdaloid rock in 24 hours, in 1906, with an average for two weeks of 600 tons per day, including all stops. The capacity of the stamps varies considerably, at the different mills, according to the nature of the rock crushed. The conglomerate rock of the Calumet & Hecla is much more refractory than the amygdaloidal rocks of the other mines, and a stamp can treat only 60 to 65 per cent. as much conglomerate as amygdaloidal rock. The conglomerate also is much harder upon stamp-shoes than the amygdaloid. These shoes are of chilled iron, cast by local foundries, which are able to give an 11-inch chill, a statement that may be doubted, but is susceptible of full verification. The shoes weigh about 800 pounds each when cast, but lose half of their weight and become badly worn in four to fourteen days, according to the nature of the rock crushed, and are then discarded. Rock is fed under the stamps in pieces ranging up to a foot or fifteen inches in extreme dimension, with a smallest dimension of about four to six inches.

The system of coarse stamping now in general use was begun at the end of the Nineteenth Century. This process utilizes mortar-grates for discharge having perforations of about ten-sixteenths inch in size, as against the old standard of about three-sixteenths inch only, while revolving screens, with aperatures of about four-sixteenths inch, let out the fines and return the oversize to auxiliary machinery for recrushing. The coarse stamping system has resulted in giving about 50 per cent. of the mill product from the stamps, before jigging, as against 10 per cent. extracted at the heads under the old method, thus affecting important economies in the amount of material handled in stamps and jigs, and reducing the quantity of slimes.

From the stamps the crushed rock is fed to jigs, which are in series, taking coarse and fine sands from the stamps. A portion of the coarse sands, discharged as tailings, is recrushed and rejigged. Various types of regrinding mills are in use, including Chilean mills and other forms. The cost of regrinding Calumet & Hecla conglomerate, which is extremely refractory, has ranged as high as 30 cents per ton in Chilean mills, but in Huntington mills the cost has been cut to 10 cents per ton. The fines and slimes are passed over slime-tables of various patterns, these including the old-style Evans round-table, frequently with two or three superimposed decks, to save floor space, and the Wilfley and Overstrom patent tables, which have given very satisfactory results. The waste sands are washed through launders to some distance from the mill, while the concentrated metal, with its adhering gangue-rock, known locally as mineral, is shipped to the smelters for reduction. Formerly the mill practice of the Lake Superior district called for dressing mineral to a high percentage of metallic contents, but modern practice yields mineral much lower in copper tenor, and the losses in tailings now average only about one-half as much as at the beginning of the last decade of the Nineteenth Century. The mineral produced by the Lake Superior mills varies greatly, ranging

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from 50 to 80 per cent. in copper tenor. Most of the mills make several different grades of mineral, these varying in size of material, and also in richness, the coarser grades carrying the larger percentage of copper. In some of the mills the coarser mineral is hand-picked for particles of silver.

Water consumption has been reduced about one-third through coarse stamping and other economies. Owing to unlimited water supply, and the enormous capacity of their pumps, the Lake Superior mills have been very prodigal of water in their washrooms. In the last decade of the Nineteenth Century as much as 10,000 gallons of water was used for washing a ton of ore, but this consumption has been reduced to an average of about 7,000 gallons per ton, and it is evident that considerable further economies are possible.

Owing to the compounding of stamps, resulting in greatly increased crushing capacity, some of the older mills have been unduly crowded in their washrooms, with consequent losses in tailings. The newer mills provide a much larger area of washroom for each stamp, thus allowing for the greatly increased stamping capacity of each head.

The tailings of the Lake Superior mines range from 0.15 to 0.75 per cent. in copper tenor. These figures are low, but are not as low as might be wished, in view of the low average tenor of the original ore. Great improvements have been effected, however, and the losses in tailings now average no more than half those of twenty years ago. Many attempts have been made in the district, and are being continued at the Calumet & Hecla, at reworking the tailings, but so far none have proven commercially feasible. The stamp-sand from the mills is utilized locally for mortar, in building construction, and is excellently adapted to that work. The stamp-sand also is used in making sand-lime brick, and for the manufacture of paving blocks.

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CHAPTER VI.

The Hydrometallurgy of Copper.

Readers desiring a detailed exposition of this subject are referred to Eissler's excellent volume entitled "Hydrometallurgy of Copper." This chapter will be found to give a fairly complete outline of the subject, but without any attempt at great detail.

The extraction of copper values from ores by simple leaching processes has been known for many centuries, and probably was discovered by some of the earliest followers of mining and metallurgy. Leaching processes vary, according to nature of the ores, and in minor details. The simplest process is that by which the water from sulphide copper mines is compelled to precipitate its copper values on scrap-iron, after reaching surface. Plants for leaching cupriferous mine waters are simple, usually, and the process is essentially the same, wherever used. At Butte the water from the mines carries .0015 to .0065 per cent. copper, and the seepage water from the tailings piles is very much richer. The oxidation of chalcopyrite in tailings is very slow, but chalcocite and oxidized ores leach much more rapidly. The tailings piles at Butte are leached by water, conveyed in ditches over the surface of the piles, and such leach-water, after leaving the tailings, goes from pond to pond, and then is pumped to precipitating tanks, in series of two or three with grades of 1 to 240 at the beginning, and 1 to 50 at the end, the copper being precipitated on scrap-iron, tin cans and other iron waste, the product being cement copper running from 30 to 90 per cent. in copper tenor. The product resulting from the precipitation of copper from cuprous sulphate solutions upon scrap iron is a very impure mixture of metallic copper with iron, antimony, arsenic, silica, etc., and is washed, sometimes repeatedly, before reduction to blister copper in blast-furnaces.

Lixiviation is especially adapted to sulphide ores of low grade, but not all low grade ores can be handled advantageously by leaching, as it is not adapted to ores containing considerable quantities of ferrous oxide, manganese or lime, while the leaner oxides, carbonates and disseminated sulphides having quartz gangues are especially suited to lixiviation. The initial outlay for a leaching plant is comparatively small, but the process is slow, and, to be even fairly complete, requires much time, for long continued leaching, in the case of average ores. Where applied on a very extensive scale, as in Spain, the principal disadvantage is the locking up of enormous quantities of ore, entailing a heavy investment, but this disadvantage, when once overcome, affords compensation by reason of the immense amount of material in process of leaching acting as a sort of balance wheel, rendering it possible to forecast production to a far greater extent than in the case of mines using ordinary concentration and smelting processes of reduction.

The mines of the Sierra Morena, in Spain and Portugal, have been worked intermittently for about three thousand years, and immense piles of low-grade sulphide ores and refuse have accumulated. As these weath-

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ered, the sulphides became oxidized gradually, and natural lixiviation was brought about by the rains. The bulk of the copper so leached out was lost, but it was learned, at some remote time in the past, that the copper values could be saved by depositing scrap iron in the path of the leach-water. This process of securing copper from sulphate solutions is now in use at many old and idle copper mines as well as at active properties, in various parts of the world.

The process of natural cementation is well exemplified at the San Domingos mine, in Portugal, where the low grade sulphide ore is cobbed to three or four inch size, and piled in immense heaps, 15 to 40 feet in height, which are provided with valleys for drainage, with brick chimneys at intervals. Pipes are laid over the surface of the heap, and water is applied copiously, at intervals. The water draining from the heaps is collected in sluices, and the metal, carried in solution as copper sulphate, is precipitated on scrap-iron. Some of the heaps at the San Domingos contain as much as a million tons of partially leached low-grade ore, and require eight to ten years for the complete extraction of values to the point of impoverishment where further work, by even this phenomenally cheap plan, is unprofitable.

A modified method, which might be termed artificial cementation, was employed for a long time at the Rio Tinto mine, in Spain, but has been succeeded by a process that will be described later. By this old method broken ore was piled in roast-heaps, called teleras, in quantities of 1,000 to 1,500 tons per heap, the ore ranging from 1.5 to 2 per cent. in copper tenor. The heaps were fired, burning slowly for three to six months, after which the ore, then uniformly and thoroughly roasted, was placed in cement tanks, each about 5 feet deep, 35 feet wide and 100 feet long, provided with false bottoms of square timber. The leach-water from these tanks ran into settling tanks, where the copper was deposited on pig-iron. After five or six successive leachings the ore was removed and piled in heaps, called terreros, and weathered again for further leaching. At one time the Rio Tinto had about seven million tons of low grade ore in terreros, for further leaching.

The present leaching process in use at the Rio Tinto differs somewhat from the method previously described. The bulk of the copper values of the Rio Tinto is contained in chalcocite, distributed in pyrite, and not in chalcopyrite distributed through iron pyrite, as formerly held. The first process in the leaching of low grade ores is exposure to air and moisture, which form some ferrous sulphate, that oxidizes to ferric sulphate, which reacts, with considerable rapidity, on the iron copper sulphides, producing copper sulphate and iron sulphate. About half of the copper values contained originally are changed into the form of sulphate within six months, the final reaction producing copper sulphate and sulphuric acid. About two years are required to extract 80 per cent. of the half of the copper remaining in the leach-heaps after the first six months of leaching.

At the Rio Tinto a site is chosen for a leach-heap where the ground is concave and sloping, to permit the leach-liquor to run out from the base of the heap. The first step is the building of a network of air-flues, with an internal diameter of about one foot, connecting every 50 feet with vertical chimneys built of rough stones. The ore, crushed to not larger than 3-inch size, is spread alternately, in lumps and fines, to a height of about 30 feet.

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and the surface is leveled, each completed heap containing approximately 100,000 tons of ore. The surface of each heap, after levelling, is formed into squares, by means of ridges of mineral, these serving to distribute the water locally. A system of gutters is arranged for running water over all parts of the mass, and water is run on as the heap is built up. The ore oxidizes rapidly, the temperature of the air in the chimneys rising to 170° to 180° Fahrenheit, and at the latter point the chimneys are closed, to check too rapid local oxidation, and to promote the slow and thorough oxidation of the entire heap. The pile of ore changes to a brownish color, due to the hydration of the yellowish, basic ferric salt. Great care is required to prevent firing the heap, as fire once started is very difficult to extinguish. When oxidation has proceeded as far as safe, water is supplied, at the rate of 50 cubic meters per hour, until the soluble copper is leached out, after which the heap is allowed to oxidize naturally, and the process of leaching is repeated. After about one year the squares on the surface of the heap are rearranged, and gutters are shifted. At the edges of the heap the mineral has become cemented, holding a considerable quantity of copper salts, and the edges are dug down into terraces, and the copper extracted therefrom by washing. When the copper contents have been reduced to about 0.3 per cent., the heap is considered thoroughly leached, and the residue, containing an average of 49.5 per cent. sulphur, is exported as washed sulphur ore.

The copper liquor, as it runs from the heap, has considerable ferric iron in solution, and, to remove this, the liquor is run over a smaller heap of ore, known as a filter bed, laid in a reservoir formed by a masonry dam thrown across a small ravine. The filter bed greatly reduces the quantity of ferric iron carried in solution, and the leached liquor is then run to the cementation tanks, reaching the tanks containing, per cubic meter, about 4,000 grams of copper, 1,000 grams of ferric iron, 20,000 grams of ferrous iron, 10,000 grams of free sulphuric acid and about 300 grams of arsenic, a total of about 3.5 per cent. carried in 96.5 per cent. water. The liquor is run from the reservoirs, at about 300 cubic meters per hour, through the precipitation tanks over pig iron, producing cement copper, the process of cementation being facilitated by warm weather. The precipitation tanks are arranged in series, on the slope of a hill, the leach-liquor passing forward and back, and being discharged from the lowest tank practically free from copper, but containing considerable ferrous iron and free sulphuric acid. This waste liquor coming from the cementation tanks, called salida, is pumped back and mixed with fresh water, for further use on the leach-heaps. Each series contains three parallel tanks, which are about 2¼ feet deep, 5½ feet wide and 320 feeet long, the slope at the bottom varying from one in five hundred, in the first series, to one in ninety in the last series, added velocity being provided in the final series to overcome the tendency of the free sulphuric acid to attack the pig iron more rapidly as copper is deposited from the solution. The tanks are built of lumber and the spaces between them filled in with stone and cement. No metal is used in the construction of the tanks, wooden plugs being used for joining the timbers. Cracks between the boards are filled with oakum and pitch, to render the tanks water-tight, and at each end of each tank there is a drop-door. The tanks contain about one ton of pig iron for each foot of length.

The precipitate is taken daily from the tanks, the cement copper being removed from one tank at a time. The rough precipitate is taken to the

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cleaning and concentration plant, where the precipitate is cobbed from the pig-iron, which is replaced for further use. The crude precipitate so secured, containing an average of about 70 per cent. copper, is fed onto a perforated copper plate, through which it is washed by a strong jet of water from a small nozzle, into a long launder, material not passing the perforations being removed and hand-sorted. The precipitate passing into the launder is washed and concentrated, by the velocity of the water, into different grades. The first few yards of the launder produce a red precipitate, known as No. 1, that assays about 94 per cent. copper and under 0.24 per cent. arsenic. This is followed by No. 2 precipitate, assaying about 92 per cent. copper and between 0.3 and 0.75 per cent. arsenic, while No. 3 precipitate, at the far end of the launder, consisting of very fine grains, averages only about 50 per cent. copper, and up to about 5 per cent, arsenic, including also graphite from the pig-iron, and some antimony and bismuth. Nos. 1 and 2 precipitate are bagged for shipment to the refinery, and No. 3 is moistened with acid liquors, made into balls by hand, dried in the sun and then smelted and bessemerized in the ordinary manner.

A system of combined roasting and leaching, in use in the Sierra Morena district of Spain, consists of roasting copper sulphides with ferrous iron sulphate, which reduces the copper to the form of sulphate, after which it is leached. Iron sulphate is produced extensively in the ordinary cementation process.

Copper sulphides may be converted into chlorides in various ways. By one process the sulphide copper ores are treated with ferric chloride, or with ferrous chloride and hydrochloric acid, decomposition being hastened by saturating the ores under treatment with calcium chloride or sodium chloride, both cheap and common chemicals. Another process, which is quicker, and gives closer extraction, though costlier, consists of roasting the raw sulphide ores with the addition of about 1.75 per cent. salt. The ore so treated is roasted in teleras, after which the chlorurized ore is leached in vats, and the residuum placed in terreros, for further weathering and leaching. A modification of this process is in use near Pittsburg and at several other American points.

The Doetsch leaching process is not in present use, though once employed extensively at the Rio Tinto. By this process raw sulphide ores were mixed dry with about one-half per cent. of ferrous sulphate and salt, the ore being broken to half-inch size and built up into large heaps having channels and chimneys for ventilation. The weathering process required about two years, and about 80 per cent. of the copper contained was secured by leaching and cementation.

The Hunt & Douglas process is a modification of the Doetsch process, but none of the chloride processes are in very general use.

The earlier wet process of Langmade, improved by Henderson in 1860, and since modified slightly, is in quite extensive use in Great Britain. This system is designed for the extraction of small copper values from the cinders remaining from cupriferous pyrites after burning for sulphur used for the making of sulphuric acid.

Metallic copper is slightly soluble in cyanide solution, the solubility being in direct ratio to the fineness of comminution. Copper carbonates and oxides, in small quantities, have a deleterious effect on the cyanide treatment of gold ores, decomposing the solution rapidly. Copper taken into the

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solution to a point where affecting its strength for gold solution can be precipitated electrolytically.

A patented hydro-electrolytic process is planned to leach copper direct from the ore and deposit pure metal electrolytically from the solution. By this process ore first must be crushed to size passing a 40 to 80-mesh screen, then calcined and leached in tanks in a solution containing 6 to 10 per cent. of sulphuric acid. It is claimed that one ampere of electrical energy will precipitate one ounce of copper in 24 hours, but this process does not seem to have passed the empirical stage.

New processes of lixiviation for copper ore are numerous, and many new systems have been patented, in different countries. Some of these new processes call for involved and intricate reactions, possible in laboratory experiments, but difficult of carrying out in the actual extraction of copper on a large scale commercially. A fault common to many new leaching processes is that materials too costly in price are required, and such processes, while technically correct, are unavailable commercially by reason of high cost. In practically all developed copper fields only the low grade ores are adapted to leaching, all ores of medium and high grades being treated by smelting, with or without preliminary concentration. Only the cheapest materials are available for leaching processes that will prove commercially successful, and the only two chemicals that seem to have met the tests as to strength and cheapness are salt and sulphuric acid, with salt losing ground in this field, in which it once disputed supremacy with the acid.

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CHAPTER VII.

THE PYROMETALLURGY OF COPPER.

Smelting, or the reduction by fire, of metal from ore, has been known to mankind from prehistoric times. The reduction of copper to metallic form is effected by three methods, or combination of methods, these being hydrometallurgy, where leaching processes are employed, pyrometallurgy, where fire is the reducing agent, and electrometallurgy, with electric energy as the agent of reduction. The greater part of the world's copper production is secured with the aid of fire by smelting, but the rough copper so obtained is refined, as a rule, by electrolysis. This chapter is devoted to smelting in its various branches.

The antiquity of copper smelting is evidenced by the finding of copper and bronze in tombs and disinterred cities of very great age, and it is obvious that the copper must have been smelted, because the ancients are not known to have possessed mines of the native metal. The secret of smelting never was lost, but was handed down from generation to generation, and spread from country to country. In Europe there were copper smelters, at very early periods, in Germany, Austria and Sweden, it being obvious that the metallurgical practice of these works was derived from the Romans.

In Great Britain there are fugitive historical references to copper smelters early in Plantagenet times, and it is altogether probable that smelting was done, in a primitive manner, on tin ores, many centuries before the Christian era, and that the improved metallurgical practice introduced to the island by the Romans was never lost entirely, through the troubulous centuries preceding the welding together of numerous petty principalities into one nation, under Alfred the Great, in the year 900. In the Swansea district the earliest recorded smelter is that of the Mines Royal works, dating from A. D. 1584, though it is known that these works were preceded by still earlier smelters. The Taidach works date from 1727, and in Cornwall, copper smelters at Hayle date from early in the Eighteenth Century. The Welsh and English were the first to engage in copper smelting as an independent industry, the practice, from time immemorial, having been to smelt the ore at or near the mines, in primitive works under the same ownership. As a result of the establishment of independent works that bought ore from many mines, the Welsh smelters progressed more rapidly in metallurgical knowledge than their competitors and gained great skill in treating refractory ores. As a consequence of this progress Swansea became the seat of the greatest diversified smelting industry on the globe, the location of the city being favorable for the receipt of ore and matte from foreign countries. The smelting industry of Swansea, though still large and highly diversified, is of much less importance than formerly, the decadence of Welsh smelting having been aided, beyond doubt, by the arbitrary restrictions imposed upon the producers of the ore, for at the height of their prosperity the Swansea smelters drove very hard bargains

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with the miners. For a long ton, twenty-one hundredweights of one hundred and twelve pounds each were demanded and received, in addition to which an allowance of three and one-half pounds on three hundredweights was exacted for "draftage," and allowances also were claimed for moisture. No new smelters have been built at Swansea since 1867, though perhaps nearly three-fourths of the world's copper output was smelted at that point about the middle of the Nineteenth Century.

The smelting of copper dates from time immemoral in China, Persia and India, and Japanese smelting was begun about the Seventh Century of the Christian era. In Japan the large and highly important modern copper smelting industry now in existence may be said to date from about 1890, when the first modern machinery and equipment were installed at a Japanese plant.

The change of base of the copper smelting industry of the world dates from about the middle of the Nineteenth Century, when the development of highly important copper industries in Lake Superior, Chile, Australia and South Africa led to the building of smelters near the mines. The smelting industry, so far as copper is concerned, has reverted to the ancient practice of thousands of years, interrupted for a couple of centuries by the rise of the Welsh smelting industry, and the reduction of copper ores is carried on now, as a rule, at or near the mines, though, in the case of electrolytic refining, the greater portion of the rough copper is refined at long distances from the smelters.

In Chile the first reverberatory furnaces were built in 1842, at Coquimbo, by Charles Lambert, and Lambert, who was an extensive operator of Chilean mines, opened the Port Tennant works at Swansea, in 1852, to escape the intolerable exactions of the Associated Smelters. From this declaration of independence may be said to date the decline of the Welsh smelting industry. Charles Lambert built the first Chilean blast-furnaces, at Coquimbo, in 1857, but these were not entirely successful. Chile now has a number of modern smelters, though none of the first magnitude, and a considerable amount of ore continues going to Swansea for reduction.

In Australia the first smelter was built at Port Adelaide, South Australia, in 1851, and the second was erected at Wallaroo, in the same state, in 1861. The first smelter in New South Wales was built in 1874, at Lithgow, and the first in Queensland was built, in 1888, at Aldershot, a suburb of Maryborough, while the first smelter in Western Australia was not constructed until after the opening of the Twentieth Century. In Tasmania the first copper smelting was done at a plant on the east bank of the Derwent, at Smelting Works Bay, shortly previous to 1860, but these works do not seem to have proven a success. The modern works of the Mount Lyell, which are exceeded in size by many plants, but in efficiency by none, date from 1896.

In the United States the smelting industry was slow in gaining a foothold, partially because of the policy of England in forbidding the smelting of copper ore in the colonies. There was a limited production of ore from mines in New Jersey, Vermont and elsewhere, during the Eighteenth Century and in the early decades of the Nineteenth Century, but the first American smelter of which authentic records have been found was the Revere works, at Port Shirley, Boston, Massachusetts, having cupola furnaces, which were built in 1835. The company owning the works was reorganized in 1851, and continued business as a copper smelter until 1868, and remains

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in business with a copper rolling mill, though no longer a smelter. It is asserted by Nicol Brown, an eminent English authority, that a copper smelter was built by Crocker Bros. at Taineston, Maine, in 1836, but there is no town by this name in the state of Maine, and verification of the statement has not been obtained. The first thoroughly successful American smelter was built, in 1845, at Baltimore, by the Baltimore & Cuba Smelting & Refining Co., to treat Cuban ores. This plant had reverberatory furnaces, operated by Welsh smeltermen, and treated ores from Cuban mines, and later from South American mines, that previously had been shipped to Swansea for reduction. This plant, now under the ownership of the Baltimore Refining & Smelting Co., remains in existence, and has been in continuous and successful operation for upwards of sixty years.

The New Haven Copper Co. built a small smelter at New Haven, Connecticut, in 1846, and from the opening of this primitive plant dates the great copper and brass manufacturing industry of the Naugatuck Valley, now the first in this line. In New Jersey a small but good copper smelter was built in 1846, at Bergen Point, and this small beginning has resulted in the building up of the enormous copper smelting and refining industry now found on the New Jersey coast along New York Bay. The Orford works, at Constable Hook, New Jersey, were built in 1881, this being the first strictly modern plant in New Jersey.

The beginning of the Lake Superior industry may be said to date from the construction of a small smelter at Pittsburg, Pennsylvania, in 1848, by Hussey & Howe. This proved fairly successful, and the affiliated firm of Hussey & Co. built a copper smelter for Lake Superior ores at Cleveland, Ohio, in 1850. In the same year the Detroit & Lake Superior Copper Co. built a smelter at Detroit, Michigan, and shortly after the same company built the first Lake Superior smelter at Hancock, Michigan, this being located in the heart of the Lake Superior copper district.

The southern copper smelting industry dates from 1854, when two small blast furnaces were built at Ducktown, Tennessee, a reverberatory furnace being built at the same point in the following year. The copper industry of Tennessee was extinguished, temporarily, in 1863, by the American Civil War, and modern copper smelting in that state may be said to date from 1890, with the advent of the Ducktown Sulphur & Copper Co., which has been a leader in the development of successful raw sulphide ore smelting. In North Carolina a small blast-furnace was built at the Ore Knob mine in 1878.

The earliest western copper smelting was done in California, circa 1865, but the bulk of the Californian copper ore production of that day went to Swansea for smelting, and the Californian copper industry suffered almost complete extinguishment shortly previous to 1870. Modern copper smelting in California dates from 1896, when the Mountain Copper Co. erected a fine modern plant at Keswick, in Shasta county. In Arizona some crude smelting was done at an early date, but modern smelting was begun in the Clifton district of Graham county, circa 1873. Copper smelting in Utah is a comparatively recent affair, though this state now has some of the best works to be found anywhere.

In Montana the first smelter was built at Butte, in 1880, by the Boston & Colorado company, and reverberatories for matting were built in the

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same year by the Parrot mine, and the Meaderville smelter of the Montana company was constructed shortly afterward.

The smelting of copper has made greater progress since the middle of the Nineteenth Century than in all the centuries intervening since the discovery by primitive man that metal could be obtained from copper ore through heat, and this progress is shown in no more striking manner than by the increase in furnace capacity. About the middle of the Nineteenth Century the capacity of an average reverberatory furnace was circa seven tons per diem, while in 1902, the capacity had reached three hundred tons. The blast-furnace had increased, by the year 1900, to a daily capacity of three hundred tons, while in 1907 the capacity of the largest blast-furnace, at the Washoe works, was two thousand seven hundred tons.

In smelting gold and silver ores it usually is necessary to provide a metallic carrier for the precious metal values, the proportion, by weight, of the gold and silver being so small that it is necessary to collect these metals in some other metal of less value, but found in the ore in larger quantities. The preference, until recently, has been for lead, as a collector, but there is a marked tendency, noted since the beginning of the present century, to substitute copper for lead.

Copper melts at about 2,000° Fahrenheit—2,043° according to Plattner—or approximately 1,100° Centigrade. When heated within 200° of the melting point the metal becomes brittle and friable. Copper, when fluid, at white heat, is of a beautiful sea-green color, and volatilizes slowly, combining with oxygen to give a green flame.

The old method of smelting called for reduction of the ore to metal by six stages. In the first stage the ore was roasted in a reverberatory furnace, with the addition of about 15 per cent. of fuel. In the second stage the roasted ore was smelted, with flux and fuel, to a matte of about 35 per cent. copper tenor. In the third stage the low-grade matte was roasted in reverberatory furnaces, with the addition of about 40 per cent. fuel. The fourth stage called for the smelting of the roasted matte, with the addition of about 50 per cent. fuel, to white metal of about 75 per cent. copper tenor. In the fifth process the white metal was resmelted, in reverberatory furnaces, with about 60 per cent. of fuel, to blister copper. The sixth and final process called for the refining of the blister copper by a sucession of partial oxidations. The process of bessemer smelting usually is applied to the conversion of high grade matte, as hereinafter explained, but consists essentially of any reduction of ores by means of an oxidizing atmosphere, and both pyritic smelting and semi-pyritic smelting may be considered forms of the bessemer method of smelting.

New smelting processes are of great variety, and are constantly cropping up in considerable number. Most of the new processes are patented, and in theory many are of a revolutionary nature. Unfortunately such processes have a bad habit of working out wrong in actual practice, though frequently successful in theory. The working out of a new theory of smelting, by laboratory experiments, is a vastly different thing from applying such new processes successfully in works handling immense quantities of material. A small mine or a new mine cannot afford to experiment with new and untried processes of reduction. That work should be left to the big smelters, which, with very few exceptions, are managed by experienced

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and progressive men, who are ready, at all times, to try out new smelting processes that give promise of resulting successfully. The progress of metallurgy is accomplished, as a rule, by small and frequent advances, rather than by great leaps or by revolutionary inventions.

In treating sulphide copper ores, which predominate in most districts, it is necessary to expel the sulphur, and iron also, where that is connected with the copper, as in most cases. The iron can be slagged by the addition of appropriate fluxes, and, where the ores are deficient in iron, that element must be provided by ferruginous flux, iron being necessary in the formation of free slags in copper smelting. As most of the sulphide ores possess an excess of sulphur, it was customary, until quite recently, to drive off the excess of sulphur by roasting before smelting. This work is done still, at many smelters, while at other works roasting has given way to pyritic smelting, or semi-pyritic smelting, as hereinafter described. Excess of sulphur may be removed from ore by heap-roasting in open air, by roasting in shaft furnaces or kiln furnaces, or by calcining in reverberatory furnaces, usually of a special pattern, with rabbles.

The process of heap-roasting is inherently defective, and seems doomed to gradual extinction, semi-pyritic smelting, commonly known as raw sulphide smelting, being preferable, in most cases. While the theory of heap-roasting is the same in all cases, there are many minor modifications. At the Rio Tinto mine, where heap-roasting has been discarded, the heaps were of enormous size, and were burned with a marvelously small amount of carbonaceous fuel. Under the former practice at this mine, hand-selected rich ores, averaging 8 to 10 per cent. in copper tenor, were piled into heaps of about 400 tons each, and fired with a single cord of wood, burning six to nine months each. At the Tyee mine, in British Columbia, the process of heap-roasting has been carried pretty closely to perfection. Ores are dumped from the railroad hopper-cars into sixteen 100-ton receiving bins, with hopper-bottoms and screen-tops, latter set at angle of 40°, all fines under three-eighths inch mesh falling into separate compartments built in the center of each bin. The level of the roast-yard is about eight feet below the tram-tracks that run under the receiving bins. The yard has six permanent trestles, sixty feet apart from center to center, and at right angles to the permanent trestles are six trenches, each four feet deep and forty feet from center to center. Between the permanent trestles are movable bridges, traveling on wheels, these being trussed so as to clear the roast-heaps below. Both permanent trestles and movable bridges have tram-tracks, with turntables, over which travel side-dumping ore-cars, which thus obtain easy access to every square foot of the roast-yard. Roast-heaps are built up automatically, by dumping the tram-cars, each heap averaging twenty-four by fifty feet in size on the bottom, by seven feet in height, and containing an average of 300 tons. Each roast-heap requires an average of eight cords of wood, and burns about three weeks, reducing the sulphur contents to about 5 per cent. The system works perfectly, cintering being reduced to a minimum. When roasted, ore is shoveled into 4,500-pound ore-cars, traveling on tram-lines laid in the bottom of the trenches before mentioned, the tops of the cars being on a level with the bottoms of the roast-heaps. Roasted ore is trammed to the burnt-ore bins, 1,500 feet distant and just behind the blast-furnace build-

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ing, there being eighteen fifty-ton bins, with central bottom-discharge gates, emptying into tram-cars running over scales to the charging-floor of the furnace.

In the case of ordinary heap-roasting, where it is not practicable to go to the expense of providing a system so well devised as at the Tyee, ground should be selected with sufficient slope to provide good drainage, and ditches should be dug to carry off rainwater, and also to divert the drainage of adjacent ground, as a large proportion of the metallic values contained originally may be leached out by water in a short time. Usually the ground is surfaced by broken rock or slag, and given a final top-dressing of clay, well rolled or pounded. Above this should be placed a layer of fines, three to six inches deep, to prevent baking the clay, followed by its inclusion with the roasted ore when the latter is removed. On this surface of fines the roast-heap proper is built. There is a first layer of wood, much or little according to the nature of the ores, and usually more than really is needed. The worst wood available will do very well, if care is taken to furnish a little good wood for kindling the fire. Channels are provided, so that after the wood has burned out there is draught through the heap. Chimneys of boards are built at various points, the number of channels and chimneys depending on the size of the heap. In American practice a cord of wood is used for an average of 30 to 50 tons of ore, the percentage of fuel growing less as the size of the heap is increased. The first layer of ore is in coarse lumps, two to six inches in size, or even larger, surmounted by a layer of ragging, or medium-sized lumps, and topped with a layer of fines. The greater the percentage of sulphur, the lower the height of the pile. The shape of the heap on the ground may be square or oblong, usually the latter, to facilitate upbuilding and removal. In a roast-yard it is necessary to have a considerable number of heaps, so that the process may be continuous. The heap is fired, after building, and the wood gradually ignites the sulphur in the ore, which continues to burn for many weeks. The success or failure of the process depends mainly upon careful handling, the heap requiring a small but steady supply of air, for even roasting, while too much air allowed to enter the heap will result in matting part of the ore. Heap-roasting requires much hand-labor, and has various objectional features tending to restrict its use.

Matte is sometimes heap-roasted, requiring several successive burnings, but the practice is of very doubtful utility.

The fuels used in smelting copper are of a great variety, choice depending largely upon availability and prices, as well as upon individual requirements. Bituminous coal is used extensively, and anthracite coal sparingly. Anthracite is a very good fuel, but unobtainable at reasonable prices in most copper fields, while bituminous coal is the most objectionable fuel, and, next to charcoal, the least used, though there is a great difference in the varieties of bituminous coal, some of which work well in partial or complete fuel charges, while others give most unsatisfactory results. Coke, which is the most common fuel, was utilized first at Freiberg, in 1818, and proved an immediate success. For satisfactory work, in either reverberatory or blast furnaces, coke should develop not less than 10,000 British thermal units. Wood is used extensively in Chile, and in

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some other districts. Charcoal sometimes is employed in blast furnaces, but for this use should not be burned dead in the kilns or pits, as in such case combustion is too rapid in the furnace, leaving a frozen charge. Where wood or charcoal must be burned for fuel, on account of local conditions, wood-burning reverberatories are preferable, as a rule. Petroleum sprayed into the firebox has been utilized in reverberatory furnaces, and in Transcaucasia is the principal fuel, giving thoroughly satisfactory results. Apparently petroleum is not well adapted to blast-furnaces, as experiments along that line have not proven successful. Gas is used to a limited extent in reverberatory furnaces, giving satisfactory results.

The nature of the charge placed in a furnace depends, necessarily, first upon the ores available, and secondly upon the nature of the principal ore or ores to be smelted. Some ores are so constituted as to be self-fluxing, containing in themselves the necessary iron, silica and limestone. In most cases it is desirable to blend the various copper ores, where the required grades can be secured, rather than to add barren fluxes, but this process depends largely upon the availability of the ores desired. One of the principal reasons for the success of big custom smelters lies in their ability to mix varying ores, from different districts, so as to lessen or entirely obviate the use of barren limestone, silica or iron ore, for fluxing. The use of "sweeteners" is to be commended, where such ores are obtainable at reasonable prices. Ores that are excessively silicious require fluxing with ferruginous copper ores, or with iron ores that are barren of copper, and vice versa. Local conditions regulate practice, and the soundest theories must step aside, at times, in the presence of prohibitory freight rates, which, unfortunately, seem entirely too common, in many of the important copper districts of the world.

In the use of silicious fluxes it should be borne in mind that all silicates are not SiO_2, which is pure silica. Quartzite or some other form of SiO_2 is much preferable to bisilicates or trisilicates, and, of course, the best silicious flux of all is a low grade ore, with gangue composed mainly of SiO_2 carrying appreciable values in gold, silver or copper, or some combination of these three metals. Barium sulphate is difficult of reduction, and ores having a heavy barite gangue are refractory in smelting. Excellent results have been secured at the Ladysmith smelter on burnt ore averaging 38.87 per cent. barium sulphate, a general average analysis of slags from this heavy barite ore giving only 0.37 per cent. copper.

In the case of native copper from the Lake Superior mines, which reaches the smelter with only 20 to 50 per cent. gangue rock adhering, the process of reduction is simple. Oxide and carbonate ores are smelted readily, but with sulphide ores it is necessary to utilize different methods as hereinafter explained. Pyritic and semi-pyritic smelting are employed successfully in some works treating sulphide ores, but the usual process of reduction calls for preliminary roasting, in yards, or, more frequently, calcination in reverberatory furnaces, before charging for smelting. The full treatment of sulphide ores is given later, in this chapter.

Fines, coming either as fine concentrates, slimes or flue-dust, best can be smelted in reverberatories, on account of the heavy draft of the blast-furnace blowing out large quantities of the fines as flue-dust, but fines can be smelted with fair success in blast-furnaces by briquetting before charg-

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ing. The briquettes made from slimes frequently include flue-dust, and are charged while moist, or the briquettes may have lime or other material for a binder, if necessary. Fines charged directly into blast-furnaces cause the growth of crusts on the sides of the furnace, together with the formation of excessive quantities of flue-dust, thus reducing the output both through losses in fumes and reduced capacity of smelting. Cement copper is a reddish precipitate, composed of metallic copper and sundry impurities, requiring smelting and refining before use. Copper bottoms are alloys of metallic copper and metals existing in the matte as impurities, formed in matting.

Ore bedding is a system by which ores of various grades are stocked near the furnace, and used as required, for mixed charges. In using this system concrete or stone-lined pits, shallow and narrow, but long, are built beside railroad tracks, and ore is dumped into them from railroad cars coming from the mine. Different grades and varieties of ore are kept in different pits, and these, as needed, are scooped up by a steam-shovel and loaded into cars for carrying to the furnaces. The system is suitable only for large works that can afford a steam-shovel, and the value of the method is dependent largely upon the thoroughness with which the plan is carried out.

Mechanical charging is preferable to hand charging in all but small works, and is in very general use. For blast-furnaces, charging is best done by means of side-dumping cars. For reverberatory furnaces the best method of charging is through hoppers in the roof, near the firebox end, and, in the case of the larger reverberatory furnaces, the process is semi-continuous. In Lake Superior smelting with reverberatories the mineral is loaded into one or two-ton side-dumping tram-cars having V-shape bottoms. These are loaded transversely on railroad flat-cars, and are unloaded onto trestles leading into the smelters, the dump-cars being discharged either into bins, for storage, or direct into the hoppers above the reverberatories.

Furnaces for copper smelting are of two classes, the first being the blast-furnace, which has a powerfully reducing atmosphere, and the second being the reverberatory furnace, where the reflected flame gives a neutral atmosphere. The comparative availability of these two classes of furnaces depends largely upon local conditions, and in many plants both forms are found. The choice of kinds of furnace should be based upon a careful consideration of all the circumstances of each individual case. There is no large difference in cost of equipment between blast and reverberatory furnaces, though as a rule the latter are somewhat more costly. Blast-furnaces and their adjuncts occupy only about half the space required for reverberatories. Blast-furnace slags usually run a little higher in copper than reverberatory slags, under similar conditions, but there is a considerable variance according to the circumstances of each case. Reverberatories make very much less flue-dust, as they lack the blast that is such a powerful agent in carrying off fine particles of solid matter in the gases from blast-furnaces. Reverberatories require only about 50 per cent. of the power of blast furnaces, and a slightly smaller force of workmen for an equal capacity.

The blast-furnace was the earliest smelter of any sort, and its age is

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greater than that of history itself. Crude forms of the blast-furnace are found in use still, in remote portions of Mexico, South America, the Philippines, China and elsewhere. In the original form the blast was supplied through hollow tubes from human lungs. In fact, iron is made, to this day, in remote oases of the Sahara desert, with the aid of human blast. The next step was the invention of a crude bellows, and to supply continuous blast, two bellowses were used, worked alternately, the blacksmith's forge of today being merely a slightly improved form of the blast-furnace of prehistoric times. In its crudest form the blast-furnace is an open pit, or shallow depression in the ground. The next step is a small oven of stone, into which ore and fuel are charged. The development of the blast-furnace, to its present size and efficiency, has been accomplished by a steady succession of little improvements, covering many centuries, rather than by single strides, yet it may be said, with safety, that blast-furnace smelting has been improved more in the three past decades than in the five preceding centuries. Increase in the number of tuyeres was begun at Freiberg in 1845. The movable forehearth, now in general use, is an American invention, of comparatively recent date. The growth of the blast-furnace in capacity has been marvelous during the past few years. In 1900, the closing year of the Nineteenth Century, the largest blast-furnace in existence had a daily capacity of about 300 tons only, yet in 1907 the largest blast-furnace in use, at the Washoe works, Montana, had a length of 86 feet and a daily capacity of 2,700 tons. This single furnace, running on 6 per cent. ore, which probably was about the average of copper ore smelted at the beginning of the Nineteenth Century, could have turned out, in less than 60 days, all of the copper produced in the world in one year, one hundred years ago. The big blast-furnace at the Washoe works, made by cutting out the end-plates and joining a number of contiguous cupolas into a single furnace, has resulted in a very considerable decrease in fuel consumption per ton of ore treated.

The date of invention of the water-jacket blast-furnace remains a subject of dispute. A ten-ton blast furnace of two feet diameter, built by Wendt, in 1876, was given a water-jacket. Two years previously, in 1874, a water-jacket was installed at the Longfellow mine, in Arizona, which was 800 miles from a railroad, at that time, with fire-brick costing one dollar each and of short life, the ore being highly basic. J. B. Cooper states that the first water-jacket blast-furnace was used at the Detroit smelting works previous to 1864. While blast-furnaces are used occasionally with fire-brick linings, water-jacketed cupolas are employed almost universally. Despite the considerable loss of heat resulting from the circulation of water between the inner and outer shells, the water-jacket has proven itself both efficient and economical. Furnaces usually are rectangular, though occasionally circular or oval, with jackets of soft steel, wrought-iron or even cast-iron, and occasionally of copper.

The smelting of copper ore in a blast-furnace is a process of reducing the metal from its ores by the use of carbonaceous fuel, usually coke, in a cupola having a blast of air, which may be drawn direct from the atmosphere, or heated before passing into the furnace through the tuyeres. Blast-furnace smelting is adapted to the reduction of almost all of the commercial ores of copper, though for certain specific uses reverberatory

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furnaces are to be preferred. Fuel and flux, in the quantities demanded for reduction and slagging, are added to the ore, the flux being barren, or containing metallic values, as circumstances may dictate.

Preheated air for the blast was used first by J. B. Neilson, in 1828, at an iron furnace, and was used first on copper at Freiberg, in 1837, but did not prove fully successful there, though utilized permanently at Kongsberg, where it was installed shortly afterward. The rotary Roots blower was the first in American use, and remains the principal producer of slightly compressed air for blast-furnaces. The pressure under which blast is furnished depends mainly upon the depth of the bath, it being evident that increased pressure is required to force air through an increased depth of molten matter, the average pressure being 14 to 16 ounces per square inch. Blast is heated to greatly varying temperatures, ranging up to 800° Fahrenheit at some works, and the heating may be done in several ways, the most economical method being the heating of the blast by waste gases from the furnace itself.

The date of invention of reverberatory furnaces seems uncertain. The earliest British record of furnaces of reverberatory type is dated 1765. Furnaces of this class can be made, at a pinch, of adobes or sun-dried brick, and these, while crude, and not recommended for use where better material can be had, give fairly satisfactory results in the hands of a first-class smelterman. In the reverberatory furnace the flames from a lower grate, on which the fuel is burned, are reflected back upon the ore, lying on a bed above, thus giving a neutral atmosphere. The forehearth is brick-lined, and movable, and the air entering the furnace may be preheated, though this is not customary. In the best average practice five to seven tons of ore are smelted per ton of fuel burned, the larger furnaces giving the lower ratios of fuel consumption. In the case of sulphide ores the reverberatory furnace produces a richer matte than from the same ores reduced in a blast-furnace.

During the past thirty years the reverberatory furnace has gained tremendously in size. In 1878 the capacity of the average American reverberatory was 12 tons only, but had increased to 24 tons in 1887, and, in the case of the larger furnaces, had increased to 50 tons in 1894, 150 tons in 1899, and 300 tons in 1902. The largest reverberatory furnace in existence is at the Washoe works of the Anaconda mines, in Montana, this being 19 feet wide and 116 feet long, with a daily average capacity of about 300 tons.

In the Lake Superior district the smelting of copper mineral is done in reverberatories. The charge is first melted down, with fuel and flux, anthracite coal and coke constituting the fuel and limestone the flux. The products of the first fusion are slags rich in copper, which are resmelted, and impure copper, which is tapped to a refining furnace, where rabbled by blowing air through a gas-pipe, this process having an oxidizing effect on the charge. The copper is then poled with staddles of green wood, to bring it to the proper pitch, when it is dipped and moulded by hand, or tapped into mechanical casting machines. It is possible to perform the entire operation of fusion and refining in the refining furnace alone, but in practice it is found profitable to separate the work into the two operations previously noted. The standard Lake Superior reverberatory furnace is 13x17 feet and the largest in the district, previous to the building of the Michigan smelter,

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was 17x28 feet. At the Michigan works a furnace 20x50 feet was built, but, after repeated trials, this was found too large to hold the heavy charges of mineral, and was cut down to 16x35 feet in size, and furnished with a 24-inch ventilated bottom.

The bulk of the world's copper supply comes from sulphide ores, and, while leaching processes are used to a considerable extent, the far greater part of the sulphide ores is reduced by heat alone. Unless pyritic or semi-pyritic smelting be employed it is desirable that as much as possible of the sulphur be eliminated before the ore goes to the smelter. Preliminary roasting or calcining may be done in the open air, by heap-roasting, as previously described, or by roasting in stall, shaft, or kiln furnaces. The roasting of sulphide ores may be reducing or merely oxidizing in nature. The calcination of copper ores is a simple process, in theory, but in practice requires nice discrimination and care, to secure the best results, owing to the varying proportions of copper, iron, sulphur and other elements found in the raw ores. The skill with which the calcining is done greatly affects the success and cost of the future processes of reduction. As the combinations of ore vary greatly in different districts, the practice also varies to a considerable extent, and the best practice for the calcination of a given ore is determined, first by theory, and secondly by actual work.

Calcining may be done in hand-furnaces, but automatic devices are more economical, and are in general use in all but the smallest and least modern works. Hand reverberatory furnaces, with the hearth heated by a fireplace separated from the furnace by a bridge-wall with side openings, give as good satisfaction as can be secured with hand furnaces. Muffle furnaces are used occasionally, though not extensively, giving a very equable heat, but proving expensive in operation. Hand power cylinders are used at times, but are not so economical as mechanically operated calciners. The Brückner automatic intermittent discharge cylinder, invented 1864, has a greater diameter and shorter length than other varieties of cylindrical calciners, hence it takes less floor space, and is automatic and efficient in operation, being in quite general use. The Douglas muffle cylinder calciner, with continuous discharge, has a central flue of tile, which takes combustion products direct to the chimney. This calciner, while suitable for general work, is especially adapted to the economical and cleanly saving of sulphur fumes for the making of acid.

The principal form of calciner is the automatic reverberatory, of which there are a number of varieties, mainly patented, all of more or less value. These consist essentially of stationary reverberatory furnaces, through which plows are dragged, to rabble the ore under calcination and to remove the calcined ore. One of the most efficient forms is the turret furnace in which horizontal revolving plows are actuated from a central shaft, the ore charge being fed automatically from hoppers above. The turret furnace is economical of floor space and attendance, and may be built with a number of decks. The four-hearth Welsh calciner has hearths of 16x16 feet. The O'Hara calciner, with straight hearth, was the first to use mechanical rabbling, with plows set on horizontal arms attached to an endless chain. The turret calciner of Pearce, with superimposed hearths, came out in 1892. The McDougall mechanical calciner, invented 1891, is the type found in most general use. This has numerous superimposed hearths, some furnaces having

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as many as six, each rabbled by rotating arms carrying plows. The Argall furnace has a hearth with reciprocating movement, rabbles being lifted automatically when the hearth makes the return movement.

Ores are roasted also in kilns, stalls and shaft furnaces. A stall furnace is merely a perfected form of heap-roasting, wherein brick, stone or slag-block walls are built about the roast-heaps, giving perfect regulation of air currents. Where necessary a roof is built, to prevent the access of rainwater, which would leach out a considerable part of the copper values. In the most modern forms of stall furnaces, paved or grated floors are added, and stalls grade into furnaces by the addition of flues and chimneys for the carrying off of roast-gases. The Gerstenhöfer shaft furnace, utilizing the sulphurous fumes for making sulphuric acid, consists of a vertical shaft with a mechanical device for feeding the charge from above, and the fresh pulverized ore is intercepted in its downward progress by projecting ledges, permitting its partial oxidation. Kiln roasting also is employed where sulphurous fumes are saved for making acid, the kilns being of shaft-like form. The advantage of kilns and shafts is found mainly in the saving of the sulphurous fumes, but the process of desulphurization is more complete than is possible in heap-roasting or stall roasting.

Matting is the process of making a semi-metallic compound from sulphide ore, materially richer in copper than the ore treated. In the process of matting a considerable proportion of the sulphur in the ore is thrown off in fumes, and a large part of the original gangue is eliminated as slag. A definition of matte, or regulus, as it sometimes is called, is exceedingly difficult to give, for the reason that matte may contain greatly varying proportions of any of its elements, and a considerable variety of elements, of which sulphur always is necessary, copper being necessary, of course, in a copper matte, and lead in a lead matte, while iron, arsenic and a number of other impurities, some valuable and others damaging, are found in greater or less number and proportions in different mattes. Copper matte may contain as little as 15 per cent, or as much as 75 per cent. of the metal, though usually rainging from 25 or 30 per cent., in the lower grades, up to 50 or 55 per cent. in the higher grades. Copper matte is an intermediate product between raw or calcined ore, usually the latter, and the finished copper product. Matte is variously considered as an alloy, a mechanical compound or a mechanical mixture. It obviously is a semi-metallic product, possessing certain metallic characteristics, such as malleability, which is quite marked in the case of some high grade mattes. The mattes of high grade have specific names, according to their copper tenor. Blue metal is a matte containing 60 to 65 per cent. copper; white metal runs 70 to 75 per cent. copper; pimple metal carries 80 to 85 per cent. copper. Black copper is impure metallic copper carrying 1 to 5 per cent. sulphur, also sundry metals and metalloids, the name coming from the oxidation of the surface to a dull black. Blister copper is the highest grade of unrefined metal, carrying 96 to 99.5 per cent. copper, with one per cent. or less of sulphur, and small, variable quantities of other impurities. Its name comes from the blebs or vesicles, in which the bubbles of gas, from sulphur and other volatile elements, are retained as the copper hardens. Blister copper looks well, and is suitable for many uses, but, with the exception of the unusually pure metal from Lake Superior mines, blister copper is red-short, as a rule, though

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not cold-short in most cases. The quality of blister copper varies greatly, the purer brands being of good commercial grade, while the baser qualities are suitable for rough copper uses only.

The tendency of present practice is away from the old plan of blowing up a matte to blister copper by easy stages, and in the most modern plants only two fusions are required between calcining and bessemerizing. The separation of matte from the slag depends mainly upon specific gravity, hence the separation is imperfect when heavy basic ferruginous slags are produced, while light silicious slags usually are quite free from matte. Copper bottoms are alloys of metallic copper and other metals existing in the matte as impurities. The formation of the bottoms purifies the matte, and such bottoms are resmelted. In matting it is found that small furnaces are exceptionally liable to freeze. The product of the first fusion in the reverberatory matting process is of low grade, ranging from 15 to 50 per cent., usually 25 to 40 per cent., in copper tenor. If the charge is blown up to more than 50 per cent. copper at the first fusion, the slags are almost certain to carry considerable copper, entailing direct losses, or necessitating resmelting.

Blast-furnace slags, as a rule, run a little higher in copper than reverberatory slags produced from the same ore. The chemical composition and physical properties of slag vary according to the nature of the ore and fluxes, but usually slags are rich in both iron and silica. In Lake Superior smelting practice the reverberatory slags run 10 to 35 per cent. in copper tenor, and are resmelted in blast-furnaces, which, in turn, give slags carrying only 0.75 to 1 per cent. copper. An average of 10 per cent. copper in reverberatory slags is considered good practice in the Lake Superior district, the nature of the material treated differing greatly from the ores of other districts. The rich slag, containing much cuprous oxide, is skimmed off at the end of poling.

The scoria, or slag from a smelter, accumulates in large quantities, and its disposal sometimes becomes a matter of difficulty. Various systems are in use for disposing of slag, the simplest being to let it run outside and care for itself, but this is possible only where there is a sharp incline and plenty of room, conditions frequently lacking about a modern smelter. Where it is impossible to permit the slag to care for itself, the cheapest method of disposal usually is by granulation, which is accomplished by running the molten slag into a trough conveying a small stream of rapidly running water. The slag granulates instantly, and is washed away by the water and deposited by gravity at any point desired, granulated slag being sluiced in water almost as easily as coarse sand. Slag may be disposed of also by removal from the furnace in slag-pots, transported by hand, horse or mechanical power, or may be run out in gutters, while liquid, though somewhat difficult of handling by this method because of its viscosity. At a number of smelters slag-bricks are made, and while these are not suitable for general building purposes, they are available, to a considerable extent, about a modern reduction plant, and make satisfactory brick for almost any rough use.

In calcining or smelting copper ores, varying proportions of the metal are volatilized and carried off with the roast-gases, while fine particles of unsmelted ore may be carried out of the smelting zone by the powerful draft of a blast-furnace. Formerly the copper blown out in fine particles, and

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volatilized by intense heat, was lost, but in all modern plants the greater part of such furnace loss is regained by deposition in dust chambers. It has been found advantageous to make the dust chambers of great length, which permits the settling of the small solid particles from the fumes, and the sublimation of the volatilized copper along the course of the flue. Dust chambers are found in all modern plants, and as a rule are merely enlargements of the flue, having transverse partitions permitting the gradual settling of the dust from the furnace fumes. In the larger plants the flue-dust is removed from the dust chambers through hoppers underneath, which load into tram-cars. As flue-dust usually is high in arsenic and antimony, volatile elements that are highly deleterious to finished copper, flue-dust commonly is smelted by itself, though sometimes mixed with matte or briquetted with fines previous to resmelting.

Fumes from sulphide ores are injurious to vegetation, and lead to much litigation. There is no question that much damage is caused to agricultural interests by smelter fumes, and equally there is no question that an industry of mulcting smelters has grown up among agriculturists in various smelting districts. The courts usually hold with the farmers, and increasing trouble is caused the smelters, with prospects of still more serious trouble in the future. It has been suggested that smelter fumes be concentrated and turned into the streams, but this suggestion is not practicable, as the damage would be far greater than now caused by dissipating the fumes in the air. The sulphur fumes from roast-heaps are especially objectionable, as they lie low on the ground, doing far more damage than the fumes thrown off from high stacks. Owing to the increasing difficulties of smelters with surrounding agriculturial interests, because of noxious fumes, it is certain that the sulphur contents must be used, to an increasing extent, in the manufacture of acid.

One ton of sulphur combined with oxygen and water makes three tons of sulphuric acid, which is the basis of all other inorganic acids, and may be called the foundation of commercial chemistry, as there is scarcely a single branch of chemical manufacture that does not depend, directly or indirectly, upon sulphuric acid. Previous to 1838 the volcanos of Sicily were practically the sole producers of sulphur for the making of acid, but owing to a short-sighted attempt at unduly raising prices, the cost of sulphur was made almost prohibitive, leading to the utilization of the sulphur contained in iron pyrites, more especially the cupriferous pyrites of Cornwall, Wales, Ireland, Portugal and Spain, incidently having a strong influence in reopening the principal copper mines of the Iberian Peninsula, which are notably rich in sulphur. Sulphuric acid can be manufactured easily by passing sulphurous acid fumes, given off from sulphide ores roasted in shaft-furnaces or kiln-furnaces, through lead-lined acid chambers, where the fumes are taken into solution by water. The contact acid process, a comparatively new invention, is available for making sulphuric acid from fumes containing only a small percentage of sulphur dioxide. The United States lags behind Great Britain and Germany in this detail of the copper industry, and, as has been pointed out by Prof. Douglas, the United States, while leading the world in some branches of metallurgical practice, is by no means well to the front in the fullest possible utilization of by-products.

The process of conversion, or bessemerizing, now in very general use in

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copper smelters treating sulphide ores, which reduces high grade matte to blister copper, dates, in its inception, from 1855, when the first patent for making steel from iron by his new process was taken out in England by Sir Henry Bessemer. The first attempt at utilizing the Bessemer process for the conversion of copper was made at the Bogoslovsk mine, in the Ural Mountains of Russia, by Seminikov, who did not succeed, however, in producing metallic copper. In 1880 Pierre Manhes begun experiments at Verdennes, near Avignon, France, and the process of bessemerizing, as applied to copper, was brought to a commercial basis by Manhes, though somewhat improved by Paul David in 1881. The first successful converters made by Manhes, at Lyons, France, took 3-ton charges. The process was brought into the United States in 1883, by Franklin Farrell, who installed a Manhes plant for conversion at the Parrot mine, in Butte, Montana, considerable improvements in the practice being made at the Parrot plant. Since then the process has enjoyed great growth, having come into practically universal use for the final smelting of sulphide ores.

The first converters utilizing the Bessemer process were very small in size, treating only 2,000 to 3,500 pounds of matte at a charge, and were rotated by hand, the operation requiring two stages. Converters now in use run 12 to 15 tons in size, as a rule, though the Washoe plant of the Anaconda has trough converters 96 x 150 inches in size, and the largest converter ever built is at Butte, Montana, being of the tremendous and somewhat unwieldy size of 8x20 feet. The weight of charge in a converter varies greatly, the first charge in a newly lined shell being much smaller than the last, owing to gradual destruction of the lining.

Bessemer converter plants vary greatly in size, at different works, but the essential plan is the same in all cases. A single unit consists of a stand, one or more movable shells, and an air-compressor to furnish blast. As a rule there are about two shells for each stand, as shells must be newly lined from time to time. The stands, built of steel, hold the shells containing the charge, which are mounted on trunnions, and the stand is provided with devices for tilting the shell. Hand power for tilting is used at some of the smaller installations, but in all larger plants mechanical power is employed, rotation usually being accomplished by electric or hydraulic power. A blast of varying strength, averaging about 15 pounds per square inch, is furnished by an air-compressor connecting with the shells through ball valves, which have replaced the old style plugs. The number and size of the tuyeres through which the blast enters the retort vary according to the style and size of the converter.

The retorts, or shells, are made of boiler-plate steel, in three parts, with flanges which are strongly bolted together. Shells are of widely varying sizes and types, the principal styles being the barrel type and the upright round type. The barrel type being easier to handle, both on and off the stands, is in most general use. The shells are lined, sometimes with firebrick, though this is going out of style, the usual lining being silicious material thoroughly tamped in and dried. The most common converter lining is made of quartz and clay, the latter serving merely as a binder. In some cases it is advisable to use silicious low grade ores for linings, to save the mineral values, but such linings rarely give us good results as those made of pure silica. Magnesite linings have been used with success, at Butte, and are said to have given unusually long service. The lining of longest aver-

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age life seems to be that made from quartzite containing about 85 per cent. silica and 10 to 12 per cent. alumina, bonded with clay. The life of linings varies greatly according to different factors, high grade matte containing little iron being least destructible to linings. The usual lining consist of practically pure quartz, or gannister, containing 98 to 99 per cent. silica, bonded with a little clay. The quartz or other silicious material usually is crushed in rolls to pass a ⅝-inch trommel, or may be crushed in a Chilean mill or grinding pan. Quartz and clay are dumped into large bins, in the lining department of a smelter, and are withdrawn and mixed as necessary in a mixing pan, or trough. The lining is done in sections, the lower section being tamped with a mixture of about one part clay to five or six parts of quartz, mixed rather dry, while the upper portion is lined with a softer mixture. The lining is tamped in, sometimes by hand, but mainly mechanically, with heated bars, and the linings, when completed, vary in thickness from about 30 inches, at the tuyeres, to extinction at the mouth of the shell.

In the actual process of conversion at the best arranged plants the high grade matte is run direct from the cupola well of the furnace into the converter shells. Blast is turned on automatically, by rotating the filled shell to its normal upright position, and the powerful blast, working its way upwards through the molten matte, causes the sulphur to unite with the oxygen in the air and pass off as sulphur dioxide. The converter blows off, with a tremendous roar, into a hood that connects with a flue running to the dust chamber. More or less copper is volatilized by the powerful blast, but nearly all of the metal so driven off is saved in the dust chambers, and resmelted at flue-dust. The blowing of a converter charge is a delicate process, and considerable experience and care are required to secure the best results. If the charge is overblown the slag becomes high in copper oxide, while if underblown the process of conversion is not carried out fully, and the resulting blister copper will contain an undue percentage of impurities. Owing to the greater specific gravity of gold and silver, the precious metals tend toward the bottom of the converter, and can be saved therefrom to a considerable extent, if desired, but as practically all bessemerized copper now is refined electrolytically, and gold and silver values are recovered much more perfectly by electrolysis than by any possible method of metallic segregation, the separation of gold and silver in the process of conversion is now attempted at but few smelters.

The ferric oxide formed during the combustion of the matte robs the converter linings of silica to form slag, and the life of the lining is long or short in proportion to the slow or rapid destruction of its silicious material through uniting with little or much iron in the matte to form slag. In average practice linings last for six to eight blows, though in some instances the life is much longer, and occasionally considerably shorter. The iron in the matte is eliminated before the sulphur, the oxidation of the sulphur contained in the charge being the final process. Zinc is oxidized from the matte to a considerable extent, while arsenic is eliminated but slowly in the earlier stages, and antimony remains practically intact in the matte until the final process, when it is largely eliminated in the last few minutes of blowing. The copper oxide in the matte is reduced by the copper sulphide, the sulphur becoming oxidized and passing off in fumes, while the metallic copper, as formed, sinks to the bottom of the shell. The flames

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from the mouth of the shell change in color, at different stages, and are watched closely by an experienced man in charge of the process. At the start lambent greenish flames, mingled with yellow, are noted playing over the surface of the charge. At the period of skimming the slag, which is when the matte has reached the white metal stage, with a tenor of about 75 per cent. copper, blue flames are noted. When blue flames become prominent the blast must be shut off, or foaming and explosion are almost certain to be caused by violent chemical reactions that produce large volumes of sulphurous anhydride. In the best practice ten to fifteen ton converters handle full average charges, and turn out finished blister copper of better than 99 per cent. tenor, in 45 to 75 minutes. The blister copper produced must be refined electrolytically, in nearly all cases, to eliminate a considerable variety of impurities, present in the metal to only a limited extent, but highly deleterious to finished copper.

In order to prolong the life of the linings, pulverized silicious material sometimes is blown into the charge through the mouth, or placed in the bottom of the shell before charging with matte, such material furnishing a portion of the silica required for slagging the iron, and thus prolonging the life of the lining. Such pulverized material should be thoroughly dried before charging, as it may cause serious explosions if even slightly wet, when coming into contact with the molten matte.

At the British Columbia smelter, in 1906, it became necessary, while rebuilding the plant, to convert cold matte in the shells. This was accomplished by lighting a wood fire, which, when thoroughly ablaze, was covered by a charge of 1,500 pounds of coke, and a light blast turned on. When the coke reached red heat, three tons of cold broken matte were added, and full air pressure turned on. The matte melted quickly, and further broken matte was added. The slag was partially skimmed, and further matte added from time to time, until the shell was fully charged. The entire process required 3½ hours only, and 15 tons of 40 to 50 per cent. matte were converted, in one stand, in a single shift. Matte up to 55 per cent. in copper tenor was converted, but was found more liable to freezing than matte of lower tenor. The process was not economical, though necessary under peculiar circumstances, but demonstrated latent possibilities.

The casting of copper, after the final process of smelting or conversion, may be done by hand or machine. In hand work the copper must be dipped in ladles and cast into moulds by hand labor. The machines are mainly of two types, one having an endless chain, with automatic tripping of ingots into water for cooling, the second type being the Walker casting machine, in which moulds are carried on a circular platform, copper being cast through a tapping-ladle direct into moulds. Some cuprous oxide is sure to be formed in casting. Copper shrinks in casting 0.1875 inch per foot, or 1.56 per cent, as compared with 1.32 per cent. for brass, 2.6 per cent. for zinc and lead, 1.69 per cent. for aluminum and 1.04 per cent. for iron. Eutectic copper is a mutual mixture which freezes out last in casting, after ingredients in excess have been removed by gradual cooling. Eutectic copper is a mixture of metal with about 3.4 per cent. of cuprous oxide, containing about 0.38 per cent. oxygen. Under the microscope eutectic copper can be seen as a thin groundmass surrounding grains of pure copper. Eutectic copper is transparent, with blue color by reflected light and is red in transmitted light. Eutectic copper may be a

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source of weakness in castings requiring tensile strength, especially in copper tubes that carry hot and reducing gases, which may react on the eutectic copper in the tubes, with the result of forming fine cracks.

The principal features of general copper refining, including impurities, are treated in the following chapter on the electrometallurgy of copper, as it seems desirable to cover the subject in one chapter, rather than in two, and the bulk of the world's copper production now is refined electrolytically.

In the middle of the Nineteenth Century refining furnaces for the refining and casting of blister copper were about 5x10 feet in size, taking average charges of seven to ten tons. The average size now is about 18x30 feet, with average charges of seventy-five tons. The oxidation of impurities contained in the copper can be accelarated by means of an air blast playing upon the surface of the molten metal. The "direct method" of copper refining consists essentially of the fusion of a mixture of raw and calcined matte, of about white metal grade, the resultant product being blister copper.

Pyritic smelting practically was invented by John Hollway, in 1878, though he did not succeed in bringing the process to do satisfactory work. The experiments of Hollway were made in an endeavor to smelt Rio Tinto copper sulphides by heat generated through the oxidation of their sulphur. The first attempts along this line in the United States were made, circa 1887, at Toston, Montana, where a partial success was scored. The first absolutely successful pyritic smelting was done by Robert Sticht, at Mount Lyell, Tasmania, in the early years of the present century.

While pyritic smelting is rather closely allied to raw sulphide, or semi-pyritic, smelting, it differs considerably in theory from that process. Full pyritic smelting practically is a bessemerizing process from the start, carried out in blast furnaces, rather than in converters, in its earlier stages. The process consists of the reduction of sulphide ores without the use of other fuel than the sulphur contained in the ore itself, whereas semi-pyritic smelting is the reduction of sulphide ores to matte with extensive use of the fuel values of sulphur contained in the ore, and with a minimum charge of carbonaceous fuel. In theory pyritic smelting is applicable to any raw sulphide ore not carrying lead. The roasting or calcining of sulphide ores drives off, by oxidation, large quantities of sulphur, which undoubtedly is a valuable fuel, providing it can be so burned as to give an oxidizing or reducing atmosphere in a furnace. Sulphide ores occasionally require a small addition of oxidized ores to serve as fluxes.

In theory one pound of pyrite, burned in a furnace, is equal to 2,026 British thermal units, this being about 35 per cent. of the calorific value of a pound of average carbonaceous fuel, but in practice the percentage of value in pyrite probably is considerably smaller. Making all reasonable deductions, one pound of pyrite probably carries fuel values equivalent to 15 to 20 per cent. of the fuel values contained in a pound of coke. The fuel value of a unit of pyrite burned to FeO and $2SO_2$ is calculated by Lewis T. Wright as 1.926, while given by other authorities as only 1.29, this comparing with 8.08 calories secured from the combustion of one unit weight of carbon burning to CO_2. It is probable that Mr. Wright's figures are a very close approximation to the actual calorific value of pyrite.

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One of the principal disadvantages, and probably the greatest disadvantage, encountered in full pyritic smelting, is that sulphur will burn only in the presence of an excess of free oxygen, which greatly lowers the temperature of the smelting zone. Sulphur, when pyrite is the fuel, burns in three stages. In the first stage of combustion, pyrite, which consists of one atom of iron and two of sulphur, chemically united, loses one-third of its sulphur and forms Fe_2S_4. In the second stage there is a loss of one-sixth of the original sulphur contents, leaving a residue of FeS. In the third and final stage of combustion the single atom of sulphur is dissociated from the single atom of iron in the FeS, completing the work of reduction. This process of three stage combustion is long drawn out, lowering the temperature of the smelting zone, and causing scaffolding, and the building up of concretions of semi-fused charges on the sides, through which the blast cannot penetrate. In theory the ore should furnish its own fuel in the sulphur contained, but in actual practice it is, of course, necessary to use a little coke, to start the process of combustion, just as it is necessary to use kindling to start a fire of anthracite coal, but in full pyritic smelting no carbonaceous fuel is required, after the initial warming up of the furnace and charge.

The most successful application of the theory of pyritic smelting has been made at the Mount Lyell mine, Tasmania, by Robert Sticht. The Mount Lyell pyrite averages about 46 per cent. sulphur, 40 per cent. iron, 4.5 per cent. silica, 1.5 per cent. barium sulphate, 2 per cent. aluminum sesquioxide and 2.35 per cent. copper. To this ore is added silicious bornite, purchased from other mines, with quartz for flux. The ore is smelted without previous roasting, and without carbonaceous fuel, other than is required for preliminary warming of the furnace and charge, to a matte of 15 per cent. copper tenor. Formerly 3 per cent. of coke was used, and a hot blast of about 525° Fahrenheit was employed, but the use of coke has been abandoned and the blast is only warmed. The first fusion product, 15 per cent. matte, represents the putting of 7 tons of raw ore into one ton of low grade matte, and the process, in addition to affording a remarkable technical success, is highly successful from a commercial point of view, by reason of its cheapness. The 15 per cent. matte is recharged and brought, in the second fusion, to a copper tenor of 45 to 50 per cent., a small percentage of limestone and coke being used for the second fusion, with a cold blast. In both fusions the charge is subjected constantly to an oxidizing rather than to a reducing process. The total consumption of carbonaceous fuel averages 3.25 per cent. only, for the double smelting, all of the coke, except the preliminary warming charge, being used in the second process.

Much valuable work in pyritic smelting has been done by Lewis T. Wright, at the Iron Mountain mine, California. He found that with a cold blast the sulphur gave rather less than one-third of the total calorific power of the sulphur volatilized, while the warm blast diminished the percentage of coke in accordance with the heat generated by the increasing quantity of sulphur burned. Mr. Wright's experiments showed 39 per cent. of the total heat generated to be carried off by gases, 25 per cent. to go in slags, and the balance of 36 per cent. to pass off in radiation from the furnace and in the molten matte produced. Air to the extent of about 350 cubic feet was required for each pound of charge. The difficulties in the way of

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pyritic smelting apparently are few and simple, in theory, but in actual practice results have been distinctly disappointing in the great majority of cases, hence the great measure of success scored by Mr. Wright and the complete success scored by Mr. Sticht are most notable, as well as most encouraging. That there are serious practical difficulties in the way of successful pyritic smelting cannot be gainsaid, but as these have been overcome fully in one plant, and very largely in another, while marked progress has been made elsewhere, it would seem that the process, which offers benefits that are readily apparent, should come, eventually, into quite general use, though it is improbable that it will be found suited to all sulphide ores.

Semi-pyritic smelting, or raw suphide smelting, is a system by which partial advantage is taken of the sulphur contents of the ore for fuel purposes, but differs from full pyritic smelting in that carbonaceous fuel, to a varying extent, is necessary under all circumstances. This process is in quite general and growing use, and has given highly pleasing results where carried out intelligently, but experience and ability are required to secure fully satisfactory practice. The process of semi-pyritic smelting may be said to date from A. D. 1555, when the essential theory was evolved by Barthold Hohler, who first utilized iron pyrites as a carrier for the precious metals. The Kongsberg process of semi-pyritic smelting adds raw pyritic ores to the charge, simply to produce a carrier or matte for the precious metals, and differs widely in theory from the principle of pyritic smelting.

Raw sulphide smelting is done in a blast-furnace, ore being put into the furnace by layer charging or by column charging. In layer charging the raw crushed ore is blended intimately with a small proportion of coke, and the mixture is fed into the top of the furnace, there being gradual heating, followed by the ignition of the entire mass. In column charging the raw crushed ore is fed into the smelting zone of the furnace, and a strong hot-blast aids in the process of reduction, exercising a bessemerizing effect. When carefully handled, a furnace fed by column charging gives matte of good grade, with exceptionally clean slags, and turns out a large tonnage of matte with minimum coke consumption. It has been found that in raw sulphide smelting furnaces of more than four feet in width are apt to run cold, and form crusts. Considerable trouble was experienced at first through the formation of crusts on the sides and corners, necessitating frequent barring, but this trouble can be overcome almost entirely by careful charging.

The proportion of sulphur varies greatly in ores smelted by the semi-pyritic process, ranging from nearly 50 per cent., as in the case of low grade cupriferous pyrites, containing chalcocite or chalcopyrite disseminated in pyrite, to as low as 5 per cent. sulphur in the total charge, in the case of some other sulphide copper ores. Zinc up to about 5 per cent. of the charge is mainly volatilized. Alumina proves injurious, tending to form infusible silicious compounds that bring about the formation of crusts in the furnace, and also gives great trouble in the settlers.

Raw sulphide smelting has been brought to a high degree of success by the Ducktown and Tennessee companies, close neighbors in the southeastern corner of the state of Tennesse. At the Tennessee smelter the first fusion gives a low grade matte of 10 to 15 per cent. copper. This matte is charged,

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broken, with silicious flux, the use of limestone having been abandoned, into a second furnace, the product of the second fusion being a matte of 45 to 50 per cent. copper tenor, though, if necessary, a matte carrying up to 60 per cent. copper can be turned out. The second fusion gives an iron slag running up to about one per cent. copper, which requires resmelting. Pyrometric tests, at the works of the Tennessee Copper Co., show that a furnace run on green ore, with a charge of only 2.5 per cent. coke, is hotter in the smelting zone than similar furnaces charged with roasted ore and 12 per cent. of coke, the excess heat produced by raw sulphide smelting ranging up to 100° Centigrade.

The Tennessee company, by changing to raw sulphide smelting, cut fuel charges of coke from 12 per cent. on roasted ore to an average of 3.5 per cent. on raw ore. The Ducktown smelter uses 4.4 per cent. coke charges only, to produce a 50 per cent. matte. This plant was the pioneer in raw sulphide smelting, and the work done there is entitled to great credit. Raw sulphide smelting reduces the output of a furnace by 20 to 30 per cent., but this reduction in output is more than counterbalanced by the elimination of the preliminary roasting processes. Raw sulphide smelting also does away with the extremely noxious sulphur fumes arising from heap-roasting. The fumes and gases from a smelter can be discharged from a high stack, causing minimum damage, while fumes from roast-heaps lie lower on the ground, and cause great injury to all surrounding vegetation. It also is possible to utilize the sulphur dioxide produced in raw sulphide smelting for the manufacture of sulphuric acid by the contact process, and this plan is to be used at the Tennessee smelter.

The raw sulphide smelting process requires 40 to 50 per cent. larger furnace capacity than the old system providing preliminary roasting or calcining, but effects enormous savings in other directions. Raw sulphide smelting requires extra labor, by reason of the double handling of matte, but this is more than balanced by the saving of one extra handling of the ore required by the old process. At the Tennessee works the saving in labor is estimated at 40 cents per ton of ore, or more than one cent per pound on finished copper, and there is an immense saving in fuel, estimated at nearly two cents per pound on finished copper.

Apparently the very considerable utilization of the sulphur contents for fuel use renders the hot-blast unnecessary in reducing strongly pyritic ores. The hot-blast has been dropped at the Mount Lyell, Ducktown and Copper Queen smelters, and never was installed at the Tennessee works, these being four of the most progressive smelting plants in existence.

The reactor process, invented circa 1901, does not seem to have proven the success that was anticipated, and is not found in general use.

Nickel-copper ores are matted quite readily, but the product is difficult of reduction, and requires special processes. The Orford works, which treat a large proportion of the entire output of nickel copper matte, utilize sodium sulphate, which dissolves copper and iron sulphides freely, forming a solution of lower specific gravity than that of the nickel sulphide. The nickel-copper matte is charged with coke and sodium sulphate into a cupola furnace. When fused the sodium sulphate is reduced by the coke to sodium sulphide, and forming a solution with part of the copper and iron sulphides, flows with the undissolved nickel sulphide through the tap-hole into moulds.

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where the constituents separate according to their specific gravities, the dissolved copper and iron sulphides floating to the surface. When the mould has solidified the parts are separated by fracture, and the tops, containing copper and iron sulphides, are recharged into a smelting furnace, where the sodium sulphide is fluxed for an iron slag. The bottoms of the moulds, containing nickel sulphide, but with more or less copper and iron sulphides admixed, are resmelted by the same process as before. Formerly four or five successive smeltings were necessary to bring the nickel sulphide to sufficient purity for the refining process, but by a recent improvement a longer smelting period is given, causing more complete dissolution of the copper and iron sulphides, and two treatments are sufficient, in an open-hearth reverberatory furnace, to effect fairly complete separation of the nickel and copper, 50-ton charges requiring four to five hours heating, after complete fusion.

The Mond process of reducing nickel-copper matte takes a bessemerized matte that is dead-roasted, which is treated with a little sulphuric acid, permitting the extraction of about two-thirds of the copper contents. The full process of securing the nickel is described in the article on the Mond Nickel Co., Ltd.

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CHAPTER VIII.

The Electrometallurgy of Copper.

For many years the possibility of electric smelting has excited the interest and efforts of scientists and practical metallurgists. Much experimental work has been done, and substantial progress has been gained, though no process of electrical smelting has been demonstrated fully successful. The first serious work in this line was done by Héroult, whose initial experiments on 7% sulphide ores gave mattes up to 45 per cent. in copper tenor, with slags carrying only 0.1 to 0.2 per cent. copper. Electrodes of carbon are used in smelting, and one of the principal difficulties encountered in actual work results from arcing, troubles from short-circuiting having given the most serious difficulties encountered in efforts at electrical smelting. Basing the figures upon the experiments of Héroult, about 3,000 horsepower are required for the operation of a hundred-ton furnace, and the consumption of carbon electrodes is 6 to 7 kilograms per ton of ore treated. Many electrical furnaces have been patented, but none are in commercial use as yet, on copper ores, though substantial progress has been made in the electrical reduction of iron ore. As yet there remain serious practical difficulties in the way of successful copper smelting by electrical energy, though these are being overcome, gradually, but the process, even if perfected, remains too costly for general use. It seems probable, however, that some form of electric smelting will become sufficiently perfected, within a comparatively short time, to permit its use in districts where large water powers can be harnessed at cheap cost, and where carbonaceous fuel is unusually costly.

There have been numerous attempts at the direct reduction of copper ores by electrolysis, and some of the experiments have given encouraging results. The Borchers process provides for the direct electrolytic reduction of 80 per cent. copper matte, but it does not seem that matte would furnish very satisfactory anodes. The most promising of the electrolytic direct reduction processes is that of Dr. Laszczynski, which was being utilized, in 1907, in Poland and near Semipalatinsk, Siberia. By this process ores are first crushed, then, if sulphides, are briquetted and roasted, to produce a mixture of copper oxide and sulphide. The roasted ore is then leached with dilute sulphuric acid, the product being a solution of copper sulphate, which is subjected to electrolysis, with the use of insoluble anodes. By means of an electric current the copper sulphate is separated into copper and SO_4, one atom of oxygen from the SO_4 escaping, leaving sulphur trioxide, which combines with water to form sulphuric acid. The ferrous sulphate in the anode, or rather in the electrolyte, is converted into ferric sulphate, which exercises upon the cathode a dissolving force equal to that of dilute nitric acid, reducing precipitation by fully one-half and giving a low grade and brittle metal in the cathode. The iron salts exist, necessarily, in the bluestone in large quantities, and are decidedly pernicious, but the process provides for the continuous making of sulphuric acid in the electrolyte. The anodes are of sheet lead, covered with thick cotton cloth.

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Previous to a description of the actual process of electrolysis, it seems desirable to give consideration to the impurities existing to greater or less extent in all unrefined copper. The two most desirable features of copper are tensile strength and electrical conductivity, even the brass founders depending largely upon the conductivity test in purchasing copper. Tests for conductivity must be made with great care, as a variation of 1° Fahrenheit from the standard causes a variation of 0.2 per cent. in conductivity. Annealed wire gives the highest percentage of conductivity, hard drawn wire of the same metal testing 2.5 to 3 per cent. lower.

No absolutely pure copper is supplied commercially, but the best electrolytic brands are of unusual purity, some ranging above 99.95 per cent. copper, but containing gold, silver, iron, bismuth and arsenic in very minute quantities. The best grades of Lake Superior copper also are very pure, but contain small quantities of silver, iron and arsenic. Occasionally aluminum, silicon and phosphorus are added in small quantities, on account of their ability to deoxidize copper injured in heating. Molten copper has the property of absorbing such gases as hydrogen, carbon monoxide, carbon dioxide and sulphurous anhydride, which are set free on solidifying, causing difficulty in making solid castings and necessitating great care to prevent porosity. There are many mixtures of copper with zinc, tin, aluminum and other elements, forming useful alloys, which are treated elsewhere in the chapter devoted to alloys of copper.

The impurities found to greater or less extent in manufactured copper are upwards of twenty in number, including aluminum, antimony, arsenic, bismuth, cadmium, carbon, cobalt, gold, hydrogen, iron, lead, manganese, nickel, oxygen, phosphorus, selenium, silicon, sulphur, silver, tellurium, tin and zinc.

Aluminum, as shown by the experiments of Addicks, when added to copper to the extent of only 0.006 per cent., brought the conductivity of the copper down to 98.6 per cent., and the addition of 0.739 per cent. aluminum reduced the conductivity of the copper so alloyed to 43.5 per cent. The factor of ratio of aluminum in reducing the electrical conductivity of copper is 500, aluminum ranking between antimony and arsenic as a deleterious element in reducing electrical conductivity.

Antimony, like iron and arsenic, exists in most commercial copper, though usually found in small quantities. In small quantities, antimony renders copper both red-short and cold-short, but under 0.5 per cent. does not seem to greatly affect the ductility of copper, though 0.2 per cent. causes copper sheets to crack at the edges when rolled. The bad effects of antimony are partially neutralized by arsenic, but are intensified by tin, aluminum or manganese, when found in copper. Antimony to the extent of 0.0071 per cent. lowers the conductivity of copper by 1 per cent., the factor of ratio in reducing electrical conductivity being 190.

Arsenic, found in small quantities in all commercial copper, does not seem to affect the ductility of copper when existing in quantities of less than 0.1 per cent., and copper containing 0.2 per cent. arsenic can be rolled hot and is highly malleable. Arsenic in small quantities renders copper both red-short and cold-short. Arsenic is extremely bad for wire-bars, reducing ductility and conductivity, but for many uses is advantageous because giving a harder copper than the pure article. Arsenic gives no particular

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trouble in smelting, but when found in copper in any considerable quantity requires elimination by electrolysis, unless arsenical copper is required for special use. Arsenical copper should contain at least three times as much arsenic as lead and bismuth combined, but should not exceed 0.6 per cent. arsenic. Arsenical copper is harder and tougher than ordinary refined copper, and has greater tensile strength. Arsenic to the extent of 0.0013 per cent. lowers the conductivity of copper by 1 per cent., the factor of ratio for lessening the conductivity of copper being 720, arsenic ranking second only to phosphorus in this respect.

Bismuth, all things considered, is the worst enemy of copper, and highly bismuthiferous ores of copper are smelted rarely, except when carrying large quantities of silver, but bismuth in small quantities is found in most sulphide ores. Bismuth is not so objectionable in smelting as in the finished metal, but can be eliminated easily, to all but a trifling extent, by electrolytic refining. In small quantities bismath renders copper both red-short and cold-short, and the addition of only 0.002 per cent. bismuth renders copper so brittle that it cannot be rolled. The bad effects of bismuth are partially neutralized by arsenic, but are intensified by tin, alumium and manganese, when found in copper. The factor of ratio of bismuth for reducing the electrical conductivity of copper is only 4, the effect of bismuth on conductivity being so slight as to be negligible.

Cadmium, sometimes found in very small quantities in finished copper, has a factor of ratio of 9 in reducing electrical conductivity.

Carbon, in the form of carbon monoxide or carbon dioxide, may be absorbed by copper at a critical pitch of the metal, producing porosity in castings, though apparently having no other effect.

Cobalt, sometimes found in refined copper to a small extent, has about the same effects as iron or nickel, and usually is found associated with nickel, when occurring as an impurity in copper.

Gold exists only as a mere trace in electrolytic copper. The factor of ratio in reducing electrical conductivity of copper is 10.

Iron is found in practically all commercial copper, in quantities ranging from a mere trace up to appreciable percentages. In large quantities, iron is a deleterious impurity, but in small quantities seems to form an alloy with the copper, and does no appreciable damage, other than to slightly reduce electrical conductivity.

Lead, next to bismuth and arsenic, is the most damaging impurity found in ordinary commercial copper. Lead to the extent of 0.02 per cent. renders copper so brittle that it cannot be rolled, and 0.5 per cent. renders copper cold-short, while lead in copper to the extent of 1 per cent. ruins the copper for all purposes except casting, for which use the lead is a positive advantage, as it largely prevents the porosity so frequently found in cast copper. The bad effects of lead are partially neutralized by arsenic, but are intensified by tin, aluminum or manganese, when occurring as an impurity in copper. The factor of ratio of lead for reducing the conductivity of copper is only 3, this being the least harmful to conductivity of any element, and being only one-half as harmful as silver, as regards electrical conductivity, notwithstanding that silver is the most perfect conductor of electricity that is known.

Manganese sometimes occurs as an impurity in copper, to a small extent. Manganiferous copper containing 2 to 3 per cent. manganese is harder

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and has greater tensile strength than pure copper, but should not contain more than traces of lead or antimony.

Nickel, in very small quantities, is a common impurity of copper, and has about the same effect as iron, reducing electrical conductivity slightly, but having no other apparent bad effect. Copper containing 2 to 3 per cent. nickel is harder and of higher tensile strength than pure copper, but should not contain more than traces of lead or antimony.

Oxygen unites with copper readily, in the form of cuprous oxide, and practically all refined copper contains a small fraction of one per cent. cuprous oxide. Up to one per cent. cuprous oxide does not affect malleability, if no other impurity is present in considerable quantities. Cuprous oxide will melt at red heat, without decomposition, and frequently becomes a component part of the refined copper. Cupric oxide in small quantities has no apparent effect on the metal, but in quantities of one-half per cent. or more lowers ductility, though not injuring the metal in other respects, even in quantities up to 10 per cent. The factor of ratio in reducing the conductivity of copper is 25, oxygen usually being found in the metal in the form of cuprous oxide.

Phosphorus, to the extent of 0.2 per cent., gives copper that can be rolled hot, and is highly malleable, but in small quantities renders copper cold-short, and, if present to the extent of 0.5 per cent., causes red-shortness. Phosphorus copper, which is harder than pure metal, should contain 99.7 per cent. to 99.8 per cent. copper, 0.05 to 0.1 per cent. phosphorus and not more than 0.04 per cent. oxygen. Phosphorus is the most deleterious element known, so far as affecting the electrical conductivity of copper, and if present in copper to the extent of 0.08 per cent. lowers conductivity to 52.3 per cent., the factor of ratio for reduction of electrical conductivity of copper being 3,000, the highest known.

Selenium occurs occasionally in crude copper, but can be eliminated quite thoroughly by electrolysis. It would seem that the peculiar physical properties of selenium should give it a greatly increased market, and in such case the metal can be secured in considerable quantities, as a by-product from electrolytic refineries.

Silicon, in even small quantities, renders copper red-short, but up to 2 per cent. does not affect ductility. Three per cent. causes brittleness, and copper containing above 5 per cent. silicon is too brittle for any ordinary use. Silicon to the extent of 0.007 to 0.042 per cent. reduces the electrical conductivity of copper less than 1 per cent., the factor of ratio for lessening the electrical conductivity of copper being 70.

Silver, which is quite thoroughly eliminated by the electrolytic process, sometimes is found in electrolytic copper to the extent of an ounce or so per short ton, and in commercial blister copper frequently is present to a much greater extent, especially in Lake copper. Silver in small quantities has no appreciable bad effect on finished copper, except for a very slight reduction of electrical conductivity, the factor of ratio for lessening the electrical conductivity of copper being only 6.

Sulphur usually is found in blister copper in the form of barium sulphate. When present to the extent of 0.25 to 0.5 per cent. sulphur causes cold-shortness, but the injurious effect may be offset by the addition of manganese or aluminum. The factor of ratio of sulphur for reducing the electrical conductivity of copper is only 8.

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Tellurium, to the extent of even 0.001 per cent., renders copper appreciably red-short, and slightly larger quantities render the copper both red-short and cold-short. Tellurium has much the same effect as arsenic on copper, but to an intensified degree, and when present to a very small extent renders copper of wonderful hardness. Its use is recommended to those who are endeavoring to temper copper. Tellurium does not greatly affect the ductility of copper, and Sperry states that tellurium in high brass does not affect rolling, unless present in quantities of more than 0.1 per cent., when the brass cracks in rolling. The factor of ratio for lessening the electrical conductivity of copper is only 4.

Tin, in small quantities, renders copper red-short and brittle, but ductility can be restored, at least partially, by heating to cherry red and cooling suddenly. Copper containing 0.2 per cent. tin can be rolled hot, and is highly malleable. When present to the extent of 1 per cent. or upwards, tin materially lessens the ductility of copper. The factor of ratio of tin in reducing the electrical conductivity of copper is 67.

Zinc, as an impurity in copper, causes trouble in smelting, though not a highly deleterious impurity in the final product. When present in copper, to the extent of 0.2 per cent., zinc causes the sheets to crack at the edges when rolled, and in considerable quantities lessens ductility. The factor of ratio of zinc in reducing the electrical conductivity of copper is 30.

The great bulk of the world's copper production, with the exception of the Lake Superior output, is refined electrolytically. The principal advantages of electrolytic refining are that gold and silver values contained in the blister copper are saved, practically intact, while the product of the electrolytic refineries is a copper of unusual purity. The principle of electrolysis, or the parting of metals and the redeposition of one selected metal by the aid of a continuous electric current, was discovered in 1835, by Michael Faraday. As early as 1836 Becquerel planned works for the electrolytic recovery of copper and silver, but, owing to the prohibitive cost, the effort was abandoned. The first patents relating to electrolytic refining were taken out by Elkinton, of Birmingham, in 1865 and 1869, and in 1870 a plant was built at Swansea to utilize this process. A little later several small electrolytic refineries were built in Germany and France, and in 1879 the first American refinery to use electrolysis was erected in Phoenixville, New Jersey, this being followed, in 1881, by the construction of the Balbach works, at Newark, New Jersey, the latter named plant being the first to do electrolytic refining of copper on a considerable commercial scale. Shortly after the construction of the Balbach works, new plants of considerable importance were built in both France and Germany, followed, at a slightly later date, by the construction of new electrolytic plants in England and Wales. Previous to the opening of the great Boston & Montana electrolytic plant, at Great Falls, Montana, in 1893, electrolytic copper was produced mainly in Europe, but America now furnishes more than half of the electrolytic copper production of the world, doing electrolytic refining of blister copper from South America and Australia, as well as from the United States, Canada and Mexico.

Considerable secrecy regarding processes is maintained at many electrolytic refineries, but while the practice varies at different plants, the fundamental principles are the same in all works, and are understood by all competent operators. There are two principal systems of electrolytic refin-

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ing, with numerous minor modifications. The series system uses rolled sheets, requiring a special rolling mill, and has electrodes in series and tanks in series, or, more frequently, in multiple series. The multiple system uses cast anode plates of 1 to 2.5 inches thickness, requires a much smaller electromotive force than the series system, and is in much more general use.

The tanks in which the process of electrolytic segregation and redeposition is carried on may be of wood, lead or slate, usually the former, though lead seems preferable. The wooden tanks usually are lined with lead, tarred felt or asphalt. The tanks may be set upon the floor, usually of cement, or may be sunk, leaving the tops about flush with the floor, to permit easier handling of the material. Tanks are terraced, in series, providing for a natural circulation of the electrolyte, which is pumped into the upper tanks and flows thence, by gravity, from tank to tank, until the bottom terrace is reached, when again pumped to the upper tanks. The Baltimore refinery uses tanks 9x2x2.5 feet in size, containing 130 electrodes of two plates each, giving a total weight of 5,700 pounds of charge, the process being carried on at a temperature of 20° Centigrade, with a power cost of about twenty dollars per horsepower year.

Connections between dynamos and tanks are made of high conductivity copper, necessarily of large size, to carry the heavy current used, and are of varying forms in cross-section, overlapping slabs of high conductivity copper being used at some plants.

The crude copper, mainly blister copper produced by bessemer conversion, may reach the works already cast in anodes, but usually arrives in pigs, and the anode bars usually are cast from blister copper melted in a cupola furnace, kept running for the purpose, and are cast in a variety of forms, usually in thin plates with projecting lugs that rest on the sides of the tanks, one lug resting on the electrical conductor, while the other is insulated. Lugs of anodes and cathodes vary in width, permitting each to make direct contact with the poles. The average American anodes average 98 to 99.5 per cent. in copper tenor, and the auriferous and argentiferous varieties carry up to 40 ounces gold and 300 ounces silver per short ton, with from a trace to 2 per cent. arsenic, and with variable quantities, usually small, of iron, nickel, antimony, bismuth, sulphur, silicon, selenium and tellurium, and with occasional minor impurities. After the process of electrolysis has been carried on until the anodes, usually rectangular in form, are worn down to about 15 per cent. of their original weight, the remaining portions are removed, melted down and recast.

The composition of the electrolyte, which is the fluid in which the process of electrolysis is carried on, varies at different works, carrying 5 to 10 per cent. sulphuric acid and 15 to 20 per cent. bluestone, added to 70 to 80 parts of water. The average composition is 6 to 9 parts of acid and 16 to 18 part of bluestone. It is desirable that the electrolyte have a sufficiently high percentage of sulphuric acid to render its specific resistance very low. The electrolyte frequently carries a very small percentage, as low as one part in two hundred millions, of some soluble chloride, usually sodium chloride, for the purpose of precipitating silver in chloride form, sodium chloride also tending to slime antimony in the form of an oxychloride. When the electrolyte becomes too foul for satisfactory use it is purified,

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brought up to the proper standard and pumped back into use. Purification usually is accomplished by working up, at regular intervals, a certain quantity of electrolyte into bluestone, and adding fresh acid. The solution deteriorates more rapidly at the higher temperatures and the low current densities, apparently in direct ratio to anode loss and cathode gain. Nickel sulphides go into the electrolyte to some extent from nickeliferous copper anodes, and arsenic also passes into the electrolyte to a considerable degree, causing trouble in elimination. The easiest method of eliminating arsenic is to reduce the electrolyte to bluestone before purification.

In the process of electrolysis metals are dissolved at the negative pole of a battery, taken into solution in the electrolyte and redeposited from the electroylte at the positive pole, where free circulation is permitted in a favorable solution, with a proper electric current. Varying currents give varying effects, and some metals pass over more freely than others, copper being one of the first to pass over. Apparently the impure metallic copper of the anode is first broken into cuprous sulphate, from which are derived the molecules of practically pure metal that are deposited on the cathodes. In actual work there is a slight redissolution of the metal from the cathode, but this is not of sufficient extent to prove seriously detrimental. Good adherent copper can be obtained on the cathodes at almost any current density, providing there is a sufficient rate of circulation of the electrolyte. Current density is employed up to 3.5 amperes per square decimeter, but the usual ratio is a current density of 14 amperes per square foot, at a temperature of 50° Centigrade. As the unrefined copper in the anodes concontains a variety of metals and metalloids, it is important that the electrical current be so regulated that the minimum of other elements pass over to the cathodes at the same time as the copper. The adjustment of the varying factors of composition and circulation of the electrolyte, current density and temperature, call for nice discrimination, to be secured only by experience and care. The matter of temperature is one of prime importance, as the cost of power decreases with rising temperature, within certain limits, and the heating of the electrolyte not only facilitates the process of decomposition, circulation and redeposition, but produces also a smoother deposit of copper on the cathodes. Covered tanks are used extensively, to increase the temperature at which the work is done, and the best results seem to be secured at a temperature of about 70° Centigrade, equal to 158° Fahrenheit.

The cathode plates are made of strips of rolled copper, of one-eighth to one-fourth inch thickness, cut into varying sizes and forms, though usually rectangular. The cathode plates are oiled and coated with fine graphite, to promote deposition, and sometimes have lead lugs soldered onto them for handling.

While the copper and minute quantities of other impurities pass over to the cathodes, the great bulk of the impurities contained originally in the anodes is first taken into circulation in the electrolyte, and then precipitated to the bottom of the tank, as sludge or slimes. If more than traces of impurities are carried over to the cathodes it is because the electrolyte has become foul, or the current is wrong. Constant watchfulness is necessary, as apparently slight causes may bring about serious disarrangements of the process, at any point. The sludge precipitated to the

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bottom of the tank may form a conductor, causing short-circuiting, and should be removed frequently, as large accumulations are reasonably certain to cause trouble.

An average anode slime runs about 40 per cent. silver, 25 per cent. copper and 2 per cent. gold, with about 10 per cent. arsenic, antimony and bismuth, the combined balance consisting of lead, silicon, sulphuric acid and minor impurities. The slimes contain greatly varying percentages of gold and silver, according to the nature of the copper treated. Slimes are removed from the bottoms of the tanks by bailing, or siphoning, and are taken to the slime-tank, where the copper scraps are picked out by hand. At some plants the slimes are put through a filter press and dried, though this is not customary. Slimes are treated generally with sulphuric acid and sodium nitrate, air and steam being admitted for agitation and heating. The copper is dissolved very readily as cuprous sulphate, by treating with ferric sulphate, and is recovered as bluestone. The arsenic also is removed by treatment with sulphuric acid and sodium nitrate, and after the removal of the copper and arsenic the remaining material is dried and smelted with soda, to slag the antimony, the impurities being oxidized by the nitrate. The doré bullion produced by this process usually is parted with sulphuric acid, but sometimes is parted mechanically, with a silver nitrate bath. Tellurium requires prolonged furnace treatment for burning off, though not especially difficult of elimination, if sufficient time is taken. Both selenium and tellurium, especially the latter, could easily be recovered from the slimes, if there were sufficient market to take the considerable quantities of these rare elements that could be furnished by the electrolytic refineries.

The process of electrolytic refining necessarily is continuous, two to four weeks being the average time required for the making of a cathode. Including time required for remelting and for other purposes, five to six weeks usually are required for the making of finished cathodes from rough copper, though much better time has been made under exceptionally favorable circumstances. The rate of progress depends quite largely upon the nature of the anodes, the process of electrolysis being greatly facilitated and cheapened by comparatively pure anodes. Mechanical devices have reduced greatly the number of workmen required about a well-quipped electrolytic plant, and have obviated most of the heavy manual labor required formerly. Traveling cranes and overhead trolleys provide expeditious means of handling both anodes and cathodes, and the electrolyte is handled by pumping, while as a rule the slimes are taken from the tanks by siphons, rather than by the old process of hand-bailing.

The cathodes produced by electrolytic refining average 99.93 to 99.9 per cent. in copper tenor, hydrogen being the chief impurity. The objectionable impurities are those that decrease electrical conductivity or render the metal brittle, the principal impurities to be guarded against being arsenic and antimony, which decrease conductivity, and lead and tellurium, which cause brittleness. Antimony and bismuth are seldom present in sufficient quantities to cause injury. The impurities in electrolytic copper usually include silver, to the extent of one-tenth to one ounce per ton, and a trace of gold, but these impurities are in nowise deleterious, though representing a loss to the refiner. Most copper ores contain silver, and the majority contain gold, in varying quantities, the copper mines of Utah being

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richer in gold than those of any other American state, followed in turn by Arizona and California. In silver, the copper mines of Montana lead, followed closely by Utah, and, at a little distance, by California and Arizona. The immense importance of the precious metals obtained as by-products from the electrolytic refining of copper is shown by the figures of such production from American copper mines in 1904, amounting to 237,116 ounces of gold and 15,769,327 ounces of silver.

Electrolytic copper is in very minute crystals, while Lake copper is in crystals of considerable size, this difference in the size of the crystals being readily apparent to the naked eye on fractured faces. The larger crystals apparently are responsible for the superior tensile and torsional strength and ductility of Lake copper, but the toughness of Lake copper disappears under electrolytic refining, the product varying in no essential particular from all other electrolytic coppers, which come out of the bath as like as peas from a pod.

The cost of electrolytic refining varies from $8 to $20 per ton, according to circumstances. Unlike smelting, which usually best can be done near the mines, to save excessive freight charges on worthless material, electrolytic refining is performed, in most cases, nearer to consumer than to producer. The extra freight paid on one to four per cent. of impurities contained in blister copper is so very small a fraction of the total transportation charges that this loss is more than offset by the advantages of cheaper labor, cheaper fuel and better transportation facilities found along the Atlantic seaboard in the United States, where a considerable amount of foreign copper is refined, as well as the bulk of the domestic production.

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CHAPTER IX.

The Alloys of Copper.

The work of alloying the metals is a special branch of the metallurgical art, requiring much technical skill and experience, owing to the different melting points of the component metals, and their different capacities of oxidation and volatilization. Insufficient heat causes segregation of the different constituents, in the case of many alloys.

Zinc is the metal most commonly alloyed with copper, the product being brass. The proportions of the two metals vary greatly, ranging up to equal quantities, in the case of very high brass. Ordinary high brass is composed of two parts copper and one part zinc, and is of a light yellow color. Low brass ranges from 75 to 88 per cent. copper and 12 to 25 per cent. zinc, and is considerably ruddier in color than high brass. The addition of lead, to a small extent, usually not exceeding 5 per cent., gives an improved color to brass, and renders the metal more suitable to machining, as well as slightly reducing the cost. Ordinary commercial brass frequently contains 2 to 5 per cent. tin, which gives added strength and density. There also are special brass alloys containing lead, aluminum and manganese, in addition to copper and zinc. Brass is a much poorer conductor of heat and electricity than copper, and is more easily fusible.

Tin is mixed with copper in a variety of proportions, giving a considerable range of bronzes, with rather remarkable variations in their physical characteristics. Bronze probably is the most ancient alloy known to man. An alloy of 97 per cent. copper with 3 per cent. tin, practically a bronze, makes good sheathing metal. A small quantity of tin added to copper causes it to become brittle, but the ductility can be restored, at least partially, by heating to a cherry red, and cooling suddenly. Ancient bronze for tools and weapons ranges from 85 to 92 per cent. copper and 8 to 15 per cent. tin. Ancient bronze medals carry 8 to 12 per cent. tin. Ancient bronze mirrors contain 20 to 30 per cent. tin. Flexible bronze contains about 95 per cent. copper and 5 per cent. tin. Gun metal ranges 90 to 91 per cent. copper and 9 to 10 per cent. tin, and if the percentage of copper is increased the gun metal becomes liable to liquation. Bell-metal contains 80 to 84 per cent. copper and 16 to 20 per cent. tin. This is highly sonorous, when cast in bells, and makes good castings, but is decidedly hard, brittle, and difficult to work. Sudden cooling reduces the brittleness and restores the hardness. Bell metal is malleable at a low heat and can be forged, if handled very carefully. Speculum metal contains about 75 per cent. copper and 25 per cent. tin, and is harder and whiter than bell metal, and even more brittle and difficult to work.

Brass-bronzes are used for a variety of purposes, and for certain specific uses alloys composed of copper, tin and zinc are preferable to either brass or bronze. Bearing brass is much harder than common brass, and contains 80 to 82 per cent. copper, 10 to 14 per cent. tin and 2 to 4 per cent. zinc, being a brass-bronze rather than a brass. A cheaper and less efficient

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bearing brass contains a smaller percentage of copper and a greater proportion of zinc. Muntz's metal is brass containing 60 to 62 per cent. copper and 38 to 40 per cent. zinc, and commonly carries about 0.2 per cent. in iron, nickel, tin, arsenic, or manganese, usually as a combination of several of these elements. There are a number of proprietary anti-friction metals having copper as a base, with varying proportions of tin and zinc, these being as a rule more closely allied to bronze than to brass, though a cross between the two metals.

Aluminum is the base of a number of important copper alloys, and the tensile strength and ductility of aluminum wire are much improved by the addition of as little as 1.5 per cent. copper. Aluminum bronze is a bronze containing about 3 per cent. aluminum, used largely for water-tube boilers. Several varieties of aluminum bronzes show high tensile strength, and an alloy of 96 per cent. copper and 2 per cent. aluminum gives a strong and fairly rigid metal. Albradium is an alloy having aluminum for its base, with the addition of copper, nickel, zinc and phosphorus. This alloy takes a very high polish and has good tensile strength. Aluminum alloyed with small quantities of nickel and copper has shown a tensile strength of 40,000 pounds per square inch.

Nickel copper, containing 2 to 3 per cent. nickel, is harder and of higher tensile strength than pure copper, but should not contain more than traces of lead or antimony. Monell metal is a natural alloy of copper and nickel, made from the nickel-copper ores of the Sudbury district. German silver is an alloy of 5 parts copper, two parts zinc and one part nickel.

Steel has been alloyed with nickel and copper, the latter to the extent of about 0.5 per cent., for the facing of compound armor plate, and this metal is said to resist corrosion as well as wrought iron.

Manganese, to the extent of 2 to 3 per cent., alloyed with copper, gives a product that is harder and of higher tensile strength than pure copper, if containing no more than traces of lead and antimony.

Arsenic alloys readily with copper, such alloys offering phenomena that are not fully explained by the chemical and metallurgical knowledge of the present day. Alloys of copper and arsenic are known usually as blanched copper, or speiss. Arsenical copper should contain at least three times as much arsenic as lead and bismuth combined, but should not exceed 0.6 per cent. arsenic, unless it be considered an alloy. Experiments on binary alloys of copper and arsenic show that arsenic lowers the melting point, down to about 20 per cent. arsenic, reaching the lowest point of fusion at 685° Centigrade, with an alloy of 19.2 per cent. arsenic, corresponding to the formula Cu_4As. With increase of arsenic the fusion point is raised to 747°. Centigrade with 28.34 per cent. arsenic, which corresponds to the empirical formula Cu_3As, and to 810° Centigrade with 32.2 per cent. arsenic, corresponding to the formula Cu_4As_2, an alloy with 37.4 per cent. arsenic giving the formula Cu_3As. The practical limit of the direct binary compound of copper and arsenic was reached with 41 per cent. arsenic, corresponding to the formula Cu_7As_4. The alloy of 19.2 per cent. arsenic gave a surface of pale blue color, the alloy of 28.34 per cent. gave a deep blue, 30 per cent. gave light purple, and 32.2 per cent. gave a reddish purple color to the surface of the alloy.

Mercury alloys with copper in the proportion of three parts of copper

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to seven parts of mercury, making a copper amalgam known as Viennese metal cement.

Phosphorus, in small quantities, renders copper considerably harder than when pure. Phosphorus copper should contain 99.7 per cent. to 99.8 per copper, 0.05 to 0.1 per cent. phosphorus, and not more than 0.04 per cent. oxygen.

Strontium and tungsten, in small quantities, alloyed with brass, give a golden metal of great tensile strength, strongly resistant to atmospheric influences. The alloy contains 60.8 per cent. copper, 37.6 per cent. zinc, 0.4 per cent. tin, 0.3 per cent. strontium, 0.3 per cent. tungsten, 0.3 per cent. aluminum, 0.2 per cent. manganese and 0.1 per cent. iron.

Tellurium, in small quantities, renders copper of wonderful hardness, though also causing it to become red-short, having much the same influence on the metal as arsenic, but to an intensified degree.

Gold and silver are alloyed with copper for coinage purposes, and for trial plates and medals.

Imitation gold, bearing a striking resemblance to the real article, is made by an alloy of copper, tin, nickel, silver and aluminum.

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CHAPTER X.

The Brands and Grades of Copper.

Copper is placed on the market in a variety of grades and shapes, descriptions of which are appended.

Lake copper is the product of the native copper mines of Lake Superior. Lake copper varies greatly in characteristics, and materially in price, the Calumet & Hecla brand being nearly as free from impurities as the best electrolytic copper, while the Copper Range metal is highly arsenical, and between these grades there is a great variety of brands made by different mines. The lake copper is the toughest that is made, hence is especially suitable for wire-drawing or cold-stamping. The best brands of lake copper command a premium over electrolytic, this varying from time to time, but averaging about one-eighth cent per pound. The standard of conductivity of lake copper is 99.5, but there is a considerable range of conductivity among the various brands, this running as low as 91 per cent. in Wolverine copper and as high as 101 per cent. in the metal from the Quincy and Michigan mines. Lake copper possesses greater tensile and torsional strength than is found in other brands. In addition to the domestic market, lake copper finds a limited but steady demand in Europe, for all uses where copper of special toughness is required, as in the making of cartridge cases, metallic buttons, etc.

Electrolytic copper is copper from any source that has been refined electrolytically, and the cathodes average about 99.93 per cent. fine. Copper made by this process is the purest chemically that is on the market, and is the best conductor of electricity, having conductivity up to 103, but lacks the toughness of lake copper, hence is not so suitable for wire-drawing or cold-stamping, but for some other uses is preferable, and for most purposes there is little choice between lake and electrolytic.

Approved brands of copper are those that have been approved by the London metal market, and include practically everything that would pass as standard copper.

Best selected copper averages about 99.75 per cent. fine, and is used largely by brass foundries for making brass castings, rolling brass sheets and drawing brass tubes.

Tough cake is practically the same as best selected copper in the English market, prices being the same, and is used mainly for rolling and for tube and cylinder making. The average tenor is about 99 per cent. copper, and this grade usually contains a little lead, which is no particular detriment for the uses noted.

Tough copper is practically the same as tough cake, and is used for wires and sheets.

Ingot copper is rated in the English market with tough cake, and is practically selected copper.

G. M. B. copper is the usual abbreviation for good merchantable brands.

Good merchantable brands of copper, a term formerly used extensively in the English market, is now generally known as standard copper. The

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old title was so misused that it deteriorated sadly, and became very indefinite, in time including almost anything that could be called copper.

Chili bars are bars of blister copper from Chile ranging 95 to 99 per cent. in copper tenor. The term is in much less general use than formerly, and most of the Chili bars are sold as standard copper.

Standard copper covers almost anything carrying 96 per cent. copper, and includes considerable metal that is decidedly inferior, much of it containing very undesirable impurities. The price ranges two to three pounds sterling per ton under the market price of tough copper. The average tenor of standard copper probably is about 97 per cent. Standard copper is more a standard for speculation, in the metal market, than a grade for actual consumption, as most of the low-grade copper included under this name is used either as casting copper, or is brought up to high grade by electrolytic refining.

Rough copper is practically the same as standard copper.

Casting copper is rough metal, not suitable for the manufacture of wires or sheets, containing considerable impurities of a serious nature, being suitable only for casting purposes.

Tile copper is brittle, and is suitable for casting only, hence usually is graded as casting copper, in the English market.

Scrap copper is the remnants from the manufacture of sheets, wire, etc., and is of good average grade, though in undesirable form, but can be melted down into cakes or ingots.

Copper is placed on the market in a variety of forms, which are listed as follows:

Ingots are cast in two sizes, the standard weight being about 60 pounds avoirdupois. Copper is put up in this form mainly for casting purposes, the two deep depressions in the top of the ingot being provided to facilitate the cuting of the ingot into three parts.

Wire bars are cast 3 to 4 inches square and 3 to 7 feet in length, averaging in weight 300 to 400 pounds, and, as the name implies, are used for wire-drawing.

Cakes are cast square, in weights of 100 pounds or upwards, some special cakes for the Russian market weighing as high as 4,000 pounds each. Copper in this form is used almost exclusively for rolling into sheets.

Moulds are somewhat similar to cakes, and are used mainly for rolling into sheets.

Anodes are cast in plates about 2 by 3 feet in size, and have an average thickness of about 1½ inches, with an average weight of about 250 pounds. Crude copper from the furnaces is cast into anodes for electrolytic refining.

Cathodes are of approximately the same size as anodes, except that they are much thicker at the top than at the bottom, and while the copper contained is exceptionally pure, it is in crystalline form, and the cathodes are melted down and run into other shapes, cathodes rarely appearing on the finished copper market.

Flat bottoms are circular copper sheets, used for making copper boilers, pans, etc., and in the English market command a slight premium by reason of being partially manufactured shapes.

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Sheet copper is cold-rolled metal, and commands a premium by reason of being partially manufactured.

Sheathing copper is hot-rolled metal, and, like sheets and bottoms, commands a premium over ordinary brands by reason of being partially manufactured.

The various alloys of copper, some of which are of considerable commercial importance, are treated in the preceding chapter, devoted to alloys.

Tempered copper is a will-o-the-wisp that is referred to frequently. Many inventors, usually poorly equipped with technical skill, have wasted much time in efforts to rediscover the "lost art" of tempering copper, and, on an average of once yearly, the American press contains long articles giving hazy details of a rediscovery of the process of tempering copper to the hardness of steel, such wonderful discoveries usually being made by blacksmiths in Maine, cobblers in Pennsylvania, farm-hands in Illinois or cow-punchers in Texas. A typical example of one of these processes is furnished by a lady in the state of Washington, who puts a razor edge on copper tools by adding an ounce of bluestone to a hundred pounds of copper, while molten, and, if an especially fine edge is desired, an ounce of bichromate of potash is added to the charge. The lady inventor evidently is a homœopathic metallurgist. It is doubtful if the mound-builders of America possessed any special art of tempering copper, as it has not been proven that the copper tools of the ancients were harder than those made from modern copper. If tempered copper were greatly to be desired, it is probable that it might be furnished with the aid of tellurium, a small quantity of which renders copper exceedingly hard, but as tempered copper merely would replace steel, in most instances, and as steel is very much the cheaper of the two metals, a perfect process for tempering copper seems unnecessary.

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CHAPTER XI.

The Uses of Copper.

Iron, copper and zinc are the three indispensable metals of the present age. The less of tin, or lead or even of nickel or aluminum would be a severe blow, working great hardship, and, even were we to be deprived of such apparently insignificant metals as antimony, cobalt, manganese and platinum, the industrial world would suffer a loss entailing disastrous consequences. The taking away of gold and silver, and that useful thief-taker, mercury, which catches most of the world's gold supply, would reduce the finances of the globe to chaos. Iron and copper, however, are the main pillars of the metallic structure, while zinc, in addition to many other virtues, possesses the unique quality of being the only electrically negative metal, and, without it, copper, for electrical uses, would be much like a "pair" of scissors with but a single blade.

Many great industries are dependent upon the metal copper, which, directly and indirectly, affords employment of some hundreds of thousands of persons, mainly skilled workmen, and adds nearly or quite five hundreds of millions of dollars yearly to the wealth of the world. Copper is nearly as indestructible as the precious metals, and its life is infinitely longer than that of iron or steel, as has been brought to attention by more than one archæological discovery, in which bronze weapons or implements were practically intact, while those of iron or steel were represented merely by streaks of rust.

The engineering trades take nearly half of the total copper production of the world, and, until about 1890, used nearly or quite four-fifths of the entire output of this metal. Since that time has been witnessed the wonderful development of the various branches of the electric industry, and, at the present time, electricity, in some of its various forms of energy, is the largest single user of the metal, with every indication that the electrical requirements of the future will continue to expand, almost indefinitely.

Electrical machinery, as dynamos or motors, is a heavy consumer of copper and brass, but the principal consumption of copper for electrical uses is in the form of wire, for the transmission of energy to be used for power, traction and lighting, and for the electrical impulses providing the conveyance of messages. Copper is an integral factor of prime importance in all electric installations, and for the transmission of power, light and telegraphic or telephonic impulses, is a necessity. It is true that iron wires were used by the pioneers in the telegraphic and telephonic fields, but these are giving way rapidly to strands of copper. Iron is of low electrical conductivity. rendering it an inefficient and costly medium for transmission, and its lack of ductility, and the ease with which it is rusted, render it far less desirable than copper, though it is used at times because of its greater cheapness.

The life of copper wire is as yet undetermined. When laid under-

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ground it is affected by electrolysis, but to nothing like the same extent as iron, and copper wire, in the atmosphere, while undergoing some surface oxidation from carbon dioxide and sulphur vapors, is but slightly affected thereby.

The trolley line of the present day, threading its way through the mazes of every city and town of any importance, and weaving a spider's web over most of the thickly populated sections of the United States, is a strictly modern affair, and may be said to date from about 1890, the earlier lines having been few in number, short in length, and of an experimental and usually unsatisfactory nature. At the end of 1906 there were upwards of 40,000 miles of trolley lines in the United States, requiring upwards of 40,000 tons of copper for power transmission alone. The average weight, in that year, of trolley wire in the United States, was 1,688 pounds per mile for short lines and 2,687 pounds per mile for long-distance power lines on interurban and well-equipped city roads. The trolley line is as yet in its infancy, and the time will come, unless some superior means of traction shall be invented later, when the United States alone will have more than a million miles of electric roads, wild as this prediction may sound at the beginning of the Twentieth Century. Furthermore, the trolley line must grow more popular in all other countries. The United States has led in the electrification of transportation lines, but the cities of Europe are now possessed, in most cases, of modern electric street railways, and it is but a question of time when interurban lines will supplement urban transportation facilities in Europe, as they now do in the United States.

In addition to the large quantities of copper required for power transmission lines, the metal is used very extensively in the motors of the cars themselves. The weight of copper in a street railway car ranges from a minimum of about 250 pounds to a maximum of nearly one ton, a forty horse-power trolley-car motor containing an average of about 800 pounds of the metal.

The electrification of steam railroads has been discussed academically since the trolley-car first became a factor of importance in the field of transportation. The work of electrifying the steam lines has proceeded but slowly, much to the disappointment of many urgent advocates of such a change, but the reasons for this slowness are not difficult to find. Thousands of millions of dollars have been invested in steam railroads, in the United States alone, and it would be folly, or worse, for those in charge of these lines to discard an old and proven motive force for a newer power, until the latter had demonstrated fully its ability to do the work more cheaply and advantageously.

In the war now on between the steam roads and trolley lines, for urban and suburban passenger business, the trolleys have had very much the better of the battle, and are now forcing the fight into the country of the enemy, by means of linking together various interurban lines, through which plan long stretches of road have been brought into single systems. On some of these lines dining and sleeping cars have been introduced, but the latter seem to be more in the nature of an advertisement, or a boast, than for practical use. The steam locomotive and the electric trolley-car have been running side by side for a sufficient length of time,

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in a sufficient number of fields, to afford fair basis for comparison, and a dispassionate survey of both fields leads to the conclusion that neither is supreme, and that, for at least many years to come, the steam locomotive will hold its own, on many lines. Each method of traction has its advantages and disadvantages. It is possible to build an electric motor that will compete with any steam locomotive, as to speed and tractive power, but this would require feeding from a much heavier wire than now in use on any trolley line. For long hauls and great speed between distant points, the trolley cannot yet be held a serious competitor of the steam locomotive, while for short distances, immediate access to centers of population, and frequency of trips, the electric line has proven its great superiority to the steam road.

Electrification of tunnels and terminals has been undertaken by a number of railroads, and electric traction offers so many points of superiority for these special uses that it is certain to dispossess the steam locomotive, in the majority of cases.

It is now possible to distribute electric energy for great distances, without serious impairment or waste, and it would be folly to attempt to set a limit to the future possibilities in this field. Eventually it may be found practicable to transmit electric energy from great central stations, located at available water-powers, or in coal-fields, along many hundreds and even thousands of miles of railway line, and when that time arrives, the steam locomotive will have met its Waterloo. That steam ultimately will be displaced by electric power, in many, and probably in the majority of cases, may be accepted as a reasonable probability, but this process will be gradual, and due allowance must be made for the influence of future inventions, which may give an entirely new phase to the situation. It should be borne in mind, in this connection, that the past decade has witnessed some marvelous developments in the production of power, entirely outside of the electrical field, these including the perfection of the turbine steam-engine, great improvements in turbine water-wheels, the vast increase in scope and power of internal combustion engines, and the utilization of producer-gas. The prophet who attempts to peer too far into the future may strain his reputation, as well as his eyesight.

Hydro-electric power installations are becoming very common, throughout the world, and from these plants electric energy is distributed for distances of fifty to one hundred miles, and even for one hundred and fifty miles in the case of some of the later installations. In transmitting power for long distances, a high voltage is used, almost invariably, the current being stepped down at the point of utilization. Water power, which was the principal mechanical force of the world, one hundred years ago, but which fell into very general disuse about the middle of the Nineteenth Century, is coming into its own again, and where a stream was made to furnish a few hundred horse-power, by means of a wasteful overshot water-wheel, fifty or seventy-five years ago, the same stream now gives thousands of horse-power by means of the economical water turbine. The utilization of water power is revolutionizing the location of industries, which, for the past three generations, have been located near fuel supplies, or along the lines of least resistance in the distribution of fuel.

Electric lighting has ceased to be a novelty or a luxury, and is now

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a necessity in every progressive community. There can be no question that eventually electric energy for both lighting and power purposes will be transmitted throughout the country, to such an extent that rural, as well as suburban populations, will benefit fully from its use. In 1902 the American Census Bureau reported 125,143 miles of main and feeder wires connected with electric lighting and power plants, and this network of wires must have reached nearly or quite 200,000 miles in 1907.

The telephone, invented in the last quarter of the Nineteenth Century, and not in general use until after 1880, is now found scattered throughout the length and breadth of every civilized land, and in many countries that only by a stretch of imagination could be termed more than semi-civilized. Greater New York alone possesses nearly a quarter of a million telephones. At the end of 1906 the various affiliated companies of the American Bell telephone system had in use about 375,000,000 pounds of copper wire, of which more than 50,000,000 pounds were added in 1906, the increase for that year having averaged almost exactly 1,000,000 pounds per week. In addition the thousands of smaller independent telephone systems throughout the country use tens of millions of pounds of copper wire yearly. At the beginning of 1907 the Bell system of the United States had in use sufficient wire to girdle the earth thirty-eight times, at the equator, if the wire were standardized to the size used for long-distance transmission. In addition to the requirements of the telephone companies for wire, the instruments themselves contain considerable brass, and modern desk-phones are made of brass, nickel-plated. Furthermore, an immense amount of copper is required for the big switchboards of the telephone companies, and the mammoth switchboards of the electric light, power and traction lines also are consumers of enormous quantities of the metal.

In the beginnings of telegraphy, iron wire, because of its lower cost, was used very generally, but the lower conductivity of iron, and its lack of ductility and proneness to break under stress of wind or sleet, renders iron wire, while cheaper in the first cost, much dearer in upkeep than copper, and the present tendency of the telegraph companies is to replace iron with copper wire, wherever possible, the greater initial cost being more than offset by the far greater life and assurance of good service given by copper. The various ocean telegraph cables, of which there are approximately 200,000 miles in use, require many thousands of tons of copper. The government cable, between the United States and the Philippine Islands, is 8,200 nautical miles in length and in making required 19,000,000 pounds of iron and steel wire, and 3,600,000 pounds of copper wire. In addition to the wires, all telegraph instruments are made of heavy brass, and copper sulphate is used in enormous quantities for batteries, furnishing power for the transmission of the electric impulses.

In addition to the power, light and traction lines, and the telegraphs and telephones, copper wire is used to the extent of millions of pounds for minor electrical systems, these including messenger call systems, fire-alarm systems and burglar-alarm systems for banks and private residences. These systems not only require much wire, but also are considerable consumers of brass for their annunciators and other instruments.

Electric heating and cooking are as yet in the experimental stage, to the extent that while their feasibility has been demonstrated, their

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cost remains prohibitive, in most cases. It is probable, however, that further inventions will reduce the cost to a point where the electric current will come into quite general use, for these purposes. The immediate availability of the electric current, which may be turned on or off by the mere touch of a switch, has brought about the very general use of electric lighting, and will bring about as wide a use for cooking and heating purposes, as soon as the march of invention will permit the furnishing of the current at lesser cost, for such uses.

In addition to its use for the transmission of electrical impulses or energy, copper wire is utilized for other purposes, in a great number of industries, though the electric trades consume more than ninety-five per cent. of the copper wire that is drawn.

Brass, an alloy of copper and zinc, is one of the most useful metals known to man, being the most valuable of all alloys, and probably is consumed to a larger extent than all other alloys that are made. The engineering trades are the heaviest consumers of brass, and, notwithstanding the immense consumption of copper for electrical purposes, it is probable that the engineering trades remain the heaviest single consuming interest in the copper trade. Every modern steam engine has brass oil-cups, and many have brass, gun-metal, bronze or composition copper bearings. Copper and brass boiler-tubes are used in locomotives and other high-pressure boilers, and every locomotive requires a large amount of brass in its trimmings. Copper tubes are used almost exclusively in marine condensers.

The ship-building trade is one of the very best customers of the copper mines. Until the era of iron vessels, prudent ship-owners sheathed the hulls of their vessels with copper, which kept the bottoms clean, and within the past few years this practice has been renewed, with modern steel steamers, on which it is necessary to plank over the hull, below the water line, in order to give a backing for the riveting-on of the copper sheets. The loss in speed, and consequent loss in time and fuel, brought about by barnacles gathering on iron and steel bottoms, is very great, and this can be obviated only by dry-docking and scraping, at considerable expense and loss of time, or by copper-sheathing below the water-line, and the latter plan is considered the cheaper. In all likelihood some method will be devised, eventually, for the plating of copper directly on the steel bottoms of boats. Every modern passenger vessel and warship of great size is a consumer of hundreds of tons of copper, in the form of brass for engines, copper and bronze for fittings, copper and brass for dynamos and motors, and in wires for telephone, telegraph and electric light systems.

In the line of land transportation, the use of copper for roofing and sheathing passenger coaches of railroads is spreading. The underground railway cars in New York are sheathed throughout with copper, which proves more durable than wood, and this utilization of the metal is likely to increase steadily, as old-style cars of wooden frame give way to steel cars. The ideal passenger car of the future will have a steel frame, copper roofing and sheathing, wooden interior finish with brass fittings, and paper wheels.

Wherever there are waterworks, brass faucets and valves are found. The

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consumption of brass for valves is enormous, and for very many uses these valves, while very costly in the larger sizes, prove economical in the end.

In the arts and manufactures, copper plays a highly important part. The great vacuum-pans of the sugar factories and refineries are made of copper, and there are copper vats in pulp and paper mills. The worms and stills of distilleries are of copper, and the copper brewing kettles in which beer is made are of immense size, and are numbered by thousands. There is scarcely a branch of manufacture that does not make use of copper or brass, usually to a considerable extent, in one or many of the various processes employed. In the textile trades, copper rolls for stamping patterns on print-cloths are consumers of hundreds of tons of the metal.

Perforated metal screens of brass and copper are in use in many industries, and these, while considerably higher in first cost than similar screens of iron, are more economical for many uses. Similarly, woven wire screens of brass are replacing steel wire-cloth for many uses, the first cost being higher, but the life much longer.

The automobile may be termed a strictly Twentieth Century invention, as the modern machines date from but a few years back, even though their forbears were seen, as a rarity, in the closing years of the previous cycle. An average automobile requires about 100 pounds of copper, mainly in the form of brass, for lamps, horns and other parts and accessories. The world's consumption of copper for automobiles probably reached nearly or quite ten million pounds in 1907.

The motor-boat is another Twentieth Century invention, even more recent than the automobile, and is gaining rapidly in popularity. These boats require from fifty to two hundred and fifty pounds of copper each, according to size.

In building construction, the uses of copper are extensive and increasing. Copper roofs for buildings, with the metal in either sheet or tile form, are quite common, and the use of copper for cornices is general, these having much longer life than cornices of galvanized iron. Copper is more costly, but its freedom from corrosion and its rich appearance render it desirable for ornamental trimmings and cornices on the better class of buildings. Bronze gates and doors for churches and public buildings are highly ornamental, and of practically perpetual life. Bronze grille work is in high favor, both for its rich appearance and its durability. In some recent buildings, copper sheets have been used almost exclusively for outside walls and facings, in place of brick or cut stone. The use of this metal for sheathing interior woodwork, where exposed, as in baseboards, window-sashes, doors, etc., is increasing. In the destruction of San Francisco, in April, 1906, through an earthquake shock, followed by fire, the Kohl building, an eleven-story office structure, suffered comparatively little damage, being the only tall building in the city that was not badly injured. In this building all interior woodwork was protected by sheet copper, and it was this protection that allowed the building to escape with the minimum of damage. This use of copper is certain to increase, as the severe trial imposed in San Francisco proved the value of metallic sheathing for interior wood finish, and architects and builders have been greatly impressed by the advantages of this feature of construction. The San

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Francisco earthquake and fire also proved the great danger to pedestrians resulting from the use of concrete and terra cotta cornices. There is a growing use of copper for windows and sashes made from sheet metal, and one firm in Maine turns out over one million copper-wire window-screens yearly, these costing about three times the first price of steel woven wire, but proving cheaper to the user in the long run.

In builder's hardware, brass, bronze and copper locks, knobs, butts, bolts, catches and drawer-pulls are in steadily increasing favor and use, and because of the superior durability and appearance of copper and its alloys, will continue to displace iron to a greater extent, as wealth increases and the standard of living is raised. In modern office and apartment buildings and in hotels, the mailing chute, made of brass and glass, is becoming a necessity, rather than a luxury. There is a large consumption of high-grade brass pipes and castings for gasoliers and electroliers, which are rapidly displacing the crude and often semi-barbarous iron devices of the preceding generation. Brass pipes and faucets, usually nickeled, are used in the best plumbing, for bathrooms and lavatories, on both land and sea.

The domestic uses of copper and brass are numerous and varied. Brass beds and furniture attract by their cleanliness, beauty and durability. Brass rods are used in millions of homes for stair-carpets, and for the suspension of portieres and curtains. Brass or copper lamps for burning kerosene oil are more durable than those of glass and pottery, and far safer. In the kitchen, the brazen kettles of earlier days are losing ground; there is no better material in use for cooking, when carefully cleaned, and none that may cause so much trouble if neglected.

The use of copper, in the form of bronze, for statuary, dates from prehistoric times. The ancient Greeks used mainly Pentelican marble for statues, and terra cotta for statuettes, but the modern world makes its statues and bas-reliefs almost exclusively of bronze. Iron turns to rust, wood decays, and marble is mutilated and discolored, but bronze retains the beauty and finish imposed upon it by the sculptor, being subject to slight corrosion only, in the course of ages, when buried in the earth. For general decorative purposes bronze is much used for vases, urns and similar ornamental receptacles.

The best bells are of bronze, in which copper is the principal component. In addition to perhaps a million church bells, there is a considerably larger number of smaller bells, mainly made of brass, in use in practically every power plant, and in fire, burglar and messenger alarms.

Copper is used extensively for munitions of war, the largest single requirement being for cartridge cases, with small but appreciable quantities used for buttons, and for a variety of other uses. The brass cannon, so popular fifty years ago, are in the present age used mainly for firing salutes, ornamenting public squares and trading to the heathen. Notwithstanding this disuse of the metal for ordnance, except in small salute-guns for yachts, more copper is used now, for munitions of war, than ever was consumed in the casting of cannon. Brass and copper cartridge-cases, cold-stamped from tough sheets, are consumed annually, by the world's armies, to the extent of hundreds of millions, for machine guns and small arms, and to a scarcely smaller extent by hunters. Hundreds of tons of

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the best tough metal are used annually, merely to make the brass buttons for decorating the uniforms of the world's armies and navies. Brass fittings and buckles for men and horses, brass canteens, drinking cups and cooking utensils, also require much copper for the followers of Mars, though aluminum, by reason of its superior lightness, is displacing copper for the smaller metallic articles required by troops. The copper exploders, used in every metal mine where modern methods are employed, afford another use, apparently trivial, yet which is one of the scores of minor demands that in the aggregate consume thousands of tons of copper yearly. The amount of the metal consumed by the world, for munitions of war, cannot be much short of ten thousand tons yearly, in times of peace, and several times as much in season of great wars.

Copper and its alloys have been employed for coinage from time immemorial. Originally copper was a purely money metal, like silver and gold, and each copper coin, unless debased by the short-sighted cunning of the petty tyrant, oligarchy or democracy of the day, represented upon its face merely the intrinsic value of the metal it contained. Eventually the inherent impossibility of keeping three separate metals upon any fixed basis of parity led to the relegation of copper to the status of token money, for the same reason that silver coins have been made merely token money, by the leading nations of the globe, during the past hundred years. The Chinese continued to give honest values in their brass money until 1904, when the possibility of debasing the coinage, to the great profit of the provincial officials, suggested itself so forcibly to the astute minds of some of the governors that several of the Chinese mints were worked with feverish activity, in turning out new copper cash, but, as invariably is the case in any debasement of coinage, the work was overdone, and much confusion and loss has been caused by the excessive issue of copper coins, in several of the provinces. In 1904 the four mints of Tientsin, Wuchang, Canton and Foochow, emitted 3,997,710 twenty-cash pieces, and 371,916,330 ten-cash pieces, consuming therefor 13,718 long tons of copper. The total amount of copper consumed for Chinese coinage in the three years 1903 to 1905, inclusive, probably was between thirty thousand and forty thousand long tons, though possibly greater, and the coinage requirements of 1905 alone have been estimated as high as 59,000 long tons, but this, without question, is excessive. For the fiscal year 1906 the United States government consumed about 825,000 pounds of fine copper for coinage, this including the metal for bronze cents and the copper used for alloying gold and silver coins. The monetary systems of practically all civilized countries include the use of copper for the smaller coins. It is estimated that nearly £1,000,000 in copper coins is locked up constantly, in the penny slot-machines extensively used in Great Britain for gas-meters, and for the automatic vending of many other articles. In the United States, France, Germany and many other countries, automatic vending machines are very common, and have necessitated, in all such countries, a considerable increase in the coinage of copper money, to maintain the supply of minor coins, so heavily drawn upon by the automatic machines.

Practically the entire works of a modern clock are made of brass, and in the case of the Yankee dollar clocks, now to be found in the most re-

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mote corners of the earth, practically everything but the glass front and the hands are made of brass, though the case is nickeled. The gear-wheels and pinions of watches, whether of the dollar variety or of the highest grade, are made from brass, and the dials of watches also are made of brass enameled. A single firm, in the Naugatuck valley of Connecticut, stamps out one hundred thousand watch dials daily, and buys Calumet & Hecla copper in lots of five to fifteen tons therefor.

Instruments of precision used in the scientific world are composed mainly of brass. Miscroscopes and telescopes, surveyor's transits and draughtsman's protractors, and hundreds of other strange instruments, of marvelous variety and complexity, that do human work without the element of human fallibility, are composed almost exclusively of brass.

In ceramics, copper and cobalt, often found associated in nature, are the principal metals used for coloring, and an infinite variety of colors and shadings of the utmost delicacy are secured, in glassware and the higher grades of pottery, from the ores and compounds of these metals.

In the business world, the uses of copper are numerous. Signs of copper, brass and bronze stare at us from every corner of crowded city streets. Copper leaf is used by sign-writers, and in various other ways, and comminuted copper is used in bronzing. Brass rods are utilized for window displays and in various mechanisms used for exhibiting goods in retail business houses.

In offices and for clerical work, copper is consumed to an extent far beyond the wildest guess of anyone who has not given thought to the subject. Brass platens are used on typewriters, for heavy manifolding, and the best numbering and dating machines have their figures cut upon brass wheels, and brass is used in other parts of such devices. Brass wire for stapling papers is consumed extensively, as are brass paper fasteners, and the little brass clips, so easily attached to or detached from masses of papers, are used by the hundreds of millions yearly, a single set of files, of the dozen or more required by the Copper Handbook, consuming about fifteen thousand such clips in every year. Hundreds of tons of copper are consumed in the manufacture of metal tips for lead pencils, these being almost invariably of brass, with a thin plating of nickel, and for metallic tips for penholders, metallic pencilholders and miscellaneous office devices and fittings.

Practically all of the high grade American toilet preparations now are put out in glass bottles, or nickeled cans. These cans, formerly of tin, now are almost invariably of brass and copper, lightly plated with nickel. A single manufacturer of talcum powder alone used more than six million small cans for his product, in 1906.

Several thousand tons of copper are consumed yearly, in the United States alone, for the manufacture of so small but necessary an article as the pin.

A single Connecticut firm uses an average of about twelve thousand pounds of copper daily for making eyelets, bals and vamps for shoes.

Brass mountings are used extensively in the manufacture of harnesses for horses, either appearing in the natural color, or plated with nickel, silver or gold. Copper is used frequently for card cases, cigarette cases and for mounting ladies' fine pocketbooks, wrist-bags, and chatelaines,

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either appearing as the natural metal, or plated. Copper is used also, to a large extent, for the heads of umbrellas and canes, and is used frequently for backing combs, brushes and mirrors.

The use of copper for ornaments is very general among all savage tribes where the metal is available, either through aboriginal production or by reason of purchase from traders. Copper wires, made from ore smelted in crude furnaces, and drawn through stone mandrels, are found in Central Africa, in the vicinity of Lake Tanganyika, and are used extensively for arm and leg bracelets, ear-rings, nose-pieces and other embellishments for the person of the untutored savage. The dark-skinned Hindoo, and the darker-skinned native of Central and Southern Africa, evince one failing in common, this being a great fondness for jewelry and ornaments made from telephone and telegraph wires, but when these are succeeded, as is commonly the case, by high voltage power transmission lines, such depredations cease, after about the third consecutive funeral. Some of the telegraph and telephone companies, operating in districts where natives are unduly fond of copper wire, have found it necessary to protect their wires by currents of sufficient voltage to give severe shocks, without causing death to wire thieves.

The uses of copper enumerated in the preceding paragraphs of this chapter are for the metal and its alloys, brass and bronze. There are other alloys, not previously mentioned, such as nickel-copper, arsenic-copper, aluminum-copper and others, that are used for a variety of special purposes.

Malachite, the green carbonate ore of copper, when found massive, is a semi-precious stone of great beauty, and is much in demand for table tops and interior architecture, and also is an exceedingly beautiful stone for brooches, pins and buttons. Chrysocolla, a silicate of copper, vies with malachite in beauty and utility, and turquoise owes its beautiful blue color to the small amount of copper contained therein. Other ores of copper are ground up for pigments, many beautiful shades, especially blue and green, being secured from mixtures having copper ores as bases.

The most important copper mineral, for other uses than the production of metal therefrom, is copper sulphate, the common bluestone or blue vitrol of commerce. This is found in nature as chalcanthite, but, as a rule, is a product of manufacture. This compound is one of the most important chemical agents known to science and the arts, and is a necessity in the electrolytic refining of crude copper. It is a component part of all wet batteries, and, as such, rings our door-bells, carries our telegrams, and is the energizing agent that permits the transmission of the human voice over the wires of the telephone. In electroplating, electrotyping and kindred industries, it is the prime factor. As an insectide it stands without an equal, dilute solutions of sulphate of copper having stayed the ravages of the phylloxera, when the vineyards of France seemed doomed. It is probable that not less than one hundred thousand tons of copper sulphate, containing a quarter of its weight in metallic copper, are consumed yearly in spraying the vines and fruit trees of Europe and America, and thus it may be said that it is to copper that we owe the sparkling wines of France, the peerless American apple and the blushing peach that reaches perfection on every continent.

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The consumption of sulphate of copper is not confined to horticulture and the electrical industries, as it is used, to the extent of thousands of tons monthly, in the textile factories, in the chemical industries and in manufactures of greatly varied lines. Bluestone, for the past few years, has found a new and valuable use, as a destructive agent in eliminating the algæ from domestic water supplies, and it is asserted, apparently with reason, that the typhoid fever germs is destroyed by adding bluestone to water in the proportion of one to ten millions. A bluestone solution of one to five hundred thousand is effective in killing the larvæ of mosquitos, when young.

During the Nineteenth Ceentury the production and consumption of copper increased by more than forty-fold, and the end of the century found the metal used for nearly forty times as many purposes as were known one hundred years before. What another century may bring forth, no man can tell, but that the metal will be in strong demand, in ever-increasing quantities, for an ever-widening variety of uses, seems open to no doubt.

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CHAPTER XII.

SUBSTITUTES FOR COPPER.

For many uses copper is unrivaled, while for other uses there are substitutes of greater or less utility that may become available under certain circumstances. The displacement of copper by other materials increases, in many lines, almost in direct ratio to the increase in price of copper, but while higher prices for the metal cause considerable substitution, lower prices invariably drive the substitutes, partly or entirely, out of the field.

In building construction, for making cornices and similar uses, galvanized iron is a cheap but not altogether satisfactory substitute for sheet copper. Iron remains a competitor of copper also in the wire trade, for telegraph and telephone lines, but owing to its low conductivity is not available for power transmission.

Copper wire laid underground, and not protected by tubing, is affected by electrolysis, but to nothing like the same extent as iron, and copper wire in the atmosphere undergoes some surface oxidation from carbon dioxide and sulphur vapors, but such oxidation is merely superficial. Apparently the life of a good copper wire, in ordinary use, is of indefinite and practically everlasting duration. Iron is low in electrical conductivity, rendering iron wires an inefficient and costly medium for the transmission of electrical impulses, and out of the question for the transmission of electrical energy. Iron also is subject to rust; and its lack of the ductility that is such a strong characteristic of copper, causes iron wires to break from winds and sleets that would not injure lines of copper wire. Telegraph and telephone wires of iron remain in use to a much larger extent than generally supposed, owing to the cheap initial cost of installation, but the cost of maintenance and repairs renders it certain that iron must give way to copper, sooner or later, at practically all points in this field. Many local telephone systems are installed with iron wires, but so certainly as such installations become successful, the replacement of iron by copper wires is certain to begin. Iron wires for telegraph lines are in quite general use on branches, but the principal telegraphic trunk lines are of copper.

Metallic sodium has been tested for overhead transmission. Owing to the great affinity of sodium for oxygen, it is necessary that it be protected from the air by being run into wrought iron pipes, which in turn are protected by weather-proof paint. It is claimed that, for the same conductivity, the cost of building a sodium conductor is only about 40 to 60 per cent. that of a copper conductor, but these figures are viewed with suspicion, and while sodium may become a serious competitor of copper for power transmission, in time, the prospects of strong competition from this source do not seem alarming.

Copper has but one really formidable competitor, this being aluminum, and in view of the very considerable substitution of aluminum for

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copper, in certain fields, and the threat of even more strenuous competition, serious inquiry into the subject seems warranted in a work devoted to copper.

The electrical conductivity of aluminum is 63, compared with 101 to 103 in the best grades of copper. As compared with copper, aluminum has fair electrical conductivity, but lacks tensile strength. The latter defect, however, is overcome to a large extent by the greater lightness of aluminum, its atomic weight being 27, as compared with 63.2 for copper. Aluminum does not oxidize readily in the atmosphere, but when brought into contact with iron an electrolytic action is brought about that causes rapid deterioration. The use of aluminum transmission wires, where exposed to the action of salt water, is impracticable, owing to rapid corrosion, and for the same reason this metal cannot be used for sheathing vessels. Aluminum wires are claimed to be superior to copper for damp places, or for withstanding acid fumes and moisture in the air or soil, these having but slight effect on aluminum.

One of the principal defects encountered in the use of aluminum for transmission wires is found in the great difficulty experienced in making good joints, although it has been stated, repeatedly, that this trouble has been overcome. Owing to the difficulty with which joints are soldered or brazed, the connections are mainly in the form of a three-way sleeve, giving a straight joint equivalent to a straight splice. In the case of large wires, dove-tailing is adopted, and, in smaller wires, a flattened tube is used occasionally. The conductivity of aluminum transmission lines is impaired somewhat by slight oxidation at the joints.

Aluminum being much lighter than copper, the number of poles required for a transmission line can be reduced, but owing to the large coefficient of expansion, aluminum wires sag heavily in warm weather.

The principal electrical use of aluminum is found in power transmission lines. This metal having lower conductivity and considerably less tensile strength than copper, its use necessitates bars or wires of considerably larger section, which disadvantage is balanced by the much lighter weight, but wires of aluminum are much more apt than those of copper to suffer from the stresses of snow, ice and wind, because of lesser tensile strength. Aluminum cables are in use in a California transmission line that carries power for a distance of 154 miles, to San Francisco. The longest transmission line is from Niagara Falls to Syracuse, a distance of 162 miles. This latter installation includes nine aluminum cables, each containing nineteen wires, giving a total length of about 28,000 miles of wire, the cables carrying a voltage of 60,000. The general concensus of opinion among those who have used both aluminum and copper wires, for power transmission, is that aluminum is materially cheaper in first cost, but not so satisfactory in operation, being more subject to accidents, and requiring greater outlay for upkeep.

The use of aluminum in electric railway systems is limited practically to high-tension lines for feeder cables, as it cannot be used for trolley lines because aluminum will not solder or braze satisfactorily, and trolley wires require carefully soldered or brazed joints made smooth. If a satisfactory method of brazing or soldering aluminum can be invented, and this would seem probable to come in time, aluminum will become a competitor

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of copper in the trolley field, on practically the same terms as the metals now compete in the field of long distance power transmission. For high tension feeder wires on trolley lines aluminum possesses one marked advantage over copper, in that it does not melt when short-circuited, as copper does.

Although extensive tests have been made with aluminum wires for telegraph and telephone lines, these have not proven satisfactory, and the metal is but slightly used for these purposes, aluminum wires being found lacking in tensile strength. The telephone and telegraph companies prefer steel wire to aluminum, and copper wire to either.

The weight of aluminum rolled is 162 pounds to the cubic foot, and for copper, 555 pounds per cubic foot. In electrical capacity for power transmission, one pound of aluminum is nearly but not quite equivalent to two pounds of copper, hence in figuring a parity between the metals, for power transmision purposes, the base can be secured by doubling the market price of copper and comparing same with the market price for aluminum, but for the purpose of final comparison, allowances must be made for the cost of drawing the wires and further allowance made for the added expense and difficulty of securing satisfactory joints in the aluminum transmission lines.

Aluminum was given an excellent opportunity of demonstrating its capacity to replace copper, during the era of high prices of the latter metal that culminated in the market break of July, 1907, but it cannot be learned that there was any very general substitution of aluminum for copper, on account of the high price of the later metal, although advocates of the substitution of aluminum for copper claimed that with copper at 26 cents and aluminum at 39 cents there was an economy of 50 per cent. in price, and of 55 per cent. in weight, in favor of aluminum.

Aluminum is becoming a serious competitor of brass in the manufacture of light castings, but for heavier work does not seem to have made much headway as yet. The aluminum castings have superior lightness, but lack the tensile strength of brass. The principal use of aluminum castings has been made by the automobile trade, but such castings do not seem to have been entirely satisfactory to some manufacturers, although well liked by other makers. Aluminum seems to be a very satisfactory substitute for copper and brass in the making of pans, kettles and boilers for various industrial uses, such as sugar manufacturing, wax refining, fruit canning, etc., and for kitchen utensils is much preferable to copper or brass. For certain uses, such as buckles, buttons, canteens, cups and other equipments for troops, the extreme lightness of aluminum renders it preferable to brass or any other metal.

For some uses various alloys of aluminum possesses considerable advantages over the pure metal, but some of the much-touted alloys of aluminum have given results falling far short of the promises made for them. There are, however, several aluminum alloys of marked value. Alloyed with about 1.5 per cent. copper, aluminum wire gains materially in tensile strength and loses nothing in ductility, wire so alloyed permitting spans of 150 feet in length, for long distance transmission lines carrying high-voltage currents.

The present production of aluminum is only a trifle more than one

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per cent. that of copper, and is about the same in tonnage as the copper production of a century ago. It is probable, however, that the production of aluminum will show a larger proportionate increase than that of copper, for the next decade.

As matters now stand, with aluminum around its present range of prices and production, it scarcely can be considered a serious competitor of copper in any single field, with the exception of long-distance power installations, but gives a material decrease in the cost of production of aluminum, through improved processes which are possible, though not yet in sight, a largely increased production would be assured, as the supply of raw material is absolutely inexhaustible, and were the metal to be sold at a price corresponding to a considerably reduced cost of production, which might not be the case immediately, if the new processes were controlled by a monopoly, but would be certain to come in time, aluminum would become a competitor to be reckoned with seriously by all the other commercial metals, but the brunt of the fight would be borne by tin and copper, and probably tin would be the greater sufferer of the two, in the long run. Apparently the supremacy of copper in its leading fields is not severely threatened by aluminum, which metal will make a place for itself in the industrial world, having certain advantages that must greatly extend its present use, and certain limitations as well, which, in all probability, will operate to prevent its becoming a dangerous competitor of copper.

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CHAPTER XIII.

GLOSSARY OF MINING TERMS.

The following glossary of mining, milling and trade terms first appeared in Vol. II of the Copper Handbook, and has been amplified in 1909 and 1907. It will be found fairly complete.

ACICULAR. Needle-shaped.

ACID. An acid rock is one in which bases are combined with acids, forming salts. The antithesis of basic.

ADIT. A mine opening, driven from the surface into a hill or mountain, on practically a horizontal plane, only enough rise being allowed to provide for natural drainage and to allow the easy removal of cars bringing rock from the breast of the working. An adit can be driven only where the surface is mountainous or quite hilly.

ADOBE. Sun-dried brick.

AIR-BLAST. A violent explosion, caused by the escape of air compressed by the settling of the upper workings of a deep mine.

AIR-COMPRESSOR. A machine for condensing air to a pressure sufficient to actuate machinery, when delivered underground, or elsewhere, at a considerable distance.

AIR-DOORS. Owing to strong currents of air frequently found in the depths of mines, it is sometimes necessary to build a little chamber in a drift connecting two shafts, with a door at either end, to prevent extinguishment of the lamps and candles of the miners by strong air currents.

AIR-DRILL. A power drill operated by compressed air.

AIR-SHAFT. A shaft sunk solely to provide ventilation for deep workings, or an old shaft kept open solely to furnish air to the mine. Nature provides a means of ventilating even very deep mines. Two shafts, one of which is sunk on slightly higher ground than the other, will provide natural ventilation underground, when connected by a drift, the longer shaft becoming a chimney, and the shorter an inverted syphon, down which the air is sucked with great force.

ALKALI. An alkali is a lye—the opposite of an acid.

ALLOY. Two or more metals united mechanically, but not chemically, by fusion.

ALLUVIUM. Soil or broken rock deposited by the action of water.

ALTERED. An altered rock is one that has undergone changes in its chemical and mineralogical structure since its original deposition.

ALUMINOUS. A rock having aluminum as a base or prominent constituent element.

AMALGAM. A union of mercury with other metals, such as gold, silver or copper. Mercury will not amalgamate with iron.

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AMALGAMATION. The process of uniting gold, silver or copper with mercury. The quicksilver is expelled later, by heat, and recovered for further use.

AMORPHOUS. Without structural form.

AMYGDALOID. A trap rock, of igneous origin and frequently of highly complex structure, the name coming from the little pits or amygdules of softer rock-material found therein. In the Lake Superior copper district the copper-bearing amygdaloids frequently show the native copper in the amygdules left by the leaching out of the softer rock originally contained therein.

AMYGDALOIDAL. Of the nature of or akin to amygdaloid.

ANALYSIS. A complete chemical test of any given substance.

ANHYDROUS. Devoid of water.

ANTICLINE. A fold of rock-strata bulging upwards, in saddle-shape. The reverse geologically of syncline.

ANTICLINAL. An anticline. Of the nature of an anticline.

ANTIGUA. In Mexico, is a mine worked by Spaniards or Mexicans at a time so remote—from 50 to 300 years—that particulars have been forgotten. Sometimes valuable.

APARTADO. Apartado de correos is Spanish for postoffice box. Usually written apartado only or abbreviated to Ap.

ANTIMONIDE. An ore of any metal chemically united with antimony.

APEX. That part of an ore vein at or nearest surface. In the United States usually requires opposing experts and several lawsuits to determine. In case of litigation, rightful title to the apex usually rests in the litigant having the most money.

APICE. Apex.

ARENACEOUS. Of a sandy nature.

ARGENTIFEROUS. Silver-bearing.

ARGILLACEOUS. Of a clayey nature.

ARASTRA. A Chilean mill. A circular trough, in which broken ore is pulverized by a revolving wheel or mill stone

ARROYA. A gulch.

ARROBA. A weight of varying heft. Spanish, 25.36 pounds avoirdupois; Portuguese, 32.38 pounds.

ARSENIDE. An ore of any metal, of which arsenic is the other constituent.

ARSENOPYRITE. An ore of any metal with which arsenic and sulphur are chemically united.

ASSAY. A chemical test of ore or metal to determine its exact content and value in any given metal or metals.

ASSESSMENT WORK. The amount of work required annually by the United States government, from the holders of an unpatented mining claim.

ATTLE. Cornish term for waste rock.

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AURIFEROUS. Gold-bearing.

AUXILIARY. An auxiliary engine or machine is one kept in reserve for use when the principal machine is out of commission.

AVERAGE PRODUCE. Cornish term for percentage of copper in ore.

BACK. The roof of rock above any mine opening driven on a horizontal plane.

BAD AIR. Air in which miners cannot work, owing to powder fumes, noxious gases or insufficient ventilation.

BAL. Cornish for mine.

BALANCE BOB. A counterweight for pump rods.

BALL HEAD. A steam stamp, named after its inventor.

BALL STAMP. A Ball head.

BARRANCA. A deep gulch or cañon, with precipitous sides.

BARILLA DE COBRE. Spanish term for native copper, dressed but unsmelted. Equivalent to the "mineral" of Lake Superior mines. Used mainly in Bolivia.

BARREL WORK. Copper in small masses, detached from its rock-matrices at the rock-house, and shipped in barrels direct to the smelter.

BARROW. A wheelbarrow; also same as burrow.

BARTLETT. A Bartlett concentrating table.

BASALT. A trappean rock.

BASE. An alkaline element.

BASE BULLION. Copper or lead carrying much gold or silver.

BASE METAL. Any of the more common metals except gold, silver and platinum.

BASIC. Of an alkaline nature.

BASIN. A syncline; a trough in the earth's surface.

BATTERY. A set of gravity stamps, usually five in number.

BEARING. The bearing of a mineral outcrop is its strike.

BEATING AWAY. To cut down or stope a mineral body.

BED. A stratified rock formation. Used in some mineral districts for veins or lodes lying horizontally, or approximately so.

BEDDED VEIN. A vein parallel with the stratification of country rock.

BED ROCK. The solid rock, as differentiated from loose or surface rock. The ledge.

BELLS. Signals for lowering and hoisting the bucket, skip or cage in a shaft usually are given by bells, the number of strokes indicating the nature of the load, the place for stopping, etc.

BIT. A steel drill; a short hollow cylinder of soft steel, used in diamond drilling. The diamonds are set around the inner and outer edges of the bottom of the bit, boring the most refractory rocks when the bit is rotated.

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BLACK COPPER. Copper partly smelted, but containing impurities requiring refining.

BLACK JACK. Sphalerite, zinc blende of dark color.

BLANCHED COPPER. Copper containing a large amount of arsenic, practically forming an alloy.

BLAST. (N.) Air forced through tuyeres into a blast furnace or bessemer converter. (V.) To explode gunpowder or dynamite.

BLASTED. A blasted miner is one who has been injured by the explosion of a charge of dynamite or gunpowder.

BLAST FURNACE. An oven in which ore is smelted, with the aid of air pumped in under pressure.

BLASTING. The breaking of rock by means of high explosives, inserted in holes bored in the rock for the purpose.

BLENDE. Zinc blende; sphalerite.

BLIND DRIFT. A drift connected with other workings of the mine at one end only. A cul de sac.

BLIND LODE. A lode not outcropping at surface.

BLISTER COPPER. Copper of 96 to 99 per cent. tenor.

BLOCKING OUT. Opening the ore in a mine so that it can be won merely by stoping. Properly speaking, ore is not blocked out for stoping until opened on three sides.

BLOSSOM. The outcrop of an ore body altered by weathering.

BLOW. A blossom.

BLOWER. A fan used to force air into a mine; a blowing engine.

BLOWING ENGINE. A rotary engine for forcing air into blast furnaces under an average pressure of about one pound avoirdupois per square inch.

BLOWING IN. A smelting furnace is blown in when charged and the process of reduction by fire is begun.

BLOWING OUT. A smelting furnace is blown out when the metal and slag are tapped out, and the fires are allowed to die out.

BLOWOUT. An outcrop larger than the ore-body beneath.

BLUESTONE. Copper sulphate.

BOILING SHAFT. A sand-shaft in which quicksand and water boil up from the bottom.

BONANZA. A body of exceptionally rich ore. Commonly applied to silver mines.

BONNET. The cover or roof of a cage; also a steel casting connecting the piston-rod with the upper end of a stamp-shaft.

BORE HOLE. A drill hole bored for test purposes.

BORT. A form of crystallized carbon between the diamond and the black diamond.

BORTZ. Bort.

BOTRYOIDAL. Shaped like a bunch of grapes.

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BOTTOM. A mass of impure copper formed below the matte, in matting copper ores.

BOULDERS. Detached masses of rock, rounded by attrition, usually found at or near surface, in alluvial deposits lying above rocks in place.

BOX CAÑON. A cañon closed at one end.

BRANCH. A vein branching off from the main ore body.

BRATTICE. A screen for the regulation of air currents in a mine.

BREAST. The face or working end of a drift, stope or adit.

BRECCIA. A conglomerate rock, in which angular fragments of rock are cemented together.

BRECCIATED. A rock stratum made up of sharply broken fragments, partially or wholly cemented together.

BROKEN. A vein is broken when lacking clearly defined walls or characteristics of regularity.

BROKEN GROUND. Rock strata where the walls are poorly defined and the general formation unsettled.

BROOD. Cornish for waste ore, such as mundic or zinc blende, when found in connection with copper ores.

BUCKET. A kibble. An iron or steel bucket used for hoisting in a mine. In a vertical shaft a bucket swings free in ascending and descending, but in an incline shaft the bucket runs on a skidway of plank timbers, or ride a trolley cable.

BUDDLE. A conical table on which ore is dressed. Machine and name both growing obsolete.

BULKHEAD. A wooden or masonry partition walling off a mine opening, or protecting mine sets against soft or creeping ground.

BULLION. Refined gold or silver. Sometimes erroneously applied to copper.

BULLION BARS. Unrefined gold and silver secured by melting the precious metals precipitated to the bottom of the tank in the electrolytic refining of argentiferous and auriferous copper anodes.

BUNCH. A pocket of exceptionally rich ore.

BUNCHY. An ore body given to considerable variations in width or values, or both.

BURDEN. Overburden.

BURROW. A rock burrow.

CABLE. The steel wire rope used in shafts for hoisting buckets, skips or cages.

CAGE. The elevator used in vertical shafts for hoisting mineral and for lowering men, timber, etc.

CAKES. Copper cast in the form of cakes.

CALCAREOUS. Of a limey nature.

CALCINE. To drive off sulphur or other volatile constituents of an ore by heating.

CALCINER. A calcining furnace.

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CALCINING FURNACE. A furnace for roasting ore to drive off sulphur, previous to smelting.

CALCITE. Crystals of calcium carbonate.

CAM. A curved tooth, fixed on a shaft, for lifting the pistons of gravity stamps.

CAMP. A mining town.

CAÑON. (pronounced canyon). A deep gorge with precipitous walls.

CANYON. A cañon.

CAP. The top piece of a framed set of mine timbers; copper caps containing fulminate of mercury, used to explode dynamite in blasting rock.

CAPPING. The rock or other ground overlying the mineral body of a mine.

CAP-ROCK. Capping.

CAPTAIN. In most mining fields where Cornishmen are found, the man in charge of mining work is termed a captain. The mining captain is the executive officer underground.

CARBONACEOUS. Of the nature of coal; containing carbon.

CARBONATE. An ore of any metal or metals with which carbon and oxygen are chemically united.

CARBONATES. A term commonly applied, in the western part of the United States, to ores containing a considerable proportion of lead carbonates, usually argentiferous.

CARBONIFEROUS. Rocks of the geological ages usually associated with coal measures.

CARGA. A Mexican weight equalling 300 pounds avoirdupois.

CARTRIDGE. Dynamite put up in cylindrical cases of oiled paper to fit the holes bored by drills.

CASING. The wooden lining of a shaft; an iron pipe put down outside of a diamond drill hole when passing through soft or broken ground, to prevent the hole becoming clogged by matter intruding from outside.

CASTING COPPER. Impure copper better suited for casting into various forms than for drawing into wires or rolling into sheets.

CAVE. A natural opening or "vug" in a rock formation; the partial or complete falling in of a mine.

CAVING SYSTEM. A plan of mining, by which the worked out upper levels and surface are allowed to subside gradually, as the mine workings are deepened.

CEMENT COPPER. Regulus. The impure metal obtained from ores by leaching processes.

CERRO. Spanish for a hill showing rock outcrops.

CHAMBER. A large stope.

CHAPEAU DE FER. French for gossan or iron hat.

CHARGE. The amount of ore, flux and fuel required for one filling of a furnace.

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CHIMNEY. An ore body of pipe shape in an approximately vertical position.

CHERT. A coarse flint containing calcium.

CHILEAN MILL. An arastra.

CHILE BARS. Bars of Chilean blister copper, weighing about 200 pounds each.

CHLORIDE. The ore of any metal united chemically with chlorine.

CHLORIDES. Commonly applied, in the western part of the United States, to chloride ores of silver.

CHURN DRILL. A drill having a churning motion, used for boring test-holes, or wells.

CHUTE. A section of a lode or vein differing by being much richer or leaner than the average; also a trough for dropping ore or waste to lower openings in a mine.

CIRCA. Approximately.

CLACK. A pump valve.

CLAIM. Public land staked off and claimed by a prospector or miner. Size of claims varies in different countries.

CLAY COURSE. A seam of clay between vein and wall.

CLAY PARTING. A clay course.

CLAY SLATE. An argillaceous slate.

CLEAN-UP. The cleaning up of accumulated ore or metal in a mill or smelter.

CLEAVAGE. The parting of rock along more or less regular lines of least resistance.

CLEAVAGE PLANES. The lines along which rock cleavage occurs.

COARSE JIGS. The jigs used to handle the heavier grades of ore or metal.

COARSE METAL. Matte resulting from the first smelting.

COBBING. Breaking masses of ore into lumps by hand hammers.

COLLAR. The top of a shaft; the surface timbering of a shaft.

COMPANY ACCOUNT. Miners and other underground employes working on fixed wages per shift or month usually are called "company 'count men" to distinguish them from miners working on contract.

COMPARTMENT. Mining shafts usually are divided into two or more compartments, separated by framed timbers and planking.

CONCENTRATES. The concentrated ore or metal, after partial or complete elimination of gangue rock.

CONCENTRATION. The process of separating native metal or ore from its gangue of worthless rock.

CONCENTRATING TABLE. A concentrator.

CONCENTRATOR. A plant where ores are concentrated; a jig, or machine for separating ore or metal from gangue-rock, the process usually employing a rocking or oscillating motion, aided by jets of water, whereby

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the worthless gangue is driven off and the heavier mineral retained by specific gravity.

CONCHOIDAL. A fracture resembling in form the shell of a bivalve mollusk.

CONCRETIONS. Nodules formed by aggregation of mineral matter.

CONDUCTIVITY. Electrical conductivity is measured by the resistance offered to the passage of an electrical current.

CONGLOMERATE. A rock stratum formed of pebbles and rounded boulders cemented together. Sedimentary conglomerates are ancient seabeds; volcanic conglomerates are called tuffs, and consist of scoriaceous matter ejected from volcanic vents and cemented to rock, under pressure.

CONSTRUCTION ACCOUNT. Many of the Lake Superior copper mines summarize their finances so that the cost of operation is divided into two classes, one being for general working expenses and the other for construction account. The latter includes new buildings and machinery on surface, and frequently new mine openings. In effect the construction account of a mine is like the stock account of a merchandise firm, and sometimes, like charity, "covers a multitude of sins."

CONTACT. The junction of two dissimilar bodies of rock.

CONTACT VEIN. A mineral body found between two unlike rock strata.

CONTORTION. The distortion of a rock body.

CONTOUR. The outline or configuration of any given tract.

CONTRACT. Many miners work on contract, agreeing to sink, drift or stope at a fixed price per running foot, or per fathom. These are known as contract miners, and are usually the more skilled workmen.

COPPER ORE. See detailed descriptions of copper ores and copper-bearing minerals in chapter on chemistry and mineralogy.

CORE. A drill core.

CORNISH PUMP. A form of mine pump actuated by long rods reaching from surface down the shafts.

CORNISH STAMP. A gravity stamp, in which the heads are raised by cams and dropped by gravity.

COST-BOOK SYSTEM. A plan of mine operation, used in Cornwall only, by which shares are subject to unlimited assessment. A sort of unlimited partnership.

COSTEANING. Proving an ore body by trenching across its outcrop at approximately right angles.

COUNTERBALANCE. Hoisting plants usually are worked in counterbalance for deep shafts. The weight of the descending cage or skip is used to partially offset the weight of the ascending cage or skip.

COUNTER VEIN. A cross vein, running at approximately right angles to the main ore body.

COUNTRY ROCK. The predominant rock form of a given district.

COURSE. The direction or strike of a mineral body; a stretch of mineralized matter in an ore vein.

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CRAB. A hand winch.

CREEPING. The movement caused in mines by the pressure of superincumbent and adjacent rock masses.

CRETACEOUS. Of a chalky nature; limestone of a certain geographical horizon.

CRIBBING. The lining of a shaft; frameworks of timber to support an underground roof.

CROPPINGS. Outcrops.

CROSS COURSE. An intersecting vein.

CROSSCUT. An opening similar to a drift, except that the crosscut is sent at approximately right angles to the formation, while a drift follows the trend of the lode or vein.

CROSSCUT TUNNEL. A tunnel driven at approximately right angles to the ore body.

CROSS VEIN. An intersecting vein.

CRUCIBLE. A vessel of refractory material, used to contain ores and metals for assaying or smelting.

CRUSHER. A rock crusher.

CRYSTALLINE. Showing crystals.

CRYSTALLIZED. Having plainly defined crystals.

CRYSTALS. Geometrical forms, with plane faces, of infinite variety, assumed by the majority of minerals.

CUPOLA. A furnace in a smelter.

CUPRIFEROUS. Copper-bearing.

CUT. To intersect an ore body; the portion of a working face of mineral removed at one operation.

CUTTING DOWN. To enlarge a shaft.

CWT. A hundredweight, or 112 pounds avoirdupois.

DAM. A masonry barrier, built underground, to hold back water.

DATUM LEVEL. The level (usually sea-level or mean level of nearest considerable body of water) from which altitudes are measured in surveys.

DEAD ROASTING. Sulphide ores are dead roasted when all the sulphur possible to drive off by roasting has been eliminated.

DEAD WORK. The opening of new shafts, drifts and winzes, preliminary to the stoping of the mineral bodies.

DEBRIS. Broken down rock material.

DECOMPOSED. Rock or ore broken down by elemental action.

DECREPITATE. To break into fragments with violence, under the blowpipe or great heat.

DENDRITE. A mineral crystallized in form similar to the branch of a tree.

DENOUNCEMENT. In Mexico, the formal filing of a claim to mineral land.

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DENUDATION. The uncovering of rock strata by the weathering of wind or water, or both.

DEPOSIT. A term, loosely used, meaning a mineral body.

DERRICK. A mast, freely rotatable, carrying a boom or yard-arm, at the end of which is a sheave-wheel. In mining is used mainly for open pit work.

DESSICATION. The drying out of water from any given substance.

DETRITUS. Debris. Broken down rock.

DEVELOPMENT WORK. Dead work.

DIAMOND DRILL. A machine for boring holes in rocks, taking its name from the black diamonds or bort used to form cutting surfaces on the inner and outer edges of the hollow cylindrical bit.

DIE. The iron block in the mortar, onto which the ore is fed for crushing under the stamp.

DIORITE. Greenstone; a crystalline spathic hornblende.

DIP. The angle at which a lode or vein descends from the earth's surface.

DIP COMPASS. A compass having the needle fixed to swing in a vertical plane.

DIRT. Frequently used to designate ore broken underground.

DISINTEGRATION. The breaking down of rock forms, usually through weathering.

DISSEMINATED ORE. Ore found scattered through a gangue of valueless rock.

DISTURBED. An ore body is disturbed when lacking defined walls and settled character.

DOLLY. A crude prospecting stamp set on a spring pole.

DOLOMITE. Magnesian limestone; carbonate of calcium and magnesium.

DONKEY HOIST. A small auxiliary hoisting engine, usually operated underground and actuated by compressed air, or used for preliminary work at new shafts or exploring pits.

DOWNCAST. A shaft having a downward air current.

DRAFTAGE. An arbitrary allowance claimed by some British smelters, to cover loss of weight in transport.

DRESS. To separate ore from gangue rock by hand or machinery.

DRESSING FLOOR. A floor or dirt surface where ore is dressed by cobbing and other hand-work.

DRIFT. A horizontal opening in a mine, following the direction of the lode or vein; loose alluvial matter, such as sand, pebbles and boulders.

DRIFT COPPER. Native copper found in alluvium, far from its original rock matrice, whence carried by glaciers.

DRIFTING. Opening drifts. Driving.

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DRILL. A steel bar for boring in rock, having a single sharp cutting face, or two cutting faces crossed at right angles.

DRILL-CORE. Solid, cylindrical cores of rock, are cut by the operation of the diamond drill. These are raised to surface and form a valuable permanent record of the strata through which the drill has passed.

DRILL HOLE. A hole bored by a drill.

DRIVE. A drift.

DRIVING. Drifting.

DROP SHAFT. A shaft, usually of heavy framing sunk by weight, through sand or similar material.

DRUM. The cylinder of a hoisting engine, around which the cable winds.

DRUSE. A vug.

DRY ORE. Argentiferous lead ores containing insufficient lead for fluxing in a smelter.

DUCTILE. That which is capable of being extended in length by tension.

DUCTILITY. The capacity of a metal to elongate, when under pull from the ends, without cracking or breaking.

DUMP. A place for depositing rock taken from a mine. An ore-dump contains good mineral, and a waste-dump the worthless rock hoisted from underground.

DYKE. A fissure in the rock formation, usually transverse, filled with igneous matter. When mineralized, dykes are called cross or counter veins.

DYNAMITE. Nitro-glycerine absorbed by wood pulp, infusorial earth, or some similar article, to render it safer in use. Power varies greatly according to percentage of nitro-glycerine contained.

EISENER HUT. German for iron hat, or gossan.

EECTRIC DRILL. A power drill operated by an electric current.

ELECTROLYTE. The solution in which electrolytic separation of metals is carried on.

ELECTROLYSIS. The separation and redeposition of metals by electrolytic action.

ELECTROLYTIC. Term applied to copper means copper gained from impure metal by electrical decomposition and redeposition, whereby the copper is taken from an impure bar and redeposited in a pure form at the opposite pole of the battery, while other metals are precipitated to the bottom of the solution in the tank in which the work is done.

ELVAN. Cornish name for the dyke rocks of Cornwall, usually greenstone or porphyrite.

EROSION. The wearing away of surface masses of rock and soil by the elements, or by glacial action.

ERUPTIVE. Rock matter deposited in molten form by volcanic action.

ESCARPMENT. A rock wall, nearly or quite vertical.

EXFOLIATION. The separation of thin leaf-like layers from the main body.

Digitized by Google

EXPLODERS. Fulminating caps, for setting off high explosives.

EXPLOITATION. Development work and production.

EXPLORATION. Prospecting work.

FACE. The breast of a drift. A face of ore is the ore shown at the working end of a drift or stope.

FAHLBAND. A banded crystalline rock, carrying finely disseminated ores.

FALL OF GROUND. Rock falling from the roof into a mine opening.

FALSE SET. A temporary set of timber.

FAN. A machine for forcing air into a mine.

FATHOM. Six feet. In stoping, a fathom is a cube of six feet.

FAULT. Dislocation of a rock stratum by which continuity is lost.

FEE. The ownership of land in fee-simple.

FEE-OWNER. The owner of land in fee-simple.

FEEDER. A branch ore vein.

FERRUGINOUS. Carrying iron.

FILLING. Occupying old stopes or chambers with waste rock; allowing a mine to fill with water.

FINES. The finer ore or metals saved in concentrating processes.

FINISHER JIGS. The jigs used to save the fine ores or metals in a concentrator or stampmill.

FIRE. The miner's warning cry when a blast is to be set off, is "fire."

FISSLE. That which easily may be split.

FISSURE. Rock matter deposited at a later period, in a crack in the original rock.

FISSURE VEIN. A fissure, containing ore, usually disseminated in a worthless gangue.

FLAKE COPPER. Very fine scales of native copper.

FLEET-GEAR. A compensating device for taking up slack and paying out rope where a hoisting system is worked in counterbalance. Several turns of the cable are taken around each drum of the hoist, and the bight of the cable is carried to the rear and around a large sheave-wheel lying horizontally and traveling on trunnions, allowing the taking up or paying out of the cable.

FLOAT. A particle or boulder of ore or rock, dissociated from its matrix.

FLOAT COPPER. Drift copper.

FLOAT ORE. A detached ore mass found at a distance from its matrix.

FLOOR. The floor of a drift or other horizontal mine opening; the underlying rock stratum.

FLOUR COPPER. Very fine native copper that floats on water and is very difficult to save in milling.

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FLUCCAN. A seam of clay, found in ore bodies, or more frequently, between the ore and walls of country rock.

FLUKAN. Fluccan.

FLUME. A launder or pipe line for carrying water.

FLUX. Any mineral used in the furnace to aid in fusing the gangue rock and worthless elements, which combine with the flux to form slag.

FLUXING ORE. An ore containing appreciable metallic values, but smelted mainly because containing fluxing agents required in the reduction of richer ores.

FOLIATED. Having a laminated structure.

FOOT. The foot-wall.

FOOT-WALL. The stratum of rock underlying an inclined mineral lode or vein.

FORK. To pump water from a mine; the branching of a vein.

FORMATION. A term used to imply the general geological conditions of a given district.

FOSSICKING. Extracting ore from old mines or waste-burrows.

FOUNDERS SHARES. The few shares necessarily issued to individuals organizing a stock company. In case of companies owned outright by other companies, founders shares are issued to as many individuals as are required to incorporate and hold the offices required for corporate management, as the laws do not permit a corporation, which is an artificial person, to form another corporation, or to serve as a director of another corporation.

FRACTURE. A break.

FREE. A metal is free when virgin or native, and not combined chemically with any other element.

FREE MILLING. A metal or ore that is separated readily from its accompanying rock by mechanical means.

FREEZE. A furnace freezes when the heat falls sufficiently to permit the molten charges to solidify.

FRIABLE. That which may be pulverized easily.

FROZEN. A furnace is frozen when its molten charge solidifies.

FURNACE. An oven for the smelting of ore.

FUSE. A cotton cord with a gunpowder core, so made as to carry fire to an explosive placed for use.

FUSIBLE. That which may be melted.

FUSION. Melting. Alloying metals while liquid, through heat.

GRABBRO. A rock composed mainly of plagioclase feldspar.

GAD. A small wedge or chisel.

GALENA. Lead sulphide, frequently found associated with sulphide copper ores.

GALLERY. A drift.

GALLOWS FRAME. A framework over the mouth of a shaft, carrying a sheave-wheel, over which the hoisting rope passes to the engine.

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GANGUE. The foreign rock matter in which ore or metal is disseminated, the gangue rock being mechanically and not chemically united with the ore or metal.

GASH VEIN. A shallow fissure vein, rapidly narrowing to extinction.

GEODE. A hollow nodule of rock.

GEOLOGICAL HORIZON. Geological age.

GEOLOGY. The science of the formation of the earth.

GIANT POWDER. Dynamite.

GLACIATION. The erosive effect produced by glaciers.

GLANCE. Any metallic sulphide showing a bright, shining surface. Copper glance is chalcocite.

GLORY HOLE. A large open pit from which pay ore is or has been extracted.

G. M. B. "Good Merchantable Brands"—an English grade of refined copper. Term becoming obsolete.

GNEISS. A banded, slaty granite.

GOB. Mud above a mine; refuse in worked-out openings.

GOPHERING. Prospecting work confined to digging shallow pits or starting adits. Term used from similarity of this work to the crooked little holes dug in the soil by gophers.

GOSSAN. Iron hat. A rock capping, usually quartzose, showing yellow to reddish brown iron stains, from disseminated limonite or hematite. Frequently is found overlying veins of copper ore.

GRADE. The percentage, or value, of ore bodies and partly refined metals; the percentage of rise in roads or mine openings driven on an approximately horizontal plane.

GRANITE. A dense, granular rock, composed of varying proportions of quartz, feldspar and mica.

GRANULATED. In the form of grains.

GRASS ROOTS. At surface.

GRAVITY STAMP. A stamp, usually set in batteries of five, in which the piston is raised by a cam, the stamp crushing the charge in the mortar by its weight, when allowed to fall.

GREENSTONE. Diorite, or gabbro.

GRIZZLY. A grating of heavy iron or steel bars, through which fall the smaller pieces of rock or ore.

GROSS TON. A long ton of 2,240 pounds avoirdupois.

GROUNDSILL. The bed-piece of a set of mine timbers.

GUIDES. Perpendicular wooden stringers for guiding cages in vertical shafts.

GUT. To rob.

HACIENDA DE BENEFICIO. Spanish for milling plant.

HACIENDA DE FUNDICION. Spanish for smelter.

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HADE. (American). Dip of a vein from the zenith. (English). Dip of a vein from the horizon.

HALVAN. Cornish for refuse copper ore.

HANGING. The hanging-wall; the stratum of rock overlying an inclined mineral lode or vein.

HARDHEAD. A lump of partly smelted ore, carrying high percentages of refractory elements, such as iron, antimony and arsenic.

HAT. The capping of a mineral body.

HAULAGE PLANT. A mechanical installation for the underground tramming of rock, operated by ropes, compressed air or electricity.

HEAD. Water pressure.

HEADGEAR. A building, or framework, fitted with sheaves, over the mouth of a shaft.

HEAP-ROASTING. Burning the sulphur out of ores piled in heaps, with a small amount of wood or other fuel.

HEAVE. A fault. The rolling out of line of dip by a lode in making depth.

HEAVING. Rolling.

HECTARE. A metric measure of area equalling 2.471 acres.

HECTARRA. Spanish for hectare.

HOIST. An engine for raising ore from a mine, and for lowering men and material therein to.

HOISTER. A hoist.

HOLE. Any opening in the ground; a hole drilled for explosives.

HOLING THROUGH. A drift or other mine opening is holed through when a connection is made between two separate sections working toward each other.

HORIZON. The sky-line, commonly used in the sense of absolutely flat, as shown by a spirit level. Geologically, all rock strata of the same geological period.

HORSE. An intrusion of country rock into a mineral body; sometimes used as synonymous with dyke.

HORSEPOWER. One horsepower is rated as equivalent to raising 33,000 pounds avoirdupois, to a height of one foot in one minute.

HORSE-WHIM. A windlass operated by horse-power.

HOT BLAST. Heated air supplied to a blast furnace.

HUEL. Wheal.

HUNGRY. Nearly or quite barren of mineral value.

HUNTINGTON MILL. An improved Chilean mill.

HYDRATED. Containing water of crystallization.

HYDRO-METALLURGY. The reduction of ores by wet processes.

HYDROUS. Containing water of crystallization.

IGNEOUS. Of volcanic origin.

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IMPREGNATED. Containing ore. Properly used in referring to country rock carrying mineral similar to that in the vein.

INCH. One-twelfth of a foot. See Miner's inch.

INCLINATION. The dip of a vein from the horizon, measured in degrees.

INCLINE SHAFT. A shaft sunk at any except a vertical angle with the horizon.

INCRUSTATION. A solidified coating, usually crystallized.

INFILTRATION. The deposition of a mineral matter from percolating waters.

INGOT. A mass of metal cast in a peculiarly formed mold; applies only to gold, silver or copper. Iron and lead are cast in pigs.

IN PLACE. Rock matter in the position where deposited by nature.

IN SITU. In place.

INTAKE. The opening for water to enter a pipe or flume.

INTRUSIVE. Igneous rock masses pushed up through other and older rock formations.

IRIDESCENT. Showing the colors of the rainbow.

IRON HAT. Gossan.

JACK. A miner's name for sphalerite. Is called black jack, ruby jack or rosin jack, according to color.

JIG. A machine for concentrating ore or mineral by means of oscillatory or vibratory motion, aided by jets of water, separation of the ore from its gangue being effected by utilizing the greater specific gravity of the former.

JIGGER. A crude jig.

JIGGING. Concentrating ore by the use of a jig.

JUMP. To take possession of mineral lands held or claimed by another party.

JUMPER. A churn drill; one who jumps a mineral claim.

JUNCTION. The uniting point; the point of contact between dissimilar rock forms.

KEWEENAWAN. Pertaining to or of the Keweenaw formation, in which the Lake Superior copper mines are opened.

KIBBLE. A bucket used for hoisting material in a shaft.

KILLAS. Clay, slate or shale.

KILO. A kilogram.

KILOGRAM. A metric weight of 2.2046 pounds.

KILOMETER. A measure of distance equalling 0.621376 miles. For rough computations may be figured as five-eighths of a mile.

KIN. A Japanese weight of 1.31 pounds avoirdupois.

KINDLY. The appearance of rock carrying or promising to carry good mineral values.

LADDER ROAD. A ladderway.

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LADDERWAY. The series of ladders giving ingress and egress to a mine shaft; the compartment in which the ladders are.

LAGGING. Timber, usually of small diameter, placed over the cap-timbers of incline shafts and drifts, to prevent damage from falling rock.

LAMINA. A thin plate. Plural is laminæ.

LAMELLAR. In thin sheets of laminæ.

LAMINATED. Lamellar.

LANDER. The man at the mouth of the shaft, who receives signals from below, and attends to the unloading of rock sent up in buckets, skips or cages.

LAUNDER. A wooden flume or sluice, used to convey water, or tailings held in solution in water.

LAVA. Rock formed of flows from volcanoes.

LEACH. To dissolve minerals from ore by water, or acid, or both.

LEACHING. Lixiviation.

LEAD. A mineral body; the metal.

LEADER. A small vein running to a larger one.

LEDGE. The solid rock where encountered at or nearest surface.

LEG. An upright timber supporting the cap of a set of timber.

LEG-PIECE. A leg.

LENSE. An ore body of lenticular form.

LENTICULAR. Having the shape of a double convex lense.

LEVEL. A horizontal opening in a mine. Levels commonly are opened at stated intervals as depth is gained—usually at 100 feet in modern mining practice. The word "level" frequently is used interchangeably with the word drift, but is more comprehensive. Both drifts and crosscuts may be opened on a level, but a crosscut is not a level.

LIGNEOUS. Of a woody nature.

LIMESTONE. Calcium carbonate.

LIXIVIATION. The process of leaching out mineral values from ores.

LOCATE. To make formal claim to public mineral lands.

LOCATION WORK. Labor required by law to be done on mining claims when located.

LODE. Variously used in different mining fields. In Lake Superior refers to the mineralized stratified beds. Is used locally, in many fields, as synomymous with vein. Sometimes is used as meaning an aggregation of mineralized veins.

LONG TON. A gross ton of 2,240 pounds avoirdupois.

LOW GRADE. Carrying mineral values but sparingly.

MAGMA. An originally molten mass of rock coming to the earth's crust from depth.

MAGMATIC. Of the nature of or pertaining to magma.

MAGMATIC SEGREGATION. The process by which the different constituents of molten rock masses crystallize at varying temperatures,

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with a tendency to separate themselves, so far as circumstances allow, from the other compounds.

MALACATE. A whim with vertical drum used for hoisting in Mexico. Sometimes is called a Zacatecas malacate.

MALLEABLE. That which may be made to change form, without fracture, under a hammer.

MAN-CAR. A skip-truck having tiers of circus seats, used for carrying miners to and from work in mines operating deep inclined shafts.

MAN-ENGINE. An appliance for raising and lowering miners in deep incline shafts. Consists essentially of two long beams, worked in counterbalance and having platforms at stated intervals.

MASS. A solid chunk of native metal.

MASSIVE. Rock without defined lines of cleavage; ore occurring without appreciable gangue, as contradistinguished from ore disseminated throughout a gangue.

MATRICE. The rock surrounding an imbedded object, such as a particle or mass of ore or native metal.

MATRIX. Matrice.

MATTE. Regulus. A product between sulphide copper ore and blister copper, varying greatly in the percentage of metal contained. Is obtained by eliminating more or less sulphur and other elements from sulphide copper ores.

MATTING. The process of converting sulphide ores into matte.

MATTOCK. A miner's pickaxe.

MESA. Spanish for a tableland or plateau.

MESH. The size of openings in a screen.

METALLIFEROUS. Carrying metal.

METALLURGY. The science and practice of reducing metals from ores and minerals.

METAMORPHIC. Rock that has been metamorphosed.

METAMORPHOSIS. The process by which changes in structure are effected in a rock form by heat or percolating waters.

METER. A metre.

METRE. A linear measure of 39.37 inches.

METRIC TON. A weight of 2,204.6 pounds avoirdupois.

MILLING. Dressing ore in a mill; also running ore in a mine through a winze for loading into tram-cars or wheelbarrows on a lower level than the one where broken.

MILL RUN. A mill test.

MILL TEST. The determination of the metallic contents and recoverable values in any given ore by the milling of a sufficient quantity to afford average milling conditions.

MINE. An open pit, or underground opening or openings, from which mineral values are extracted.

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MINER. In strict construction, the man that does the drilling and blasting in a mine. In a broader sense, all men working underground.

MINERAL. Ore or rock containing metal. In the Lake Superior district the term mineral has a special use, being employed to designate the native copper, with its adhering gangue of amygdaloid or conglomerate rock, as it comes from the mill, before going to the smelter.

MINERAL BELT. The mineralized territory in a given formation or district.

MINERAL DE COBRE. Spanish for copper-matte.

MINERALIZED. Carrying metalliferous values.

MINERALOGY. The science of minerals.

MINERAL RIGHT. The ownership of the right to mine under the surface of land owned by another holder. Mineral rights sometimes are reserved in selling the surface of land in some districts.

MINERS INCH. The amount of water that will flow through an opening one inch square under a six-inch head, which is 2,274 cubic feet in 24 hours, or 94¾ cubic feet per hour, equal to 655 wine gallons or 593 imperial gallons hourly.

MINING ENGINEER. Any man having sufficient ability to pass intelligently upon mineral values, and to open and operate a mine, whether such ability was gained in a school or by practical experience. Graduates of technical mining schools usually are given the degree of engineer of mines and sign the letters E. M. after their names. The letters M. E. stand for mechanical engineer, when given by a school, but are often used by men engaged in mining, who lack scholastic degrees, as an abbreviation for mining expert.

MISSED HOLE. A drill hole, charged with explosives which fails to be set off by the fulminating cap.

MOIL. A steel bar, like a drill, except that it is sharpened to a point instead of having a cutting face.

MOLDS. Copper cast in molds.

MOMME. A Japanese weight equal to 3.75 grams or 2.4113 pennyweights.

MONOCLINE. A specific portion of the earth's crust in which the strata have a practically uniform dip.

MORAINE. A mass of boulders and detrital material marking the limits of a former glacier.

MORTAR. An assayer's mortar in which rock or ore is crushed with a pestle; a mortar-box.

MORTAR-BOX. The iron box under the stamps, into which ore or rock is fed for crushing.

MOUTH. The opening, at surface, of an adit, tunnel or shaft.

MUCKER. A trammer.

MULLOCK. Australian for waste rock broken underground.

MUNDIC. Pyrite.

NATIVE. A virgin metal—not an ore.

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NICKELIFEROUS. Carrying nickel.

NODULE. A small mineral mass of approximately spherical form.

NON-CONFORMABLE. Rock strata not associated originally in the position now occupied.

NUGGET. A lump of native metal. Term usually applied to gold.

OPEN-CAST. A mine worked as a quarry, without underground openings.

OPEN CUT. Open cast.

ORE. A chemical union of one or more metallic elements with other elements, usually non-metallic, of which oxygen, carbon and sulphur are the most frequent. For the various ores of copper, see chapter on chemistry and mineralogy.

ORE CAR. A mine car for carrying ore or waste rock.

ORE CHUTE. A specific portion of an ore vein carrying increased values. Usually has a vertical or diagonal dip on the plane of the dip of the ore body.

ORE DUMP. A dump for ore.

ORE SHOOT. An ore chute.

ORTHOCLOSE. Silicate of potassium and aluminum. An acid feldspar.

OUTCROP. The ledge of a lode or vein that is exposed on the surface of the earth.

OUTLIER. An isolated rock or group of rocks lying at a distance from the main body, and separated therefrom, on the surface of the earth, by a different rock formation.

OUTPUT. Production.

OVERBURDEN. Superincumbent material, usually drift or alluvium.

OVERHAND STOPING. Removing ore in ascending steps.

OXIDATION. Process of conversion of other minerals into oxides by weathering, or by the chemical effects of underground waters.

OXIDE. An ore of any metal or metals chemically united with oxygen.

OXIDIZE. To unite with oxygen. Many minerals and most metals oxidize with greater or less rapidity when exposed to air or water.

PARE. Cornish for a gang or shift of miners.

PARTING. The separation of two or more metals mechanically admixed by electrolysis, cupellation, use of acids or other chemical or metallurgical processes; a fluecan.

PASS. A winze.

PATENT. Direct title, from the government, to mineral lands.

PATIO. A walled yard with paved floor where finely crushed argentiferous ore is amalgamated.

PAYSTREAK. A portion of a vein or mineralized bed carrying workable values, occurring on either wall, or, occasionally, in the center of the mineral body.

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PENTHOUSE. A shed-roof erected in the bottom of a shaft; when sinking, to protect miners from accidental fall of rock, timber or tools from above.

PENTICE. An erroneous spelling of penthouse.

PEROXIDE. The oxide of any metal containing the greatest proportion of oxygen.

PERPENDICULAR SHAFT. A shaft sunk vertically.

PERTENENCIA. One mineral claim in Mexico; area, one hectare, or 2.471 acres.

PETERING. Pinching.

PETER OUT. To pinch out.

PETROLOGY. The science of rocks.

PHOSPHATE. An ore of any metal or metals with which phosphorous and oxygen are chemically united.

PICK. A pick axe.

PICUL. A Chinese weight of 133 1-3 pounds.

PILLAR. A section of rock or ore left in place to support shafts or roofs.

PINCHING. The narrowing of a vein.

PINCHING OUT. The narrowing of a vein to extinction.

PIPE VEIN. An ore body of chimney form, deposited in the vent of an extinct volcano.

PIT. An opening in the earth's surface, usually shallow.

PITCH. Synomymous with "dip," but occasionally used to designate the angle of decline from the horizon, measured along the strike of the ode or vein.

PLAIN. A flat, champaign country.

PLANE. A level surface bounded by straight lines.

PLANT. The machinery equipment of a mine or reduction works. In general use the term includes buildings housing machinery.

PLAT. The enlargement of a shaft at a level, to give extra space for loading and unloading the cage, skip or bucket.

PLATEAU. An elevated plain.

PLUMBIFEROUS. Carrying lead.

PLUTONIAN. Plutonic.

PLUTONIC. Rock strata of volcanic origin.

POCKET. Underground, an ore deposit, usually of small extent. On surface, a bin at shaft-house or mill, in which ore, flux or fuel is stored.

POCKETY. Carrying only occasional bunches of good ore.

POLING. The process of adding carbon to a charge of molten copper in a reverberatory furnace by stirring with long poles.

POLL-PICK. A tool having a pick on one end, and a poll, or hammer head, on the other.

POOD. A Russian weight of 36.112 pounds avoirdupois.

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POPPET-HEAD. Framework over a shaft for a sheave-wheel.

PORPHYRITIC. Of the nature of porphyry.

PORPHYRY. Like charity, covers a multitude of sins, and quite commonly is used to describe any crystalline rock. Properly, is any crystalline rock showing larger crystals upon a ground-mass of smaller crystals. Porphyry may be granite, quartz or one of several other rocks.

POUND. The troy pound is used for gold, silver and platinum only, the avoirdupois pound being used in weighing the other metals and other commodities in English-speaking countries.

POWER-DRILL. A machine for drilling holes in rock, actuated by compressed air, steam or electricity.

PRILL. Cornish for selected ore secured by cobbing.

PRIMARY. The first; the oldest rock formations.

PROP. A heavy timber placed with its foot against the floor of a mine opening, and its top against the roof, to support the rock above.

PROSPECT. To seek for mineral; a new mining property that has not yet earned the right to be called a mine.

PROSPECTOR. A searcher for mineral.

PROTOXIDE. The oxide of any metal containing the least proportion of oxygen.

PUDDINGSTONE. A coarse conglomerate showing rounded pebbles.

PULLEY-STAND. A temporary tripod or other light frame construction, holding a pulley, over which passes the rope used in hoisting.

PULP. Pulverized ore or concentrates.

PULVERIZE. To crush to powder.

PULVERULENT. That which easily may be reduced to powder.

PYRRHOTITE. Magnetic iron sulphide.

PYRITE. Iron disulphide.

PYRITES. Sulphide ores; more properly iron disulphide.

PYROGNOSTICS. Characteristics of a mineral under the blowpipe.

QUARRY. An open pit, of varying size, sometimes several acres, from which stone or ore is mined.

QUARTER-SECTION. In the United States a quarter of a square mile; 160 acres, laid out in a parallelogram, each side of which is one-half mile in length.

QUARTZ. Silica. Dioxide of silicon, frequently containing traces of iron and other minerals, and often the gangue of gold and other metals.

QUARTZ CLAIM. In the United States mining claims are divided into two classes, the first being placer claims, carrying mineral, usually gold, in alluvium, and quartz claims, this name being applied to any prospect carrying metalliferous bodies in place.

QUARTZITE. An oxide of silicon, with other minerals in varying quantities, partly granular and partly crystalline in structure.

QUARTZOSE. Rock having much quartz in its composition.

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QUICKSAND. Fine sand, which flows easily when wet.

RAGGING. Cornish for rough cobbing; broken lumps of ore of medium size.

RAISE. A shaft or winze that is being opened from below. Sometimes called upraise or uprise.

RAKE VEIN. A vein cutting through stratified rocks.

RANGE. A mineral belt, also in many American states a surveyor's term for describing and locating lands. The state is surveyed in sections (with their subdivisions), towns and ranges. A town (or township) comprises 36 sections and is a square of six miles. Each township receives a double number, one for the town and one for the range. The towns are numbered consecutively from south to north, and the ranges are similarly numbered from east to west.

RAW ORE. Ore before treatment.

REAMER. A tool like a bit, used to enlarge a hole previously drilled.

REDUCTION. The separation of metals from their ores.

REEF. A stratified mineral-bearing rock formation.

REFINING. The elimination of impurities from crude metals, or separation of metallic alloys obtained in the reduction of ores.

REFRACTORY. A refractory ore is one that cannot be smelted by ordinary metallurgical processes. A refractory stamp rock is one that is pulverized with unusual difficulty.

REGULUS. Copper matte.

RENIFORM. Kidney-shaped.

RESERVES. Bodies of mineral-bearing ground opened in a mine ahead of immediate requirements.

REVERBERATORY FURNACE. A smelting furnace in which the flame from the grate below is reflected back by the roof, on the charge of ore above.

RISE. A raise.

ROASTING. Driving off sulphur and other volatile elements from ore, by heat. When done in a furnace, under great heat, the process is called calcining.

ROASTING FURNACE. An oven for the expulsion from ore of sulphur, arsenic and other volatile elements.

ROB. To remove pillars and other supports from a mine for their mineral values, regardless of the future of the property.

ROCK. Stone.

ROCK BREAKER. A rock crusher.

ROCK BURROW. A pile of refuse rock from a mine.

ROCK CAR. An ore car.

ROCK CRUSHER. A machine for reducing rock or ore to smaller sizes. Crushers are of two types, the jaw crusher and the centrifugal. The jaw crusher works as a man cracks nuts with his teeth; the centrifugal operates on the plan of a coffee-grinder.

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ROCK DRILL. A power drill.

ROCK DUMP. A rock burrow.

ROCK FILLING. Waste rock, placed in worked-out stopes to support the roof.

ROCK-HOUSE. A building where copper-bearing rock is received and put through crushers before shipment to the mill. Is really a preliminary mill, and usually is built in connection with the shafthouse.

ROLL. To make depth at irregular angles.

ROLLS. Heavy steel rollers, worked in pairs, like a clothes wringer, for crushing rock and ore.

ROOF. The rock above a mine opening.

ROOM. Similar to a stope; term usually applied to mines working mineral bodies lying nearly horizontally.

ROYALTY. A percentage paid to the fee-owner from mineral values obtained by the lessee of a mine.

RULE-OF-THUMB. The guesswork and rough measurement plan of mining, in contradistinction to systematic development from data obtained by careful surveys.

RUN. A bar or course of ground better or worse than the average value of the mine.

RUNNING GROUND. Superincumbent material that falls into the mine openings.

SADDLE. An anticline.

SAFETY CAGE. A cage furnished with automatic appliances to stop its descent in case the cable breaks.

SALT. A chemical union of an acid with a base.

SALTING. Placing foreign ore in a mine to deceive intending purchasers or other interested parties.

SAMPLE. A specimen of ore from a mineral deposit. A selected sample usually is misleading because containing far above average values, and fine samples frequently come from the poorest mines. An average sample is what its name purports—if it be an average sample.

SAMPLING. Securing sufficient ore from mine openings to allow a test to determine average values. Honest sampling requires great skill and prolonged practical experience.

SAND PUMP. A pump, usually centrifugal, designed to lift water carrying large quantities of coarse tailings or sand in solution.

SANDS. Tailings from the stampmills of Lake Superior copper mines.

SAND SHAFT. A shaft sunk through quicksand.

SAND WHEEL. A large wheel, having buckets on its inner perimeter, for elevating water carrying stamp-sand.

SCALE COPPER. Copper in very thin flakes.

SCHIST. A metamorphic laminated rock of foliated structure, made up of superimposed flattened particles.

SCHISTOSE. Of the nature of schist.

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SCORIA. Slags from copper smelters; volcanic ash.

SCORIACEOUS. Of the nature of scoria.

SCRAM. A mine that is being gone through carefully, when apparently worked out, for mineral previously overlooked.

SCRAMMING. Searching a mine for mineral previously overlooked.

SCREEN. A grating of perforated metal or woven wire.

SEAM. A thin layer of rock or ore.

SECONDARY ENRICHMENT. Nature's process of evolving high-grade from low-grade ores. See chapter on geology.

SECTILE. That which may be cut easily.

SECTION. A field or district; also, in the United States of America, a square mile of land.

SECTION POST. A boundary mark set at section corners, by surveyors.

SEDIMENTARY. Rocks formed by deposition from water, as contradistinguished from rocks formed by igneous action.

SELVEGE. Fluecan.

SET. A framed form of timber, used for supporting ground in a mine.

SHAFT. A downward mine opening having its upper end at surface.

SHAFT-HOUSE. A building at the mouth of a shaft, where ore or rock is received from the mine.

SHALE. An argillaceous slate, of fissile structure.

SHEAVE. A grooved wheel, notched to carry rope; an open pulley.

SHIFT. A miner's turn, of eight to ten hours' work; a force of men employed on one turn.

SHIFT-BOSS. A mine boss, or under-captain, in charge of one gang or party of miners.

SHOE. A stamp shoe.

SHOOT. A chute.

SHORT TON. A weight of 2,000 pounds avoirdupois.

SHOT. A blast of some explosive.

SHOT COPPER. Small rounded nodules of native copper, somewhat resembling small shot in size and shape.

SHUTE. A chute.

SILICA. Dioxide of silicon.

SILICATE. An ore of any metal or metals chemically united with silica.

SILICIOUS. Containing much silica or quartz.

SILL. The floor-piece of a set of mine timbers.

SINKING. The process of deepening a shaft or winze.

SINKING-PUMP. A movable pump, usually vertical, secured to a platform, and lowered as required, as the shafts are deepened.

SKIP. An iron box, open at the top, running on four wheels, and hauled

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by a cable, used in incline shafts for hoisting ore and rock, and for lowering timber.

SKIP-ROAD. A track of T-rails, spiked to wooden sleepers, on which a skip runs.

SKIP-WAY. A skip-road.

SLAG. The vitreous refuse matter from a smelting furnace.

SLICE. To remove mine pillars.

SLICKENSIDE. A polished rock surface, showing striations produced by movement of adjoining rocks under great pressure.

SLIDE. A dissociation of strata caused by the subsidence of the overlying rock formation.

SLIME. Exceedingly small particles of rock and mineral held in solution in water.

SLIME TABLE. A circular revolving table, whereon slimes are worked, and the minute particles of mineral saved.

SLIP. A fault where a superincumbent stratum has slid downward.

SLUDGE. Mixed rock and water, brought to surface where a diamond drill cuts through very soft rock: tailings from a concentrator or mill.

SLUICE. A wooden flume or launder.

SMELTER. Works where ores or crude metals are freed from gangue or chemically united elements by heat.

SMELTING. The reduction of ores and crude metals, in furnaces, by heat, fuel and fluxing material being added to the matter to be smelted.

SMELTS. A smelter.

SOAPSTONE. Steatite.

SOFT GROUND. Underground openings that do not stand well and require heavy timbering.

SOLLAR. A platform in a shaft.

SPATHIC. Having a form approximating that of feldspar.

SPECIMEN. A sample of mineral selected because typical, unusual or exceptionally rich.

SPEISS. Impure metallic arsenides produced in copper smelting; ore particles finely disseminated throughout a rock, usually occuring as impregnations.

SPHALERITE. Zinc blende; zinc sulphide, often found associated with galena and chalcopyrite.

SPILL. Lagging driven ahead of the regular timbering in treacherous ground.

SPITZKASTEN. Pyramidal boxes wherein ores are concentrated and sized by a jet of water fed from below.

SPOON. A long-handled spoon, used to scrape out drill holes.

SQUARE SETS. A form of mine timbering having forms with mortised and tenoned sill, top piece and uprights of equal length, joined at right angles.

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SQUIB. A fuse.

SPRAG. A cross-timber set to secure the hanging wall in a stope.

SPUR. A short branch from a principal ore vein.

STACK. The chimney of a furnace; usually employed to designate a number of furnaces, when used in the plural.

STAMP-MILL. A mill for crushing and concentrating minerals.

STAMP-ROCK. Rock containing fine copper that can be secured by crushing and jigging.

STAMPS. Machines to crush rock or ore by heavy blows.

STAMP-SHOE. The heavy chilled iron casting attached to the lower end of a stamp piston, that does the actual crushing of rock in a stamp-mill.

STANNIFEROUS. Tin-bearing.

STATION. A chamber in a shaft, cut out for pumps, etc.

STATION-PUMP. A mine pump permanently placed, as distinguished from a movable sinking-pump.

STEAM-HAMMER. A heavy hammer, actuated by steam or compressed air.

STEAM-STAMP. A stamp actuated by steam.

STEATITE. Soapstone. A greasy mineral, having a talc base.

STEP FAULT. A series of faults, rising like steps.

STOCKWERK. Country rock penetrated by numerous small stringers of ore, the entire mass averaging sufficiently rich to permit its mining and treatment.

STOPE. Used interchangeably to designate the excavation above a drift, or the pay-rock remaining unmined above a drift.

STOPING. Breaking down the mass of pay-rock or ore above a drift. When stoping in an ore body of average width, miners can break rock much more quickly and cheaply than when driving the drifts, which are about 7x7 feet in size.

STOPING GROUND. Ground in reserve, opened by drifts, and ready for breaking down.

STRATA. The successive rock layers of the earth.

STRATIFIED. Having regular layers of varying rock forms.

STRATUM. A layer or bed of rock.

STREAK. The color given by a mineral when scratched or rubbed on porcelain.

STRIKE. The horizontal trend of a mineral body, measured by the points of the compass; a discovery of ore.

STRINGER. A thin seam of ore.

STRIP. To remove the drift or alluvial soil overlying an ore body.

STRIPPING. The drift or alluvial soil overlying an ore body.

STRUCTURE. The form of a mineral, whether granular, crystalline or amorphous.

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STUDDLE. A prop in a mine.

STULL. The top-piece of a set of mine timber.

SULPHATE. An ore of any metal or metals with which sulphur and water are united chemically.

SULPHIDE. An ore of any metal or metals with which sulphur is united chemically. Sometimes called a sulphuret.

SULPHOANTIMONITE. An ore of any metal or metals with which sulphur and antimony are united chemically.

SULPHOARSENITE. An ore of any metal or metals with which sulphur and arsenic are united chemically.

SULPHURET. A sulphide. Term becoming obsolete.

SUMP. The pit at the bottom of a shaft, where water collects.

SURFACE CAPTAIN. A mine superintendent whose duties are wholly on surface.

SURFACE RIGHTS. The ownership of the surface of land only, where mineral rights are reserved.

SWABSTICK. A stick used to clean out drill-holes.

SYNCLINAL. A syncline; of the nature of a syncline.

SYNCLINE. A trough formed by rock strata that are low in the center and high on the sides. The reverse of an anticline.

TABLE. An ore concentrator taking finely crushed particles of ore and gangue for separation.

TABLE LAND. A plateau.

TAILINGS. Refuse matter from a mill.

TAMP. To closely pack clay or other sticky earth into a drill-hole above the cartridges, to give greater force to the blast.

TAP. To draw off molten metal or slag from the vent of a furnace.

TAPER OFF. Cornish for stopping work temporarily.

TELERA. Spanish for a roast-heap of sulphide ore.

TENOR. The average metallic content of an ore, matte or impure metal.

TENSILE STRENGTH. The resistance to breaking or elongation offered by metal when under strain from either end.

TERRERO. Spanish for burrows of partly leached ore.

TERTIARY. Rock forms of the third great geological period.

TEST-PIT. A shallow pit sunk to discover mineral.

THROW. The vertical displacement of a vein caused by faulting.

TIMBER. The wooden beams and sticks used for underground supports.

TIMBER-BOSS. The head timberman.

TIMBERMAN. One who works at timbering a mine.

TON. See metric, long and short tons.

TONELADA. Spanish for long ton.

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TOSSING. Jigging finely comminuted ore.

TOWN. See Range for description.

TRACHYTE. A micaceous hornblende and feldspar rock.

TRAM. To load rock or ore in tram-cars and push same to the shaft; a tramway.

TRAM-CAR. A car running underground, on T-rails, used for carrying rock from the stopes and other workings to the shafts.

TRAMMERS. Men who load and tram the broken rock underground.

TRAP. A dense gray, blue or greenish rock of volcanic origin; of considerable variety in different beds, but usually of feldspathic-augitic nature.

TRAPPEAN. Of the nature of trap.

TREND. The general direction of a mineral body.

TRESTLE. A frame-work of timbers, connecting various mine and mill buildings on surface, usually carrying tram-tracks.

TRIBUTE. The royalty or percentage paid by workmen to owners for the privilege of working a mine. Apt to be a form of grand larceny, at the expense of the mine's future.

TRIBUTOR. One who works a mine on tribute.

TRIPOD. The three-legged iron fame on which the working parts of a power-drill rest; a three-legged wooden frame over the mouth of a pit or shaft.

TROLLEY-CABLE. A wire rope sometimes used in an incline shaft as a guide for the bucket.

TROUBLED. A vein is troubled when disturbed or faulted.

TRUE FISSURE VEIN. All mineralized fissures are true fissure veins. Term commonly used as meaning a fissure vein with promise of holding to great depth, in contradistinction to a gash vein.

TSUBO. A Japanese measure of six feet square, equalling 36 square feet.

TUFA. A porous limestone. Name frequently used in place of tuff for rock of volcanic origin.

TUFF. Scoriaceous material from volcanic vents, solidified by time and superincumbent pressure. Tuffs range in density from porous pumice-stone to dense and exceedingly refractory conglomerates.

TUNNEL. A practically horizontal opening entirely through a hill or mountain. Term is commonly used instead of adit, which is a horizontal gallery having only one opening to surface.

TURBINE. The most efficient form of a water-wheel; also a new form of steam-engine in which the entire movement of the power producing parts is rotary instead of reciprocating.

TUYERES. The vents by which air is supplied, under pressure, to blast furnaces and bessemer converters.

UNCONFORMABLE. Rock strata that do not correspond as to bedding, or geological horizons.

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UNDERHAND STOPING. Removing ore in descending steps.

UNDERLAY. The mineral bodies lying under a given tract, though not outcropping on surface.

UNDERLIE. The underlay.

UNPATENTED. Mining claims held from the United States Government, subject to annual assessment work.

UNSTRATIFIED. Rock forms not bedded in layers.

UNWATER. To free from water; to pump out.

UPCAST. A shaft having an upward air current.

UPRAISE. A raise.

VAN. To dress ore.

VANNER. A jig for dressing ore by means of vibratory motion, aided by jets of water to carry away gangue-rock.

VARA. A Spanish-American measure of length of 33 inches.

VEIN. A mineral body having defined walls. See contact vein and fissure vein.

VEINSTUFF. Ore with its associated gangue.

VENTILATION. The system of natural or artificial air currents in a mine. See air-shaft.

VERTICAL. Perpendicular. Upright and downright.

VERTICAL SHAFT. One sunk at an angle of 90° with the horizon, or directly downwards toward the center of the earth.

VINNEY. Cornish for copper ore with a green coating caused by weathering.

VIRGIN. Native metal occurring elementally, as distinguished from ores, which are chemical compounds.

VITREOUS. Of a glassy nature.

VOLATILE. That which can be driven off as vapor, by heat.

VUG. A druse. A hollow, or cave, entirely surrounded by rock. Usually shows fine crystallizations.

WALL. Rock of a different formation adjoining a vein or other ore body.

WATER DRILL. A power drill in which a current of water runs through the bit of a drill, changing the rock-dust from the bit into sludge, which is expelled from the bore-hole by the force of the current.

WATER-JACKET. An outer casing for a blast-furnace, in which water circulates, to keep the metallic furnace-walls from melting because of the intense heat of the charge.

WATER LEVEL. The ground water level is the point above which water does not rise when a mine is allowed to fill. The basic water level is the point below which altered and enriched ores are succeeded by base unaltered sulphides.

WEATHERED. Rock altered in structure by exposure to air and water.

WET PROCESS. Lixiviation.

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WHEAL. Cornish for mine. Synonymous with bal.

WHIM. A windlass with a horizontal drum.

WHIP. A rope and fixed pulley or pulleys for hoisting.

WILFLEY. A Wilfley concentrating table.

WINCH. A windlass.

WINZE. A blind shaft, usually short, leading downward from a horizontal opening of a mine.

WINDLASS. A winding device for hoisting from a pit or shaft, by means of coiling a rope or cable around a drum.

WIRE BARS. Refined copper cast into bars for wire drawing.

WORKINGS. The underground openings of a mine.

ZINC BLENDE. Sphalerite. Sulphide of zinc.

ZINCIFEROUS. Carrying zinc.

ZINC SULPHIDE. Sphalerite.

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CHAPTER XIV.

Copper Deposits of the United States.

Copper is found throughout the entire length of the Rocky Mountains, in Canada, the United States, Mexico and Central America, and in the cordillera of the Andes in South America from the extreme north to Punta Arenas on the Straits of Magellan. The North American copper deposits apparently are richer west of the main range of the Rockies, and the principal deposits, as a rule, occur in various isolated mountain ranges in the high tablelands between the Rocky Mountains and the Pacific. In the eastern part of the United States the Appalachian Mountain system carries copper ores from Maine to Alabama, the principal deposits occurring in the Green Mountains, Blue Ridge Mountains and Piedmont Mountains. In the Lake Superior district native copper is carried in the roots of an ancient mountain range. The mines of the United States furnish 55 to 60 per cent. of the total copper supply of the world. Occurrences of copper are treated by states, in alphabetical order.

ALABAMA. In the northeastern portion of Alabama the extension of the Ducktown district of Tennessee carries pyritic ores of a similar nature. Copper occurrences are noted in the counties of Cleburne, Clay, Coosa, Dean, Haralson, Marion and Randolph.

In Cleburne county considerable copper mining was done in the eighth decade of the Nineteenth Century. The Woods or Stone Hill mine showed a prominent gossan, with chalcocite in the secondary zone, succeeded by chalcopyrite at comparatively shallow depth. The ore was but slightly argentiferous and carried occasional sphalerite. The Smith mine, near the Woods, had a similar ore body.

Mines of cupriferous pyrites have been opened recently in Clay county, and copper ore is found near Goodwater in Coosa county. Cupriferous pyrites are being developed in Dean county. In Haralson county the Tallapoosa pyrite mine, about 25 miles east of Tallapoosa, shows lenses of slightly cupriferous iron pyrites.

ALASKA. The territory of Alaska is greater in area than France, Germany, Belgium, Holland and Denmark combined, and its copper deposits are scattered over a vast territory, in most cases but slightly explored. Transportation facilities are excellent for the coast mines, but lacking for the interior properties, which must have rail connections in order to become producers. The first important copper production was secured in 1904, from coast mines. The geography of Alaska remains somewhat vague as to the interior, by reason of the country being so vast, so sparsely populated and so slightly developed. It is known that certain tribes of aborigines possessed copper before the coming of the white man, and it is altogether probable that this copper was secured from the native deposits of the metal found in the Copper River country and adjoining fields.

The principal copper districts of Alaska, so far as now known, are those of Prince of Wales Island, Prince William Sound and the Copper River coun-

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try, the latter an immense district with numerous occurrences of ore and native copper. Alaska never has been organized as a territory, and has no counties, hence the difficulty in giving anything like exact limits to the districts of the interior.

The principal copper field of the present is the Prince William Sound district, which includes a long stretch of mainland and outlying islands. This district includes Latouche Island, Knights Island and the Ketchikan field. Nearly all of the mines are located within a mile or less of tide-water, and are enabled to ship their ores easily and cheaply to smelters along Puget Sound. The ore is mainly chalcopyrite, commonly associated with pyrrhotite and occasionally with pyrite, with a little chalcocite and malachite, occurring along shear zones and in sedimentary slates and altered lava flows called greenstones. As a rule, there are fairly strong gossans of slight depth. Latouche Island has several promising properties that are shippers, and the Bonanza mine has a large ore body outcropping on a mural escarpment near the sea. Knights Island shows promising sulphide ores in greenstone and associated rocks of the Orca series. Glacier Island also shows ore of promise. Ketchikan is the principal town of this district.

Several mines have been developed on Prince of Wales Island, mainly on contact deposits between limestone and intrusive diorite or greenstone. Below a shallow zone of oxidation the ore is mainly chalcopyrite, associated with magnetite, in lenses up to 40 feet width and 150 feet length, the chalcopyrite carrying one to two dollars gold per ton, with small silver values.

The Copper River country includes a number of sub-districts of large area, around the headwaters of the Copper, Tanana, Shusitna and White rivers, including portions of the Wrangell, Chugatch and Alaskan mountain ranges. The Copper River basin is a broad syncline, the central part of which is occupied by the Wrangell Mountains, of Tertiary age. The most prominent rock formation is the Nicholai greenstone, associated for about 300 miles with Permian limestone. The Nicholai formation consists mainly of amygdaloidal flows, resembling those in the Lake Superior district, and carries native copper and secondary sulphides. The flows are mainly altered basalts, containing considerable metallic copper in fissures, or in sedimentary rocks near the point of contact with the traps. Copper occurs native and as oxides in shear zones, or as chalcocite and bornite in veins in greenstone. Bornite, which is the principal ore, is slightly auriferous and argentiferous.

The basin of the Kotsina River, in the Copper River district, shows native copper with quartz gangue, near the basal flows of the greenstone series, filling amygdules in greenstone and associated with epidote, as in the Lake Superior district, there being a little bornite and chalcopyrite in connection with the native copper. This district is about 125 miles northeast of Valdez.

The Chitna district shows numerous occurrences of sulphide ores, with native stream copper along the valley of the river, and between the river and Mount Wrangell. On Nugget Creek, a tributary of the Kuskulana River, a mass of native copper, reported as three by eight feet in size was found. Native copper is found on the headwaters of the Nizina River.

Numerous copper occurrences are noted on the headwaters of the White River, and small masses of native metal weighing up to ten pounds have

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been found in greenstone dykes, said to traverse limestone and schists. The veins are small, and those noted seem of small importance. Along Kletsan Creek, near Scolai Pass, on the divide between the White and Chitna Rivers, native copper occurs as stream metal, evidently derived from ancient basaltic dykes intersecting diorite and Carboniferous limestone. Most of the valley is overlaid with a deposit of volcanic ash, up to one hundred feet in depth.

Native copper is reported from the Kenai Peninsula and the Turnagain Arm district, and copper sulphides occur in metamorphic rocks in the Kenai Peninsula. Copper ores are reported from Resurrection Bay and Lynx Creek, 50 miles north of Seward, and on the Knik River and Lake Iliama, west of Cook Inlet.

ARIZONA. Arizona is the second district of the United States and of the world in point of copper production, ranking second only to Montana. No other copper field has shown such heavy gains in production during the past decade, and there is none with brighter prospects for the future. About one-sixth of the copper mines of the United States are found in Arizona, and of this number many are of very doubtful value, while a few are of thoroughly demonstrated worth, and a considerable number are properties of much promise.

There are evidences of rude mining operations by prehistoric peoples at a number of points, but no traces of smelting, and, had the copper ores been reduced, the slags and possibly remnants of the furnaces scarcely could have escaped attention. It seems probable that azurite, malachite and ochrous iron were mined, in a crude way, for pigments, and prehistoric turquoise mines have been found at several points, notably in the Dragoon Mountains.

The first copper smelter of Arizona, built of adobe bricks, is said to have been located at the Ajo mines, in Yuma county, about 40 miles southeast of Gila Bend, and to have been operated by P. R. Brady and others, immediately after the Gadsen Purchase, in 1852. In 1873 copper production was begun from the Longfellow mine, near Clifton, Graham county, with an adobe furnace.

There are numerous copper districts in the various counties, these having, as a rule, a generally southeasterly and northwesterly trend, with copper deposits commonly on or near the contacts of igneous rock with Paleozoic limestones, mainly of the Carboniferous series. The greater portion of Arizona is included geologically in the Sonoran Plateau, with conditions much the same as in the adjoining Mexican state of Sonora.

Central and southern Arizona form a plateau of 1,000 to 5,000 feet elevation, grading to nearly sea-level along the western edge, with numerous isolated mountain ranges. Apparently this part of Arizona emerged from the seas late in the Tertiary age.

Arizona has copper mines, or attempts at mines, in the counties of Apache, Cochise, Coconino, Gila, Graham, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai and Yuma, this list including every county in the territory. The principal districts, in order of importance, are the Warren district at Bisbee, Cochise county, the Greenlee district of Graham county, the Globe district of Gila county and the Jerome district of Yavapai county,

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with a number of minor districts of some present importance and considerable future promise.

Apache county has copper deposits, apparently of promise, mainly undeveloped and but slightly prospected.

In Cochise county the Warren district, lying in the Mule Mountains, commonly called the Bisbee district, is the only important producer. Copper ores are shown, however, in the Chiricahua, Dragoon, Huachuca, Rincon, Swishelm and Whetstone Mountains. In the California mining district of the Chiricahua Mountains no important mines have been developed, though considerable good ore has been uncovered. In the Johnson camp of the Dragoon Mountains an intrusive granitic core is flanked by schist, quartzite, conglomerate and limestone, the latter carrying ores near a quartzite contact, the oxidized ores including chrysocolla, with sulphides at depth. Considerable development work has been done in the Huachuca Mountains, but no producing mines have been developed as yet.

The Bisbee or Warren district may be compared in form to half of a peach, retaining the pit, which corresponds to Sacramento Hill, a big gossan blowout half surrounded by a semi-circle of irregular ore bodies in limestone, with granite-porphyry to the northeast, the gulch between the mountains being roughly the dividing line between the porphyry and limestone. There is a conglomerate capping over the junction between the porphyritic and limestone rocks, with numerous quartzite dykes intruding the limestone. The rocks of the Bisbee district may be divided into five groups, these being pre-Cambrian crystalline schists, Paleozoic sedimentaries, Mesozoic sedimentaries, Quaternary sedimentaries and igneous intrusives. The underlying crystalline schists, of pre-Cambrian age, are unconformable with the superimposed stratum of Cambrian quartzite, about 450 feet in thickness, above which lie about 4,500 feet of limestones of Cambrian, Devonian and Carboniferous ages, with copper occurring in the Carboniferous series, the ore developed so far occurring in the beds known locally as the Naco and Escobrosa limes, which are considerably faulted. The ore bodies evidently were caused both by contact metamorphism and by percolating waters. The mineralization obviously came from the porphyritic intrusives, presumably of Carboniferous age, and in the Cretaceous period a subsidance caused an accumulation of about 4,500 feet of superimposed sandstones, conglomerate, shales and limestone, followed by emergence and much erosion, with considerable faulting. There is much displacement, accompanied by thrust-faulting, with overthrusts of nearly two miles. The limestone has numerous caves, often showing beautiful stalactitic formations, and crystalline copper carbonates. Along the contacts of the igneous and sedimentary rocks there are large masses of low-grade cupriferous pyrite, partly oxidized, and Sacramento Hill contains low-grade disseminated copper and iron pyrites. The ore occurs in very irregular bodies, but with a marked tendency to follow the bedding planes of the limestone, and the principal ore bodies found so far are adjacent to, and, as a rule, not more than 1,000 feet from, the porphyry contact. The copper ore outcropped at what is now known as the Cave shaft of the Copper Queen mine, and dips under the gulch at an even sharper angle than the drop of the gulch itself.

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All of the more common oxidized and sulphide ores are noted, and there is considerable native copper, occurring as masses up to some hundredweights in size, and as finely comminuted native metal in the fluccan, which is heavy along the walls. The principal ores are disseminated chalcocite and chalcopyrite, the chalcocite usually being associated with manganese in a talc gangue, and being the source of more than half of the total copper production of the district. There are small but appreciable values in silver and gold, and to the northwestward of the cupriferous crescent are lead ores, and, in fact, Bisbee was a lead camp previous to the opening of the copper deposits of the Copper Queen mine, in 1880. The zone of oxidation is most erratic, and full oxidation is noted to the greatest depth yet reached, which is nearly a quarter-mile. The secondary sulphides are found with oxidized ores above and below, and even the unaltered sulphide, chalcopyrite, is sandwiched between oxidized ores and native copper, in a most confusing manner. Indications are not especially promising either north or south of the cupriferous crescent, though narrow fissure veins, containing high-grade ores, are noted in the granite-porphyry for nearly the entire length of the range.

In Coconino county there are promising copper outcrops on the southern plateau of the Grand Cañon of the Colorado River, and several small mines have produced limited quantities of ore, mainly rich carbonates, with occasional chrysocolla and a little chalcocite. There also are developing copper mines in the vicinity of Flagstaff, and at Ryan, in the northern part of the county, near the Utah line.

The first mines in the Globe camp of Gila county were opened for silver, in 1874, and were closed in 1877, copper mining beginning in the following year. The pioneers suffered severely from raids of the Apaches, and worked under great economical disadvantages, due to poor transportation facilities and expensive fuel. Oxidized ores only were smelted until 1902, when sulphide smelting was introduced. The geological base of the Globe district is the Pinal schist, of pre-Cambrian age, succeeded by the Apache group of pre-Cambrian rocks and the Globe limestone, including beds of age from Devonian to upper Carboniferous, faulted by the Gila conglomerate of Tertiary age. After the laying down of the Gila conglomerate there was much faulting and compression, with marked metamorphism, with a complex of eruptives enjoying a great variety of lithological cognomens, according to the fancy of the geologists. Roughly speaking it may be said that a limestone and diabase contact shows ore bodies occurring as irregular lenses, practically parallel with the horizontal bedding planes of the limestone series, up to nearly 600 feet in thickness, resting on quartzite.. The Old Dominion fault is a very prominent geological landmark, ore occurring mainly on the southern side. There are fissure veins and fault-fissures, but many fissures are not all mineralized. The average strike of the veins is approximately northeast and southwest, with dips of 40 to 90 degrees. The ore bodies may be divided into three classes, these being irregular masses in limestone, fissure veins, and irregular mineralizations of the permeable rocks. Ores are mainly oxidized, but with occasional occurrences of sulphides, which may have oxidized ores below as well as above. The oxidized ores carry considerable hematite in their gangue, but are highly silicious and require heavy fluxing with iron as well as lime. The shortage of sulphide ores needed to furnish iron for fluxing the oxidized

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ores is a drawback to the field. The Globe district is quite extensive in area, and the Gibson property shows veins of very high-grade massive secondary sulphides, in schist. Copper developments are under way in the San Carlos and Christmas districts, and elsewhere in Gila county.

The Greenlee district, in which are found the mining towns of Clifton, Morenci and Metcalf, is known commonly as the Clifton district, and is the oldest of the present important copper fields of Arizona, dating from 1872, and also is notable for the invention of the water-jacket blast-furnace. This district is second in Arizona as a producer, but is second to none in size of its ore bodies, though the ore, while occasionally found in high-grade fissures, is mainly of low copper tenor. The Arizona and Detroit mines are working low-grade ore bodies carrying 3 to 4 per cent. copper only, and the future of the district rests mainly on extensive development of ore bodies of even lower average tenor.

The geology of the Clifton district probably is more complex than that of any other important copper field of the world, and would require a monograph of a hundred pages or more for a complete exposition. A most critical and exhaustive study of this field has been made by Prof. Waldemar Lindgren, of the United States Geological Survey, and his report thereon is a monumental work. The Clifton district may be described as a geological island of pre-Tertiary granite-porphyry, quartzite and limestone, surrounded by lava flows and a sedimentary series of Paleozoic age, including quartzite and conglomerate, upon which is imposed about 800 feet of limestone beds of Silurian, Devonian and Carboniferous ages, intruded by porphyry and partially covered with flows of rhyolite and andesite. The porphyry is essentially a monzonite and much of it is workable as an ore of low grade. Contact metamorphism apparently is responsible for most of the extensive mineralization, though there are evidences at many points of secondary enrichment. The oxidized zone extends from surface to a depth of 50 to 200 feet, usually carrying oxidized ores of greatly varying tenors, though sometimes barren. The zone of secondary sulphides is 100 to 500 feet in depth, carrying chalcocite and bornite, succeeded by the pyritic zone carrying chalcopyrite and sphalerite, associated with pyrite. The ores of the pyritic zone are low in copper tenor, and difficult of reduction, because of the considerable quantities of zinc associated therewith, but this zone contains enormous quantities of ore, which, without question, will be extracted in the future. The ore bodies include oxidized ores occurring in irregular forms near contacts, also fissure veins of sulphide ores in the porphyritic zone, and contact deposits in prophyry. There also are stockwerks, carrying veinlets of disseminated chalcocite, these occuring mainly in porphyry, but occasionally in quartzite. The cupriferous monzonite may be considered the predominant ore deposit, this containing finely disseminated chalcocite in a highly altered monzonite-porphyry, with the gangue ranging from quartz to talc. Considerable brochantite is produced, this being one of the few districts where brochantite is found as a commercial ore. The rich oxide and carbonate ores of early days are practically exhausted, in the older and larger mines, but oxidized ores low in copper tenor are treated by leaching, this being one of the very few American copper fields in which leaching processes are employed successfully. The average of all ores treated in the district is about 3.5 per cent. copper and 18 cents gold per

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short ton, while the oxidized ores treated by the Arizona Copper Co. average under 3 per cent. copper, and are the lowest in grade of any copper ores treated at a profit in Arizona.

In addition to the mines of the Greenlee district there are small copper properties elsewhere in Graham county, notably at Fort Thomas, Fort Grant, Pima, Safford, Solomonville and Willcox.

Maricopa county has a considerable number of developing mines, of various degrees of promise. The principal copper mining districts are found at Wickenburg, Cave Creek and Morristown.

Mining operations in Mohave county have been mainly for the precious metals, but there are a number of developing copper mines in the vicinity of Kingman and Chloride, and copper properties of considerable promise are noted along the Colorado River, and on the Bill Williams Fork River that forms the boundary line between Mohave and Yuma counties.

Navajo county has no copper producers, but there are ore bodies apparently worthy of serious investigation. On the Navajo Indian Reservation, shortly south of the Utah line, Triassic sandstones show a stratum carrying chrysocolla and occasional melaconite, as speiss and nodules, rich but very erratic in occurrence.

The principal producing copper field of Pima county is the Silver Bell district, though production has begun from the Pima district. The principal mining fields of the county are found in the Sierrita, Santa Rita and Santa Catalina mountains. In the latter district, near Tucson, more or less exploratory and development work has been done for about seven miles. The mountains show a granitic core, with quartzite and limestone sedimentary beds, cut by intrusive dykes of diabase, with ore occurrences along the dykes.

The Silver Bell district is in the Silver Bell Mountains, a small, isolated range of less than 3,000 feet elevation. The hills have granite bases, with quartzite and limestone strata superimposed, the latter being much eroded, with the usual intrusive rocks, the ore bodies occurring as irregular masses with prominent gossans, in porphyry shear-planes, and in limestone and granite-porphyry, near the contacts. The ores are mainly chalcopyrite and bornite.

The Pima district, on the slope of the Sierrita Mountains, was mined first in 1880, for silver-lead ores. This district shows large bodies of low-grade ore in limestone, and occasionally in porphyry, along the contact of these rocks, the ore usually having a limestone gangue, there being intrusive quartzites.

In the Santa Rita Mountains the Helvetia district shows Carboniferous limestone strata, with prophyritic intrusions, the ore bodies showing good gossan outcrops.

Pinal county, while having no large copper producers, has several districts of decided promise, and should become an important copper field, with further development. The Ray or Kelvin district shows a zone of approximately one mile width, with a length of at least three miles, in which occur banded acid igneous rocks, giving strong evidences of thermal alterations and silicification, carrying chalcopyrite coated with chalcocite, in small particles and thin veinlets, with gangue of country rock, and also

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showing occasional bunches of ore of fair size. The surface showing of gossan throughout this zone is good, and apparently copper continues into the diorite to the westward of the zone. There are no sedimentary rocks in or near the principal copper zone. A little high-grade ore is noted at points, but, as a rule, the ore is low in copper tenor, though in tremendous quantity. The Mineral Creek district, near Ray, shows silicious and argillaceous shales and quartzite, with intrusive dykes of granite-porphyry, the quartzite being much faulted and brecciated along fault-planes. Carbonate ores of varying tenor are found throughout the district.

The Christmas district, on the Gila River, shows oxidized and sulphide ores, in altered limestone near porphyritic intrusives, ore being mainly chalcopyrite, associated with a profusion of magnetite.

The Pioneer district, sometimes called the Superior district, was worked originally for gold. The principal copper property in this district has two contact veins, between quartzite and limestone, carrying silicious oxide and carbonate ores, more or less auriferous and argentiferous, with occasional free gold, and associated with iron and manganese.

The Casa Grande district shows ore of good average tenor, and copper ores of more or less promise are noted at various other points in the county.

Santa Cruz is the smallest county in Arizona, lying near the Mexican border. Principal developments are in the Patagonia Mountains, where there are several mining districts. This mountain range shows the characteristics common to practically all of the isolated ranges of the Sonoran Plateau, and ore bodies occur mainly as contacts between limestone and porphyritic rocks, or in the limestone near the point of contact. The copper ores usually are auriferous and argentiferous, and in most cases are associated with galena and sphalerite, the latter causing considerable trouble in reduction.

The county of Yavapai in area would put to blush several of the smaller kingdoms of Europe, and is mineralized in all of its mountain ranges. This county is the principal gold district of Arizona, and shows copper ores, of more or less promise, in practically every one of its numerous mining districts. There are copper mines, or attempts at mines, near Big Bug, Briggs, Carrollton, Cherry, Crown King, Dewey, Gilbert, Granite, Groom Creek, Humboldt, Huron, Jerome, Kirtland, Maxton, Mayer, McCabe, Middleton, Minnehaha, Poland, Providence, Prescott, Stoddard and Turkey. The only important copper producer is in the United Verde mine, at Jerome, though the Bradshaw Mountains have small producers of promise, and there are other fields in which development work is under way.

The Verde district, which includes Jerome, is very rugged. The district was fissured and faulted, then cut transversely, at nearly right angles, by dykes, followed by extensive mineralization, apparently by metasomatic action. The country rock is a schistose slate, extensively intruded by igneous dioritic rocks, with an unconformable capping of limestones and sandstones of later age devoid of copper. The veins at Jerome and to the southward show strong gossans and promising surface indications, but many attempts at developing mines have resulted in the making of no important producers except the United Verde. This property shows two ore bodies separated by low-grade ore and a quartzite dyke very rich in gold

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and silver. There is a limited zone of oxidized ores, largely worked out, but the principal values are in disseminated sulphides.

Yuma county was accessible with such difficulty, until the building of the Arizona & California railroad, in 1906, that copper mining developments have lagged, though there are notable deposits of copper ore along the Colorado and Bill Williams Fork rivers. The Empire Flat district shows schist and limestone beds with intrusive granite, carrying fissure veins with strong gossans. The ores are of great variety, and exceptional richness, including considerable chrysocolla in the oxidized zone, and secondary sulphides of high average tenor. The district around Empire Landing, about 75 miles above Empire Flat, is partly in Yuma county, Arizona and partly in San Bernardino county, California. Although explored slightly during the preceding twenty years, development may be said to date from the advent of a railroad, in 1906, though some copper ore was mined and shipped by way of the Colorado River to Swansea, in early days. There are ore occurrences of considerable promise in this district.

ARKANSAS. Copper ores are noted sparingly throughout the Ozark uplift, and copper deposits are found in the counties of Baxter, Garland, Montgomery, Marion, Pulaski, Searcey and Sevier. The ore as a rule is chalcopyrite, and quite commonly is associated with galena and sphalerite. The lead and zinc deposits of the Ozark region apparently are of greater promise than the copper ores. Tetrahedrite and tennantite are noted ten miles north of Little Rock, in Pulaski county.

CALIFORNIA. Few states in the Union are more richly endowed with copper. The first discovery, made in 1840, when California was a portion of Mexico, was near El Paso Soledad, in what is now Los Angeles county, and in 1854 a little copper was produced therefrom. In 1855 copper was discovered in Alpine county, but the Napoleon mine, in Calaveras county, discovered and opened in 1860, was the first Californian copper producer of importance. There was a copper boom in 1862 and 1863, with hundreds of stock companies organized, and between 1863 and 1866, nine small copper smelters were built in the state, the local production being about two million pounds in 1864, in addition to considerable shipments of ore to Swansea, Baltimore and New York. After 1868 the industry was practically non-existent, until 1896, when the Iron Mountain mine, under English management, became an important producer. The high-water mark of production was reached in 1901, with an output of 34,931,985 pounds fine copper, in which year Shasta county produced 30,990,781 pounds, with between one and two million pounds each from Calaveras and Fresno counties, the balance of the output being composed of the small contributions of fifteen other counties. In 1900 California stood fourth among the copper producing fields of the United States.

There are occurrences of copper ore in about fifty of the fifty-seven counties of California, and there are copper mines of more or less importance in the counties of: Alameda, Alpine, Amador, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Humboldt, Inyo, Kern, Lake, Lassen, Los Angeles, Madera, Marin, Mariposa, Mendocino, Merced, Mono, Nevada, Placer, Plumas, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Clara, Shasta, Siskiyou, Sonoma, Tehama, Trinity, Tulare and Tuolumne.

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The copper fields of the state may be divided into four groups, of which the first in productive importance is in Shasta county, the second in the Sierra Nevadas, the third along the Coast Range Mountains, and the fourth in the desert region of Southern California, near the Nevada and Arizona lines. The Sierra Nevada copper belt stretches along the western flanks and foothills of the mountains, showing practically continuous occurrences of copper for nearly 400 miles, reaching from Oregon on the north to nearly the Lower California line. This field contains many old mines, and is a district of much promise. The Coast Range field shows copper deposits for about 150 miles southward from the Oregon line, but the principal occurrences and developments are in Siskiyou and Del Norte counties, on the Oregon boundary. The southern extension of the Coast Range belt also shows copper ores in San Diego and adjoining southern counties. In Kern county there is an apparent branching of the Sierran copper range, with an offshoot that traverses Inyo and San Bernardino counties, reaching over into the neighboring territory of Arizona, thus establishing a close geographical and geological connection between the copper measures of southeastern California and central western Arizona. The mines of Shasta county are of preponderant importance, Calaveras county in the Sierra Nevadas coming second, with Fresno third, and with important developments under way in Siskiyou and Del Norte counties.

As a rule the alteration zone of Californian copper deposits is comparatively shallow, showing oxidized ores of high grade in profusion at surface, usually succeeded by unaltered chalcopyrite at an average depth of about one hundred feet only.

The copper district of Shasta county, as developed, is a crescent of two to three miles average width by about thirty miles extreme length. The principal developments are in the western third of the crescent, though there are properties of promise to the eastward. This district shows an extensive series of sedimentary rocks ranging in age from Miocene to Devonian, associated with igneous rocks of various ages, intercalated with the sedimentaries, or more commonly occurring as intrusives. The western end of the crescent shows slate to the west with granite-porphyry and quartzite to the east. Copper ores occur as sulphide deposits in contact zones and shear zones and a wide and irregular belt of igneous rocks runs from Iron Mountain past Bully Hill, traversing a series of sedimentaries ranging from Devonian up to nearly the top of the Triassic series. A large portion of this rock is volcanic, embracing acid and basic lavas, with fossiliferous tuffs. The entire district is much faulted and sheared, with sulphide ore bodies occurring in shear zones ranging up to hundreds of feet in width. These lenses are usually flat-lying, with chalcopyrite disseminated in pyrite, almost invariably auriferous, but low in copper tenor. The gossan cappings are massive, and large bodies of silicious ore are lacking. The Iron Mountain mine was worked originally for gold and silver values in the gossan.

In Calaveras county the principal developments are in the vicinity of Copperopolis, where mining has been done, more or less regularly, for many years. The ore bodies occur in black pyritous slate, in a bed of amphibole schist, the geological horizon being the same as at the gold mines of the Mother Lode, twelve miles eastward.

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Along the coast there are important deposits of cupriferous pyrites in the suburbs of Oakland, Alameda county, on San Francisco Bay, and copper has been found in sewer digging on Connecticut street, between Eighteenth and Mariposa streets, in the city of San Francisco.

Santa Clara county has promising copper deposits in the vicinity of the New Almaden quicksilver mines. Copper was discovered in Los Osos district of the Coast Range Mountains, San Luis Obispo county, in 1854. In San Diego county copper occurs in the Encinitas district, and at various other points.

In the desert country of southeastern California, comprised mainly in the counties of Inyo and San Bernardino, copper occurs at numerous points. The Ubehebe district of Inyo county shows promising surface indications and rich ores at several points. The Death Valley region of Inyo county was the scene of a copper boom in 1906-1907, when many mining companies were organized, and considerable work was done in the Greenwater district, which lies on the flanks of the Funeral Range, east of Death Valley. The formation of the Greenwater district consists of underlying granite-porphyry, with rhyolite flows and tuffs, the summits of the mountains being capped by remnants of basaltic flows, with no sedimentary rocks known as yet. The mineralized belt is about 30 miles in length, and ores, as found, are mainly of high average tenor, highly silicious, occurring in shear zones in granite, having a generally southwesterly trend, in streaks of one to three feet in width. The Greenwater district has proven disappointing.

COLORADO. Nearly one-third of the refined copper produced by Colorado smelters comes from ores mined in other states and territories, and upwards of half of the copper production from Colorado mines comes from Leadville, in Lake county, where the principal mineral products are lead, silver and zinc, but at depth there is a marked increase in copper values, and it is possible that Leadville may become a copper camp of importance, in time. Practically the entire copper output of the state is secured as a by-product from silver-lead and zinc ores. With the exception of a plateau in the eastern half of the state, Colorado is heavily mineralized throughout the mountains, but as a rule the geological conditions are not so favorable to the occurrence of large bodies of copper as in most of the other mountain states. Outside of the Leadville district the most promising copper fields seem to be in Larimer and Routt counties. There are copper mines, or mines carrying considerable copper values, in the counties of Boulder, Chaffee, Clear Creek, Costilla, Custer, Delta, Dolores, Eagle, El Paso, Frémont, Gilpin, Grant, Gunnison, Hinsdale, Huerfano, Jefferson, Lake, LaPlata, Larimer, Mesa, Montrose, Ouray, Park, Pitkin, Routt, Saguache, San Juan, San Miguel, Summit and Teller.

Larimer county shows numerous copper deposits near the Wyoming line, the Pearl district, lying about 20 miles southeast of Encampment, Wyoming, being the most important. The geology of the Pearl district is much the same as that of Encampment, except that quartzite is lacking, the prevalent rock formation being granite masses cut by pegmatite dykes. The ore is mainly chalcopyrite, associated with considerable quantities of sphalerite.

The Silverton mines of San Juan county produce considerable copper ore as a by-product from silver mines, San Juan county, ranking second

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to Lake county in the state, as a copper producer, with an average yearly output rising two million pounds of fine copper.

CONNECTICUT. The first copper mine in the United States was opened at Granby, Hartford county, Connecticut, in 1705, this being the Newgate mine. The Bristol mine in the same county also was a producer. The Bristol yielded mainly chalcocite, bornite and chalcopyrite, with a little malachite from the upper portions and was opened in a fault zone between gray gneiss, hornblende schist and Triassic sandstone. Native copper is noted at Farmington, in the same county, and there are occurrences of copper ore at New Britain and Simsbury, the latter being cupriferous pyrites, which also occur in Hartford county. Native copper occurs at Farmington, in red sandstone. A 200-pound mass of native copper has been found in alluvium, near New Haven, and there are sulphide copper ores at Carmel Centre and Cheshire, in New Haven county. Copper ores are noted also at Brookfield in Fairfield county, Roxbury in Litchfield county, Middletown in Middlesex county, Bolton in Tolland county, and Montville in New London county.

DELAWARE. No workable deposits of copper ore are known in this state, but chalcopyrite has been found in a granite quarry on the Brandywine river, near Wilmington, New Castle county.

FLORIDA. Small veins of sulphide copper ores are reported from several points in Florida, but no workable copper deposits are known.

GEORGIA. A little copper mining was done in the Ducktown belt, circa 1870-1875. Fannin county carries the eastern extension of the Ducktown copper belt of Polk county, Tennessee, and the No. 20 mine, between Pierceville and Frytown, has a 20-foot vein of sulphite ore giving assays of 3 to 30 per cent. copper, and with the usual oxidized ores in the upper portion.

Lincoln county has gold, silver and copper ores at various points. The Seminole mine has three veins in a 300-foot shear zone in mica-schist, cut by diabase dykes. The ore is chalcopyrite, associated with galena, sphalerite and pyrite, in chutes averaging about 3 feet with a maximum width of 8 feet. The richer ores carry seven to twenty dollars gold and silver per short ton.

The Chestatee mine, six miles from Villa Rica, in Carroll county, has a bedded vein of cupriferous pyrite 20 to 30 feet in width, with pay-streaks along either wall, and has an outcrop traceable for about 2,000 feet. This vein is said to assay about 3 per cent. copper, but probably does not average more than about half that amount.

In addition to the occurrences noted in the preceding counties, copper ores are found in the counties of Cherokee, Haversham, Rabun and Wilkes.

IDAHO. Copper was discovered in Idaho in 1864, but very little actual mining was done for the metal until 1890. Copper ores are noted in the counties of Bannock, Bear Lake, Bingham, Blaine, Custer, Idaho, Kootenai, Lemhi, Nez Perce, Owyhee, Shoshone and Washington.

The Cœur d'Alene copper belt adjoins the lead belt on the south and east in the vicinity of Stevens Peak, and extends through Shoshone county, Idaho, into Missoula county, Montana. Although silver-lead mines have

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been worked for years in the western part of the Cœur d'Alene belt, no serious attempts at copper mining were begun until 1898. This district now has one considerable producer, and a number of developing mines of promise. The Snow Storm mine, on Stevens Peak, near the Montana boundary, shows an impregnated cupriferous zone conforming to the bedding planes in Algonkian quartzite. The ore body, as developed, is 10 to 35 feet in width and upwards of 400 feet in length. The usual oxidized ores above are succeeded by chalcocite and bornite, disseminated in quartzite, with occasional bodies of chalcopyrite. The ore body as a whole averages about 4 per cent. copper, 6 ounces silver and $2 gold per short ton, the ore being highly silicious and devoid of iron and alumina.

The Seven Devils and Snake River copper districts lie mainly in Washington county, Idaho, though with extensions on the west into Baker county, Oregon. These districts have been worked spasmodically since about 1888, the lack of adequate transportation facilities precluding regular operation. The Seven Devils district shows numerous copper deposits, over a considerable area. There is an extensive series of Triassic basic lavas, with intercalary slate and limestone, intruded by diorite, all of the igneous rocks being cupriferous, ores occurring mainly as primary and secondary sulphides, largely the latter, in fissure veins, contact veins and impregnation zones, most of the ore bodies carrying considerable garnet, epidote and calcite. In the Snake River district the ores are mainly malachite, bornite and chalcopyrite, occuring usually as contact deposits between limestone and dioritic rocks, garnet and epidote being characteristic associated minerals.

In the vicinity of Mackay, in Custer county, there are several mines, of which one is of some importance. Much work has been done at this point, but the best results were not secured, owing to the vacillating policy of the principal company. The ore is of low average grade, but exists in large quantities.

Bannock county, in the extreme southeastern part of the state, shows copper ores, occurring in veins and lenses in greenstone, schist and conglomerate near limestone, the ores being both auriferous and argentiferous.

Copper ores are noted at various points in Lemhi county, notably in the Black Bird district, about 30 miles west of Salmon City, where there are well defined fissure veins, and an impregnation zone in mica-schist intruded by granite.

ILLINOIS. Float copper, in alluvium brought from the Lake Superior district by glacial action, is of rather common occurrence in Illinois, and deposits of copper ore in place have been found in the counties of Chittenden, Hancock and Hardin.

INDIANA. Occasional small pieces of native copper, brought in drift from the Lake Superior district, are found in alluvium in this state. The occurrence of copper ore in an oil-well drilled six miles northwest of Marion, Grant county, was reported, but not verified, in 1904.

IOWA. The only reported occurrences of copper in Iowa are occasional small pieces of native metal found in drift, evidently brought by glacial action from the native copper deposits of Lake Superior. It is probable

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that occasional chalcopyrite would be found in lead mines near Dubuque if a close watch were kept for such ore.

KANSAS. Occasional chalcopyrite is found in the lead and zinc mines of Galena, Cherokee county, in southeastern Kansas. The rock strata of Kansas range from Carboniferous to Tertiary, but igneous rocks being lacking, there seems slight likelihood of the existence of copper deposits of commercial importance.

KENTUCKY. Chalcopyrite occurs in Livingston and Union counties, and copper ore was reported, in 1902, from the vicinity of Richmond, Madison county, but none of these occurrences seem of commercial importance.

LOUISIANA. The only known occurrence of copper ore in this state is in a peak deposit of galena, sphalerite and barite, in halite, on Belle Isle, near the mouth of the Atchafalaya river, in Iberia parish.

MAINE. There are occurrences of copper ore in the counties of Hancock, Penobscot, Sagadhoc and Washington, there being old copper mines near Calais, Washington county, on the New Brunswick border.

Occurrences of copper are noted in Brookville, Sullivan, Blue Hill and Franklin, in Hancock county, the more important being in the vicinity of Blue Hill, where there have been about a dozen attempts at actual mining, mostly unimportant, though several small mines were opened. This county had a copper mining boom, circa 1877, at both Blue Hill and Sullivan, mining being suspended about 1884, on account of the low price of the metal. The copper slump of 1907 came just in time to nip in the bud an attempt at reopening some of these old mines. At one time there were two mining exchanges in Bangor, but at last accounts these buildings were occupied as a saloon and barber shop, respectively. The Blue Hill ores were claimed to run 5 to 30 per cent copper, with an average of 10 to 12 per cent, which obviously is a great exaggeration, and the ores were claimed to average $12 to $15 gold per ton, also an obvious exaggeration. The old waste-dumps are said to average 3 to 4 per cent. copper.

MARYLAND. Small copper mines were operated in Maryland in colonial days and during the first half of the Nineteenth Century, the copper industry of Maryland being of some importance until the suspension of mining was brought about by the discovery and exploitation of the Lake Superior mines. The copper ores of Maryland are mainly chalcopyrite, with occasional chalcocite and bornite, and a small amount of malachite. There are three copper belts, in the three counties of Baltimore, Carroll and Frederick.

The most important copper district of the state is in Frederick county, where there is a cupriferous belt running along the Linganore hills, from New London northward to a point beyond Libertytown. This district shows chalcopyrite with occasional chalcocite and bornite, in dolomitic limestones and micaceous schists.

The second district, in Carroll county, is a fault-zone, traceable by occasional outcrops for a distance of about 25 miles, the principal operations of the past having been between Sykesville and Finksburg. The predominant rock form is slate, and the ore is mainly chalcopyrite, with some chalcocite and bornite.

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The third district, in Baltimore county, shows copper ore within the city limits of Baltimore, but the principal mines are found at Mount Washington, in the Bare Hill district, a few miles northwest of Baltimore, where there is a vein of 2 to 5 feet width, in hornblende gneiss, near intrusive peridotite.

MASSACHUSETTS. In this state copper ore is noted in the counties of Berkshire, Essex, Franklin, Hampden, Hampshire, Norfolk and Worcester. A little native copper is found in some of the Triassic sandstone strata, and a little chalcopyrite is found in the lead mines of Southampton, in Hampshire county. In Franklin county, the Davis pyrite mine has been worked for sulphur values since circa 1880. Two miles west of the Davis mine is a Savoy schist, carrying a fahlband of 15 to 20 feet width and 750 feet apparent length, with a paystreak on the north wall carrying chalcopyrite. Chalcopyrite also is noted about 10 miles west of the Davis mine, in Hampshire county. At Sheldonville, Norfolk county, a 94-foot shaft was sunk, circa 1901, on a quartz vein in granite, carrying values in gold, silver and copper.

MICHIGAN. The Lake Superior copper district of Michigan was the first American copper field of importance and now is one of the oldest of the leading copper producing districts of the world, as well as the third in size of output. It is the lowest in average grade of any successful copper mining district, and probably contains the most copper of any single field. While the cupriferous Keweenawan formation of Lake Superior outcrops to the eastward in the district of Algoma, Ontario, and to the westward traverses northern Wisconsin and is found in several of the eastern counties of Minnesota, the developed and productive mines lie wholly within the limits of Michigan.

Apparently the aboriginal inhabitants of what is now the United States were entirely unacquainted with bronze or brass, and made but slight use of copper at the time of the discovery of the new world by Columbus, though both copper and bronze were used extensively at that time in Mexico, where the superior Aztec civilization flourished. There are extensive remains, however, of mining done in the Lake Superior district by some race preceding the North American Indians. This people, whose civilization was of a higher order than that of the races succeeding, is known vaguely as the mound-builders. By this long-gone race, many of the Lake Superior copper beds were mined to shallow depth, for mass copper, and at perhaps a majority of the early-day mines, opened around the middle of the Nineteenth Century, there were pits and other evidences of prehistoric mining, to a greater or less extent. That they were good judges of mineral values has been proven by the making of good modern mines under many of these ancient pits. The Ojibways, who were found in possession of the southern shore of Lake Superior by the first white man penetrating to this inland sea, were but slightly acquainted with the practical use of copper, and had no legends regarding the mining done by their predecessors.

The existence of native copper on the southern shore of Lake Superior was first published to the world in a book by M. Lagarde, issued in Paris, in 1636, though it is probable that the existence of the metal was known only from the statements of the Indians to early French explorers on the

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lower lakes. Truchement Brulé is quoted in this book as having in his possession an ingot of copper secured from the Huron Indians. It is probable that Brulé's ingot was merely a small mass of native copper.

The next notation of Lake Superior copper deposits is found in the Jesuit Relacions for 1659 and 1660. At that time the Ojibways had a few crude utensils made from copper, but the metals in their possession were mainly rough lumps, which the Jesuits said were worshipped, but which, in all likelihood, were merely venerated as unusual works of the Gitchee Manitou.

In the Jesuit Relacion for 1666-1667 is a chapter giving the journal of the exploration of Lake Superior by Father Claude Allouez, who seems to have been the first white man who, of a certainty, saw copper along the southern shore of the lake. In quick succession Lake Superior was visited by Fathers Marquette and Mesnard, and, as a result of their efforts, missions were established for the conversion of the natives. It was nearly another hundred years, however, before white men other than the Jesuit missionaries and French voyageurs and couriers du bois saw the shores of this remote and mysterious body of water.

In 1770 Capt. Jonathan Carver printed a book, in London, telling, among other things, of the native copper of Lake Superior, which, according to his account, could be had merely for the trouble of picking it up. This publication led to the formation of a mining company in London, and Alexander Henry, an adventurous Englishman, who was in turn hunter, trapper, explorer and miner, directed the operations of a party of English miners, who drove a long adit into a claybank beside the Ontonagon River, on property now owned by the Victoria mine, during the winter of 1771-1772. The spring rains caused the caving of the adit, and no further attempts at copper mining were made for seventy years.

When the treaty of Paris brought peace between the United States and Great Britain, Benjamin Franklin, who had heard of the mineral wealth of Lake Superior, deflected his pencil a trifle to the north, upon the crude map that was made the basis of delimitation, and thereby secured to the possession of the United States bodies of copper and iron that since have yielded those metals to the value of more than one thousand million dollars. Some effort was made by the American government, in 1798, to secure definite information regarding the Lake Superior copper deposits, and, in 1826, the Ojibways ceded their mineral rights to the United States government.

In 1830 the lake was first visited by Dr. Douglass Houghton, a young scientist combining rare technical skill with high courage and indomitable energy. Through his efforts was made the first survey of the Upper Peninsula of Michigan, comprising more than two-thirds of the southern shore of Lake Superior.

The first miners to reach the Lake Superior copper field were Jim Paull and Nick Miniclear, two backwoodsmen who came overland from southern Wisconsin in midwinter, suffering great hardships, and arriving on the shore of the great lake in March, 1843. Later in the same year a land office was opened by the Federal government at Copper Harbor, and a number of prospectors reached the field. The early mining locations were of immense area, and overlapped in a most haphazard and ridiculous

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manner. Confusion grew until the government adopted the expedient of selling the mineral lands outright.

In 1844 other mineral seekers, mainly devoid of practical knowledge, arrived in the district, and the news of important discoveries became bruited about. In this year arrived the first Cornishmen, who were the first real miners to reach the district. The first actual mining of copper was done in 1844, the original product being a few tons of ore, called black oxide, but possibly chaloocite, taken from a fissure vein near Copper Harbor. This vein was abandoned quickly, but the same company opened a fissure vein carrying native copper, and begun the payment of dividends in 1849, since which year dividends have been paid annually by Lake Superior properties. Shortly after the opening of the Cliff mine, in Keweenaw county, the Minnesota mine was opened in Ontonagon county, at the other end of the district Cross-fissures only were worked at first, but these, while producing several highly profitable mines, have pinched out or lost their workable values at 2,500 feet or less in depth. The stratified beds, on which all the productive mines of the present day are developed, were neglected in the early years, and the Portage Lake district of Houghton county, now much the most important portion of the field, was neglected because of the few fissure veins found crossing the stratified beds. The first successful mining on cupriferous beds was done by the Quincy, which made a success of an amygdaloid lode, and gradually other amygdaloid beds were developed. The first successful mine to be opened on a conglomerate bed was the Calumet & Hecla, in 1866, which remains the largest and most profitable mine of the Lake Superior district, and has paid greater dividends than ever declared by any other mining company in the history of the world, these exceeding one hundred millions of dollars.

The first efforts at smelting were made in 1846, when a small furnace was built, by Prof. Jas. T. Hodge, on the Gratiot river, in Keweenaw county. This ran for two short campaigns only, as selected copper rock, assaying about 20 per cent. metal, gave smelter returns of only 3.5 per cent. copper, showing that nearly five-sixths of the metal was lost in the slags. A second furnace was built about 1847, by the Suffolk Mining company, seven miles southeast of Eagle River, but this was not a success. In 1849, a third furnace was built, on Isle Royale, but never put in commission. Until about 1850 all lake copper was smelted in Baltimore, but in that year J. G. Hussey & Co. built a copper smelter at Cleveland, and a smelter was built in Detroit in the same year, and shortly thereafter a successful local smelter was built at Hancock, in Houghton county. About 1863 a smelter was built at Ontonagon, and previous to 1867 a small and unsuccessful smelter was built at Lac La Belle, in Keweenaw county. The Calumet & Hecla smelter, at Hubbell, was built in 1886, the Dollar Bay works in 1888, the Quincy smelter in 1898 and the Michigan smelter in 1904.

The Keweenawan formation in Michigan may be divided into four parts, the first including Keweenaw Point at the eastward, the second comprising the Portage Lake or central district, which includes the Calumet and South Range fields, and practically Houghton county, while the mines of Ontonagon county, and the trans-Ontonagon extension in Ontonagon and Gogebic counties comprise the third field. The fourth district is Isle Royale, nearly all of the island showing cupriferous beds, with many old and idle mines, mainly small.

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The richest cross-veins of Keweenaw county were at the western end, the most notable being developed by the Cliff, Central and Phœnix mines, The fissure veins of Keweenaw county usually cross the stratified beds at approximately right angles. The most promising copper ore body of the Lake district was opened, circa 1845, on the northeastern side of Bohemian Mountain, and some ore therefrom was shipped to Swansea. The ore was mainly bornite, with some massive chalcopyrite, occurring in an 18-inch vein. There are narrow fissure veins of ore, mainly arsenical, in the Mohawk mine of Keweenaw county, and also in the South Range mines of Houghton county. Chalcopyrite has been found in the Huron shafts of the Isle Royale mine, at Houghton, and at Copper Harbor, in Keweenaw county, two shafts were sunk, to a depth of about 20 feet each, on what was believed to be melaconite, and about forty tons of ore were extracted therefrom, the deposit apparently being merely a pocket. The green stains of malachite are found in many cupriferous beds, in the partly decomposed portions at or near surface, but it is altogether probable that the carbonates were evolved from native copper by weathering

The Lake Superior copper formation, at least four hundred miles in extreme length, with one hundred and fifty miles in Michigan, on which more or less mining has been attempted, and about one hundred miles on which actual mining and development work is in progress, consists of a series of stratified beds, resulting from old lava flows. The Keweenawan series is a succession of extrusive lavas, more than two hundred in number, with intercalations of conglomerate, about thirty in number, and occasional intercalary sandstones. This formation has an average thickness of 25,000 to 30,000 feet in the main series, with a secondary series of conglomerates and sandstones outcropping in the Porcupine Mountains of Keweenaw county. Overlying the Keweenaw series, to the north and west, is a conformable sandstone, while to the east and south is an unconformable sandstone, equivalent in horizon to the Potsdam sandstones at the top of the Cambrian series. The Keweenawan series is of Algonkian age, and at the base of the Azoic or Archæan system, lying above the Huronian ferruginous series, with a fault against which the copper strata are tilted. The entire series of beds, including both traps and conglomerates, has been tilted to angles varying from 20° to 72° with the horizon. The overlying sandstone shows small specks of copper, not in workable quantities, while the underlying unconformable sandstone shows occasional impregnations of native copper, and apparent evidence of igneous metamorphism, near the point of contact.

The Keweenaw Peninsula rises to an extreme height of nearly 800 feet above the waters of Lake Superior, and it is supposed that it once formed the shore of a sea, over which poured vast floods of lava, gradual subsidence bringing the lava beds beneath the sea. The conglomerates were supposed to be of sedimentary origin, but this supposition calls for no less than thirty subsidences and emergences of the Keweenawan series, which seems a strain upon the imagination, especially as there are only occasional patches of sandstone in place of the considerable beds that might be looked for in connection with the conglomerates, though some of the conglomerates shade into sandstone in spots, and the upper series of the Keweenawan formation, not mined at present, shows thick beds of sand-

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stone, some of which are cupriferous. It is probable that the conglomerates are partly tuffs of volcanic origin, though some undoubtedly are ancient sea-beds, formed by material laid down from rocks broken from adjacent shores. The Keweenawan series forms a syncline, of which the southern edge outcrops on the Keweenaw Peninsula, with dip to the north and northwest. The northern fold of the series outcrops on Isle Royale, with dip to the southeast. The axial line of the syncline runs somewhat north of east, but there is a marked divergence in the trend of the southern outcrops along the district where the principal mines are opened, the strike of the formation being approximately North thirty degrees East, in the Houghton county field, which produces nearly nine-tenths of the total copper output of the Lake Superior district.

Toward the middle of the Keweenaw Peninsula the western sandstone is lost under the lake, and at Bete Gris Bay the eastern sandstone also plunges beneath the waters, leaving the Keweenawan series in sole possession of the eastern tip of the peninsula. The eroded edges of the solid rock formations of the Keweenaw Peninsula usually slope, under glacial drift, to the shore lines. The district was glaciated from northeast to southwest, at a comparatively recent age, when considerable drift was deposited in the lower portions of the surface, much of the district being covered with sand, gravel and boulders ranging from a few feet to three hundred feet in depth. As a result of glaciation and erosion the harder strata, notably the greenstone of Keweenaw county, outcrop prominently, and there are moraines at various points on the southern and eastern side of the peninsula, with quicksands that are difficult to sink through. In many places, especially at the crests and escarpments of crystalline igneous strata, the naked rock stands out strongly, but the lower portions are covered with drift. From Keweenaw Point toward the south and west there is a considerable thinning of the flows, with a corresponding thickening of the conglomerates. In addition to the main series of the Keweenawan belt, consisting principally of eruptive rocks, where is a second series, mainly of sedimentary rocks laid down at a later period, this second series being found in the Porcupine Mountains of Keweenaw county, and apparently resulting mainly from the breaking down of the eruptive rocks of the preceding formation, with redeposition of detrital material so secured, in the form of conglomerates and sandstones, mainly the latter. Rich cupriferous conglomerate float has been found from time to time in the Porcupine Mountains, but the bed has not been found in place. The Nonesuch shales and sandstones of the Porcupine belt contain very finely comminuted copper, with occasional silver.

The Keweenawan formation shows extensive fissuring, more notably in the middle and eastern portions of Keweenaw county, and there is considerable faulting. The longest throw that has been noted is 284 feet, on the east vein of the Central mine, in Keweenaw county, along the Kearsarge conglomerate, estimated as equivalent to a movement horizontally northward of more than two and one-half miles.

The dip of the strata of the Keweenawan series varies greatly from point to point along the strike, and in any given cross-section is sharpest along the eastern sandstone, and flattest along the western sandstone, an evidence of thrusting exerted from the direction of the eastern or Potsdam sandstone. The contact between the Keweenawan rocks and the eastern

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sandstone shows the latter much tilted from the horizontal position occupied a short distance further east, the sandstone standing almost vertically at some points adjoining the eruptive rocks. At the Delaware mine, in Keweenaw county, the average dip of the Keweenawan beds is about 20°; at the Arnold mine, about 25°; at the conglomerate mine of the Calumet & Hecla, in northern Houghton county 37° 30′; at the Osceola mine, 41°; at the Franklin Junior mine, 47°; at the Quincy mine, 51°; at the Arcadian mine, 53°; at the old Atlantic mine, 54°; at the Isle Royale mine, 59° and at the Baltic mine, 72°.

The Keweenawan series, in Houghton and Keweenaw counties, may be divided lengthwise into three approximately equal parts. The flows of the upper third, lying to the north and west, have developed no paying mines. In the second series, including the beds approximately from the Atlantic to the Osceola amygdaloids, there are a number of successful mines, including the conglomerate mine of the Calumet & Hecla, while the lower third includes the Kearsarge and Baltic amygdaloids, which have shown the greatest persistence in retention of payable mineral values along their strikes, of any of the cupriferous beds yet opened in the Lake Superior district.

In the matter of arsenic, which is a deleterious element that is giving considerable trouble to many of the Lake mines, there are certain rules that seem to hold good in most cases, though with possible exceptions. The first of these rules is that arsenic increases with depth. In the cases where no arsenical cross-veins have been noted in the mines affected, it is possible that the increase of arsenic comes from the gangue. The second rule is that there seems, in the district from Portage Lake to the southern end of Keweenaw county, an increase in arsenic from south to north. The third rule, which is based on indubitable evidence, is that in any given cross-section the percentage of arsenic in the copper secured increases from the upper to the underlying flows, in a fairly steady ratio, the copper produced from the felsitic beds at the base of the series being notably arsenical.

A cross section of the Keweenawan series at any given point would show a large number of trap and conglomerate strata, varying greatly in thickness and of unusual persistence both as to length and depth. There necessarily must be an end to even the most extensive lava flow, and owing to inequalities existing on the land-surface and sea-bed over which these old flows were spread, any given stratum may be cut out temporarily, to reappear, at greater depth, or to either or both sides of the point of disappearance. The conglomerates afford the geological bases of measurement for the series, these being much more readily distinguishable than the trap beds, owing to cleaner walls and divergence in appearance from the surrounding and more numerous trap strata, and the correlation of cupriferous beds by means of measurements of the conglomerates has made great progress during the past decade. The conglomerates are composed of rounded pebbles of igneous rock, cemented mainly by reddish and yellowish particles of quartz-porphyry. The Calumet & Hecla conglomerate is felsitic. Of the conglomerate beds many carry copper in minute quantities, but only two have been mined seriously, these being the Calumet and Allouez conglomerates, of which the former has made the greatest mining success of the district, while the latter has been, on the whole, a failure.

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The lava flows of the Keweenawan series have experienced long continued metamorphic action, producing amygdaloidal structures in the upper portions of the various beds, and these amygdaloidal portions of the trap flows, mainly melaphyrs, carry native copper as replacements of amygdules leached out, as irregular masses in beds or along contacts between different strata, and in fissure veins. Nearly all of the amygdaloids carry some copper, but the majority are too low in tenor to be workable.

The lava flows, as a rule, are composed of dark basaltic rock with the texture of diabase. Felsite rock are of rare occurrence, except in the lower part of the belt, the basal series being felsitic. The chief original minerals are felsite, augite, magnetite and olivine, the typical rock containing about 55 per cent. felsite and 30 per cent. augite, the balance being composed of magnetite, olivine and allied secondary minerals, the base of each flow being more augitic than the amygdaloidal upper portion. Of the basaltic rocks an average type would contain about 45 per cent. silica, 15 per cent. alumina, 13 per cent. iron oxide, up to 10 per cent. calcium, about 10 per cent. of combined sodium and magnesium, and one to two per cent. each of carbon dioxide, titanic oxide and water. According to Lane the formula of the average amydaloidal rock, deprived of its copper, might be written $CaO.MgO.Na_2O.FeO.(Fe,Al)_2O_3.4SiO_2$. Both amygdaloids and conglomerates carry much epidote, and other minerals, notably calcite, occur in connection with copper, calcite crystals that carry occluded crystallized native copper being fairly common, while some occurrences are among the largest and most perfect specimens of crystallization afforded by the mineral world. In the typical amygdaloids there are considerable quantities of prehnite, laumonite and other related silicates.

The genesis of the native copper deposits of Lake Superior remains obscure, and none of the theories provided by scientists is absolutely satisfactory, though synthetic laboratory experiments lend corroborative evidence to the theory more commonly accepted that the metal was deposited in native form from sea-water, where it had been held in solution. Dr. Koenig has found mine-waters depositing copper at the bottom of the Quincy mine, where the waters are strong brines, carrying considerable bromine. In the upper workings of the Lake Superior mines, to a depth of about 1,000 feet, the mine-waters are soft, or slightly hardened by sodium silicate. Below this depth the waters become briny with sodium chloride and calcium chloride, the latter increasing rapidly with depth, while below a half-mile the mine-waters contain a few grams of copper chloride per ton, and deposit copper therefrom as opportunity offers. Carbon dioxide is lacking almost entirely from the deep mine waters of the district. It seems probable that the native copper was deposited by sea-waters from sulphide solutions through chloride reactions. Such a reaction has been found in nature in New Zealand, where the sulphide ores of a mine abandoned for forty years were found partly transformed to native copper, by the action of the sea, which had broken into the workings. Another theory, quite commonly held, is that the metal was included originally in the magma of the basic lavas and was deposited in its present form by local concentration and metasomatism. Lava flows somewhat similar to those of the Keweenawan series carry native copper in Alaska, Newfoundland and elsewhere.

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Metallic copper is found in all rocks of the Keweenawan series, including the superimposed western sandstone, and along the contact of the unconformable eastern sandstone as well, but excepting the sedimentary secondary series of the Keweenawan belt, in the Porcupine Mountains, none of the sandstones contain copper in workable quantities. The metal is found in both traps and conglomerates of the main series, the metal of the conglomerates occurring largely as cementing material. Copper occurs occasionally in the very dense trap rocks, but is found more commonly in the more open upper portions of the trap flows, where the amygdules have been leached out and replaced to greater or less extent by the native metal. It is obvious that the amygdaloidal portions of the flows were much more suitable for the physical reception of the metal than the extremely dense traps at the base of each flow.

In the amygdaloidal cupriferous beds the copper usually favors either the foot or hanging wall, but occasionally, in wide beds, occurs in streaks toward the centre, and usually is disseminated more or less irregularly through the entire width of the amygdaloid, but, with a tendency, perfectly natural in view of the physical structure of the amygdaloidal traps, to favor the hanging wall. Occasionally the mineralization is so strong that the dense basal portion of the superincumbent trap flow forming the hanging wall has been impregnated with fine copper for a few inches, or even for a number of feet, and is found workable for its metallic values.

The percentage of copper contained in the rock decreases in all mines opened to more than 4,000 feet in depth. As a rule, the amygdaloid mines usually show decreased values below a depth of about one-half mile. The payable cupriferous beds show copper courses in practically all instances, these being diagonal chutes of richly mineralized ground descending on the plane of the bed with a rake about midway between the strike and dip. Apparently the beds themselves will continue, in practically all cases, to much greater depth than mining is possible. The ultimate depth of mining cannot be foretold with any certainty, in view of the steady progress that is being made in knowledge, methods and equipments. The deepest mines of the world are in this district, the Tamarack having a vertical shaft of nearly one mile depth, while the Calumet & Hecla has a shaft sunk at an angle of 37° 30′ that is 8,100 feet in depth, with a winze of 190 feet sunk from the drift on the bottom level of this shaft. The great heat and briny waters found at the bottoms of the deep mines render work somewhat difficult, and these factors, combined with increased hoisting and mining costs, coincident with decreased copper contents, must, of necessity, eventually furnish a bottom for even the most ambitious of mines.

Considerable silver is carried in connection with copper in many of the Lake Superior mines. The mines of the Evergreen belt, in Ontonagon county, are the richest in silver, followed by the mines in the immediate vicinity of Portage Lake in Houghton county. The silver is mechanically admixed with the copper, but the two metals are not alloyed.

Various theories of cross-sectional mineralization in zones are held by students of this field, but none of them have been fully elaborated, and, while there seems some basis for such theories, there are conflicting features precluding their full acceptance at present.

Throughout the native copper district of Lake Superior there are puzzling magnetic earth currents, these being most marked on Isle Royale

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and near Duluth, and the aberrations of the mariner's compass are such that navigation is rendered somewhat difficult, and even dangerous, at times. In this connection it may be stated that the first wireless telegraphy was done in Ontonagon county, Michigan, by Ayers Stockley, shortly after the laying of the first successful Atlantic cable in 1866. Mr. Stockley used crude home-made apparatus, but succeeded in transmitting telegraphic messages correctly, for a distance of nine miles, by utilizing the magnetic earth currents traversing the cupriferous strata.

While practically the entire copper production of Michigan is from the native metal, nearly all of the principal commercial copper ores are found in the native copper district, and copper ores are found in many other counties of the Upper Peninsula of Michigan. The list of Michigan copper ores includes cuprite, melaconite, azurite, malachite, chalcocite, bornite, chalcopyrite, chrysocolla, algodonite, domeykite, whitneyite, mohawkite and keweenawite.

The active copper mines of Michigan are in the three counties of Keweenaw, Houghton and Ontonagon, with a considerable number of old and idle mines in Isle Royale county. The Keweenawan copper belt extends to the Wisconsin boundary through Gogebic county, and small quantities of chalcopyrite are noted in several of the iron mines of this county.

In Baraga county there is an isolated outlier of the Keweenawan formation, known as Silver Mountain, and the same formation, carrying native copper, is noted on the Huron Islands.

Native copper is said to have been found near Perkins, Delta county, but the discovery does not seem of commercial importance.

Native copper, evidently brought by glacial action from the Keweenawan measures to the north, has been found in drift above the iron ore body of the Cyclops mine, at Norway, Dickinson county, and chalcopyrite is noted in small quanties in connection with hematite in the Emmett mine, and also in the Chapin mine at Iron Mountain, in this county.

Copper ore has been reported from the vicinity of St.Ignace, Mackinaw county, but the occurrence has not been fully verified.

In Marquette county chalcopyrite and native copper occur on Presque Isle, in the city of Marquette and chalcocite is noted on Mount Mesnard and on the Chocolay river, near the same town, while a variety of copper ores occur near Sauks Head. Small quantities of copper sulphides are found in the gold mines north of Ishpeming, and the granite rocks extending from the serpentine lying north of Ishpeming to the shore of Lake Superior show numerous gash veins carrying copper ores and other minerals.

In Menominee county copper ores have been found near Carney, and some attempts at mining have been made thereon.

MINNESOTA. The western continuation of the Keweenawan cupriferous series extends from the Upper Peninsula of Michigan across northern Wisconsin into Minnesota. The northern fold of the Keweenawan syncline is noted in Cook and St. Louis counties, north of Duluth, where attempts at mining have been made. There also are promising bodies of sulphide copper ore, near Lake Superior, in this county. In St. Louis county, in 1900, a mass of native copper in sheet form, weighing about 100 pounds, was found embedded in iron ore, at a depth of 300 feet below the surface, in the Montana shaft of the Minnesota Iron Co.

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The southern fold of the Keweenawan syncline extends into Pine and Chisago counties, shortly north of St. Paul and Minneapolis, and several tentative efforts at mining have been made in these counties, native copper being found near Hinckley, Pine county, and native copper and malachite occurring in Chisago county.

MISSOURI. This state has a producing copper mine in Madison county, and has old mines or attempts at mines in the counties of Benton, Clare, Cole, Cooper, Crawford, Dade, Dallas, Dent, Franklin, Greene, Iron, Lawrence, Maries, Ste. Genevieve, St. Francois, Shannon and Washington, and also shows copper ores in the counties of Jasper, Jefferson and Wright. Copper ores are noted mainly along the Ozark uplift, in the southern part of the state, and in the lead district of southeastern Missouri.

The first copper production of Missouri was made in 1837, from carbonate ores, and at various times smelters have been erected in Crawford, Madison, Ste. Genevieve and Shannon counties. Franklin county once had a small copper producer, near Sullivan, but the output was very small. Native copper and various ores are found in the Stanton mine in this county.

In the Circle Diggings of Cole county, malachite, azurite and chalcopyrite are found, and a limited production has been made from this district.

The Collins mine, in Cooper county, shows chalcopyrite and carbonate ores.

The Cherry Valley mines of Crawford county have produced a small quantity of malachite.

In the zinc and lead mines of Jasper county a little chalcopyrite and occasional native copper occur in connection with sphalerite.

In Ste. Genevieve county, near the Mississippi river, attempts at mining were made previous to the American Civil War.

Shannon county has sulphide copper ores and in 1901 was the scene of a short-lived copper boom.

The principal copper mining operations of both past and present are noted in Madison county, in southeastern Missouri, which long has been an important lead field, being the site of the Mine La Motte, the oldest American lead mine west of the Alleghany Mountains. In 1868 copper mines were opened at Cornwall on parallel blanket veins of disseminated chalcopyrite with cherty gangue, having a country rock of Silurian limestone, and some little production was secured from this property. Chalcopyrite is noted occasionally in connection with sphalerite, pyrite and small quantities of nickel and cobalt sulphides, in the Mine La Motte. To the southward of the Mine La Motte, and about two miles east of Fredericktown, is the Buckeye mine of the North American Lead Co. On this tract the Buckeye copper mine was opened in early days, and produced a little ore. The present company opened a new mine, for lead, but at depth this has yielded an increasing quantity of chalcopyrite, and this ore became so common that a smelter has been erected for its treatment. The chalcopyrite averages about 6 per cent. copper after selection, and carries combined nickel and cobalt values, mainly the latter, to the extent of about 3 per cent. The country rock in the vicinity of Fredericktown is limestone, of various ages from Carboniferous to Cretaceous, with bosses of intrusive granite-porphyry, the ore occurring as irregular contact deposits, in limestone, near the contact with igneous intrusives. I have found copper ore in

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all directions from Fredericktown, and believe this district to be one of the most promising copper fields between the Mississippi river and the Rocky Mountains.

MONTANA. This state has copper mines or attempts at mines in the counties of Beaverhead, Broadwater, Cascade, Deer Lodge, Flathead, Gallatin, Granite, Jefferson, Lewis & Clarke, Madison, Meagher, Missoula, Park, Powell, Ravalli, Silver Bow, Sweetgrass and Teton. The Butte camp in Silver Bow county is overwhelmingly preponderant in importance, being the largest and most important copper district of the world.

The mines of Jefferson county, which are found principally in the vicinity of Corbin, Clancy and Basin, seem next in promise to those of Silver Bow county, though production is not large as yet.

Missoula county, in the extreme western part of the state, carries the eastern extension of the Cœur d'Alene copper belt of Shoshone county, Idaho, with similar geological conditions, and at present, is a district of small development but considerable promise.

Meagher county has a number of small attempts at copper mines, including copper deposits in shale near White Sulphur Springs.

The Butte camp of Silver Bow county dates from 1863, when placer gold mining was begun. This was followed by silver mining in the following year, and copper was first discovered by crosscutting at depth from the shafts of the silver mines. The increasing percentage of copper in several of the silver mines in the western part of the camp led, in 1879, to the building of the first copper smelter by Senator W. A. Clark, the product being a highly argentiferous copper matte, in which the principal value was silver, the copper being used mainly for a carrier. In 1880 the Parrot and Boston & Colorado mines were making argentiferous copper matte, and in 1881 the great Anaconda mine was opened, treating ore at first that averaged about 30 oz. silver per short ton, the silver bullion being very base and containing about half copper. In 1882, at a depth of about 300 feet, the Anaconda found massive chalcocite in a crosscut, and from this find a considerable shipment of 50 per cent. copper ore was made to Swansea. From that date copper production increased rapidly, while the output of the silver mines has declined, though Butte became a much larger silver producer than ever before, owing to the metal secured as a by-product from the copper mines.

The Butte camp is known officially as the Summit Valley district, but this name is used rarely. The town is in the heart of the Rocky Mountains, and, in addition to being the largest copper camp, is the second largest mining camp of the world, ranking immediately after Johannesburg, while if white population only were counted, Butte probably would lead its South African competitor. In addition to the city of Butte, with nearly 75,000 people, that has grown up around the shafts, the copper industry of this camp supports the smelting towns of Great Falls and Anaconda, with nearly 20,000 people each.

The Butte camp is approximately a rectangle of four by seven miles, but the district as now proven is approximately two miles wide and three miles in length from east to west, the principal production coming from an area that is approximately one and one-half miles north and south by two miles east and west. The deepest shaft of the district is 2,800 feet,

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showing good ore on the bottom level. Developments since the beginning of the century have increased considerably the area in which rich mines are opened, and, in addition, work of an exploratory nature has shown promising bodies of copper ore outside of the area formerly considered as including all of the possibly productive ground. The new developments have been mainly to the eastward.

The development of mines in this camp was seriously hampered for many years by the most extensive, bitter and protracted litigation to be found in any mining district, but, happily, this was settled in 1906, by a compromise in which both principals saved face, while benefiting by the cessation of litigation that was costing an average of nearly $2,000,000 yearly.

The Butte district shows an extensive area of igneous rocks of Tertiary age, with later intrusives. The oldest rock is a dark basic granite, or quartz-monzonite, known as the Butte granite, surrounded by altered limestone and other sedimentaries, and partly covered by andesite, the copper veins, so far as known, occurring exclusively in this rock. The Butte granite is cut by dykes of an intrusive, probably of the Eocene period, known as the Blue Bird granite, and aplite of later age. There is a still later intrusive of rhyolite-porphyry or quartz-porphyry, known locally as the Modoc porphyry. The older rocks are faulted by intrusive fracturing, producing fissures with a generally east and west trend. Those were faulted by prolonged volcanic activity, and are cut by intrusive rhyolite, conforming in trend with the dykes. The big butte north of the town, from which the city takes its name, is an eroded remnant of a small rhyolite volcano.

The mineralized veins in the northwestern portion of the camp, which were first to be mined, carry mainly silver and zinc values to the depths yet worked, but there are strong indications of increasing copper values at the bottoms of the deeper shafts. The most productive copper veins, which have a generally east and west trend, give poor surface showings, and, as a rule, are almost entirely barren to depths of 300 to 500 feet, and occasionally to a depth of 1,000 feet. The outcrops of these veins are decidedly unpromising in appearance, and gossans are almost entirely lacking. There are lower fissures, causing displacements of both the cupriferous and argentiferous veins, but these are poorly mineralized, as a rule. The silver veins show rather prominent gossans.

At depth there is a tendency of the wider copper veins to split into smaller parallel veins, separated by country rock that is considerably altered and somewhat mineralized. There also is an increase at depth in the number of smaller mineralized fissures, while some of the fault veins not mineralized in the upper workings carry good values at depth. The veins are very erratic in size, with many pinchings and bulgings from point to point, and with a general tendency toward increasing width at depth, this being followed by forking of the veins. The walls are poorly defined in many cases, and frequently are more of less mineralized. The heart of the Butte district forms almost a gigantic stockwerk.

No important copper district now worked shows such extensive alteration as is noted in the Butte camp. The process of secondary enrichment has been carried on so long, and so actively, that the gossans of the copper veins, undoubtedly large and prominent at one time, have

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been lost almost entirely, through the combined effects of leaching and erosion. The leaching process has been so thorough that the principal copper veins show but slight traces of values for hundreds of feet from surface, but, in compensation, the zone of secondary enrichment is the deepest found in any important copper camp, and massive chalcocite, in large bodies, has been found at a depth of 2,400 feet below surface, while the deepest shaft in the district shows secondary sulphides of good average tenor on its bottom level. There is, however, a general tendency toward decreased values with depth, as in all other mining fields, but the greatly decreased average tenor of the copper ores of Butte, as now smelted, is due partly to other factors than actual impoverishment of ore at depth, the most important of these causes being the greater thoroughness with which mineral values are extracted, the scramming of ore left standing from early mining operations, and the vast improvement and cheapening of metallurgical processes, by reason of which it is now possible to work at a profit ores that were absolutely unpayable only a few years ago. The tenor of ore produced by the leading mines, except North Butte, shows a marked decline from the figures noted at the end of the Nineteenth Century, present extraction averaging as low as 2.5 to 3 per cent. copper from several of the more important mines.

The principal copper values of the Butte district are found in chalcocite and enargite, which furnish about 90 per cent. of the total production of the camp. Chalcocite occurs massive, in immense veins, also disseminated in granules. There is considerable bornite, which occurs extensively in the western mines, but is found sparingly in the eastern properties. The mines also produce considerable quantities of chalcopyrite and cupriferous pyrite, with more or less tetrahedrite and tennantite. The large amount of enargite smelted is responsible for the heavy arsenical fumes from the Washoe smelter, it being estimated that upwards of 30,000 tons of arsenic pass off yearly in the smelter fumes from the Washoe works.

The gangue of most of the ore bodies is granitic or silicious, consisting largely of altered country rock. The veins frequently show considerable fluccan, but, as a rule, partings are poorly defined, the ore fading into the country rock, which is impregnated to some distance on either side of the vein. The ores are highly silicious, averaging about 55 per cent. silica, 15 per cent. iron oxide and 10 to 15 per cent. sulphur, the high grade ores ranging 5 to 15 per cent. copper, with an average tenor of about 6 per cent., while 90 per cent. of the production of the district, excepting North Butte, is concentrating ore averaging 2 to 4 per cent. in copper tenor.

In addition to the ore bodies now worked there are immense deposits of ore of a grade still lower, and of a tenor too low to permit profitable working at present, though it is probable that eventually these ores will be extracted and treated at a profit.

While the Butte district has shown a marked tendency toward decreased values within the past decade, a similar tendency is noted in most other districts, and Butte, far from being a decadent camp, bids fair to hold its position at the head of the copper districts of the world for years to come.

NEVADA. This state has copper resources of prime importance

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under development, and the Ely field promises to make a copper camp of the first magnitude, while developments elsewhere, notably in the Yerington district, are of promise. The state has copper mines, or attempts at mines, in the counties of Elko, Esmeralda, Eureka, Humboldt, Lander, Lincoln, Lyon, Nye, Storey, Washoe and White Pine. With the improvement in general mining conditions, brought about by the discovery of the gold bonanzas of Tonopah and Goldfield, and the improved facilities given by construction of new railroad lines, copper mining is making substantial progress.

In Esmeralda county the Sodaville and Mina copper districts are at the northern end of the Pilot Mountains, showing a contact zone of about twelve miles length, on the borders of a granite intrusive.

In Humboldt county there are promising copper deposits in the vicinity of Winnemucca, and in the Jackson Mountains, circa 60 miles north of Humboldt.

The Bunker Hill district, in the northwestern part of Lincoln county, shows nickel-copper ores, somewhat similar to those of Sudbury, with an average of about one-third ounce of platinum per ton of ore, in some cases.

The Yerington district, in Lyon county, circa 20 miles southeast of the Comstock lode, is in the Mason Valley Mountains, a small range of about 25 miles length and 5 miles width, with an extreme elevation of 6,500 feet. The core of this district is an intrusive granite, exposed by erosion in the higher peaks and deeper cañons, and covered by metamorphosed sedimentary strata on both slopes, with rhyolite flows along the eastern base. Copper ores occur in fractures and shear zones, and as bedded veins in dolomitic limestone, also as impregnations in limestone of Carboniferous age. The ores found in the dolomitic limestone are mainly oxidized, with quartz and calcite gangue, while the Carboniferous limestone shows mainly chalcopyrite, with a little chrysocolla and covellite in the oxidized zone, but the secondary sulphides, chalcocite and bornite, are found rarely. Owing to the heavy limestone gangue, carrying garnet and epidote, concentration is not effected readily, and the ores must be considered upon a smelting basis. Fortunately ore charges of about two-thirds sulphides and one-third oxides and carbonates are self-fluxing. Water supplies are available from the Walker river and from artesian wells.

In Nye county the Lone Mountain district is roughly eight miles wide by about twenty miles in length, showing at the northern end a monadnock lying about fourteen miles west of Tonopah. This district carries gold, silver, copper and lead ores.

In White Pine county the Robinson district, as it is called officially, but more commonly known as the Ely camp, is a low grade district of very unusual promise. This field, as now proven, is a belt of about one mile width by six miles length, having a generally easterly and westerly trend, transverse to the Egan Mountain range. There is an intrusive monzonite-porphyry of post-Carboniferous age cutting Carboniferous sedimentary strata, with intrusive monzonite dykes, copper deposits occurring in both the monzonite and the sedimentary strata adjoining. The principal ore body is that portion of the monzonite-porphyry lying under the zone of oxidation, and apparently is about 400 feet in thickness. According to

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Prof. Lawson the workable ores are tertiary and not secondary, having resulted from the leaching of the former secondary ores of the oxidized zone. The porphyry mass shows large quartz blowouts that cover nearly one-third of the porphyritic area, these occurring mainly along the contact between the monzonite and limestone. The limestone on the northern flank of the porphyry shows small bodies of slightly argentiferous lead ore, and on the southern flank of the intrusive monzonite gold ores are found, in the sedimentary beds. The monzonite ores of the principal Ely mines sample 2.32 to 2.6 per cent. copper, 0.03 to 0.05 oz. silver and about 40 cents gold per short ton.

NEW HAMPSHIRE. Copper ores are found at a number of points in this state, especially in Grafton county, where more or less mining has been attempted. Occurrences of copper are noted at Bath, Franconia, Haverhill, Littleton, Lyme, Oxford, Warren and Woodsville in Grafton county, near Jackson and Madison in Carroll county, at Westmoreland, Cheshire county and at Croydon and Unity in Sullivan county.

NEW JERSEY. This state has copper deposits in the counties of Bergen, Hudson, Mercer, Middlesex, Passaic, Somerset, Sussex, Union and Warren, and more or less mining has been done in several of these counties, the principal operations having been near Arlington, Griggstown and Somerville. The Schuyler mine near Arlington, Hudson county, was the first New Jersey copper mine, and apparently was the second in the British colonies that later became the United States. This mine, only eight miles from New York city, was found in 1719 by a negro slave of the Schuyler family, which was made wealthy therefrom. The first steam engine in the United States was a pump of the Newcomen type, installed at this mine, and the first machine shop in the country was built in 1794 near Belleville, New Jersey, by the owners of this mine, and the first American copper smelter was built in connection with this mine. The property was a fairly steady producer until the American Revolutionary War, and thereafter was worked intermittently, being in the hands of an English company for some time after peace was restored between England and the United States. In the Arlington district there are cupriferous sandstones overlying trap beds, with impregnations of copper in shale adjoining the trap. Except in Warren county the New Jersey copper deposits occur in amygdaloidal traps, and in Triassic sandstone and shale adjoining traps.

In Somerset county, in eastern New Jersey, copper occurs in red beds of Triassic age, associated with intrusive diabase, showing oxidized ores above, with sulphides occurring at a depth of about 600 feet, while below a depth of 600 feet native copper and occasionally chalcocite in bunches are found, giving strength to the theory that the oxidized ores above are alteration products from native copper. The main ore bed varies from 3 to 15 feet in thickness, and has been traced five miles and worked more or less for that distance. At one mine there is an incline shaft of 2,360 feet in depth. Enough copper was secured from a mine near Bound Brook to cast a brass cannon for the American army, during the Revolutionary War.

In Pahaquarry township, on the Delaware Water Gap, in Warren county, the northeastern slope of the mountain shows red shales and Medina sandstones, some of the gray sandstones interbedded with red

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shale carrying impregnations of chalcopyrite, cementing the grains to the extent of one to two per cent. copper. These beds aggregate fully 200 feet in thickness, and may become highly valuable at some future time, when ores of lower tenor than now worked will be available commercially.

NEW MEXICO. The first New Mexican copper mining in historic times apparently was done in the Santa Rita district, Grant county, about the beginning of the Nineteenth Century. Mining development, after the territory passed under American control, was hampered somewhat for many years by the old Spanish system of land titles, but this trouble has been remedied, in the main. New Mexico shows extensive areas of Permian red beds carrying finely disseminated copper ores in sandstones and shales and has copper ores in nearly all parts, copper occurrences being noted in the counties of Chaves, Colfax, Donna Ana, Grant, Lincoln, Mora, Otero, Rio Arriba, Sandoval, San Miguel, Santa Fé, Sierra, Socorro, Taos, Union and Valencia.

Donna Anna county has promising copper deposits in the Oro Grande Mountains, about 15 miles northeast of Las Cruces, and in the Organ district has copper mines on contact deposits between metamorphosed limestone and igneous intrusives.

In Otero county there are mines of copper in the Jarilla Mountains, with considerable development under way in the vicinity of Orogrande.

Rio Arriba county has extensive copper deposits in the Bromide district. These apparently are of low average tenor, though of considerable size, but have been developed only slightly.

In Sandoval county chalcocite is noted, in Triassic sandstones, in the Nacamiento district.

Socorro county is large and has a number of copper districts of various degrees of promise, including the Cooney, Kelly, Magdalena and other districts in the Mogollon Mountains, also copper fields in the Socorro and Oscura Mountains. The Cooney district, on the western side of the Mogollon Mountains, in the southwestern corner of the county, shows dacite flows, cut by rhyolite dykes, copper ores occurring in brecciated fissures near contacts, and as true fissures that carry argentiferous secondary sulphides and gold in the oxidized zone.

Taos county has pre-Cambrian deposits of sulphide copper ores associated with sphalerite.

Grant county is the source of the principal copper production of New Mexico, and has two important fields, and several others of promise. Among the new fields the Hachita district shows promising properties.

The Lordsburg district of Grant county is about eight by eighteen miles in extreme area, and is located in the Pyramid Mountains. The development of this field dates from 1870, and its history is filled with ups and downs. The Pyramid range apparently dates from about the close of the Tertiary age, showing fissure veins and shear zones carrying all of the common oxides and carbonates, secondary sulphides and chalcopyrite, with considerable galena, occasional sphalerite and cerussite, and a variety of silver ores.

The Santa Rita district of Grant county was the scene of the first copper mining in this territory. This district shows an underlying core of igneous rock, with an overlying bed of quartzite impregnated with oxidized ores and occasional native copper, some sulphide ores occurring

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in the underlying porphyry. Although mining has been done in this district for about a century, the workings were merely superficial until a deep shaft was begun in 1906.

The Burro Mountain district of Grant county is the most important in the territory. This field lies about fifteen miles south of Silver City, at the base of the Burro Mountains, and mining dates from 1879. Several small copper smelters were erected in the ninth decade of the Nineteenth Century, but the most important development dates from about 1903. The Burro Mountains are a short isolated range of only about five miles extreme width by ten miles length, showing narrow veins of cupriferous pyrite in porphyry, and associated deposits of disseminated chalcocite, with some ore bodies of unusually large size carrying sulphide ores of low average tenor, frequently zinciferous and refractory. The mineral values occur principally in chalcocite and cupriferous pyrite, with small quantities of gold and silver. The sulphides average 3.5 to 4 per cent. in copper tenor, and there are some oxidized ores, but the zone of oxidation is quite shallow.

NEW YORK. The only copper mine ever opened in the state of New York was at Canton, St. Lawrence county, but this never became an important producer. There are occurrences of ore, however, at numerous other points in the state. Chalcopyrite is found in the Ancram and Beckee lead mines in Columbia county; at Crown Point in Essex county; at Alexandria and Antwerp in Jefferson county; at Salisbury in Herkimer county; at Ladentown, Rockland county, where malachite and cuprite occur in the seams in the trap; at Ellenville and the Red Bridge lead mines in Ulster county; cuprite, azurite, malachite and chalcopyrite occur in the vicinity of Conklingville, Saratoga County; at Chester, Warren county, and at East Chester and Ossining in Westchester county.

NORTH CAROLINA. This state has copper in the counties of Alexander, Alleghany, Ashe, Buncombe, Cabarrus, Caldwell, Catawba, Chatham, Clay, Davidson, Gaston, Granville, Guilford, Jackson, Lexington, Lincoln, Madison, Mecklenburg, Mitchell, Montgomery, Moore, Person, Randolph, Rockingham, Rowan, Stanley, Swain, Transylvania, Wautauga, Wilkes and Yadkin. As a rule the ores occur in mountainous districts near the contacts of basic rocks altered to hornblende-schists, which apparently were the source of the metal, and which still contain small quantities of chalcopyrite and pyrite. The ores of North Carolina are mainly sulphides, but native copper and practically all of the commercial ores of copper, as well as many rare minerals, have been found. Copper mining was followed to a small extent previous to the American Civil War, mainly in Ashe and adjoining counties. The state is notably rich in available water powers, which should prove valuable in the development of its mineral resources.

The Virgilina district lies along the border of Virginia and North Carolina, including the counties of Person and Granville in the latter state. The length of this belt is about twenty five miles, with a width of about three miles. The Virgilina district is in the sub-Piedmont division of the Appalachian belt, and contains a number of small mines of some promise.

In the same division of the Appalachian belt, but some distance to

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the south, is found the Gold Hill district of Rowan county. This field was worked originally for gold, yielding about $3,500,000 from 1842 to 1893, inclusive, but the mines eventually were closed down, because of change of values at depth from gold to copper. The district is about one mile wide and twenty miles long, lying on a plateau of the Piedmont Mountains. The predominant copper ore is chalcopyrite, with gangue of quarts and decomposed schist. The outcrops of prominent ore bodies carry one to twenty per cent. copper, and some ores can be concentrated ten into one. The average sulphide ore of this district carries 2 to 4 oz. silver and 50 cents to $2 gold per short ton. The ore occurs in fissure veins, the secondary zone carrying considerable native copper and rich oxides and carbonates. The deepest workings are nearly 1,000 feet.

In Webster county, in the Cullowhee district, there is one producer and several developing properties of promise. This field shows lenticular bodies of chalcopyrite with quartz and corundum gangue, and prominent gossan cappings in a fracture plane following a basic band in schist.

NORTH DAKOTA. Copper was reported December, 1906, as occurring in this state, but a satisfactory verification of the statement has not been secured.

OHIO. Small masses of native copper, brought from Lake Superior by glacial action, are found occasionally in drift in this state, and native copper ingots and ornaments are taken from mounds built by a prehistoric race, but, so far as known, no copper has been found in place.

OKLAHOMA. Copper ore has been found in small quantities at several points in the state of Oklahoma, notably in the mountains of Woods and Woodward counties, where auriferous copper ores have been found, but no mines have been developed.

OREGON. Copper ores are found in this state in the counties of Baker, Douglas, Grant, Jackson, Josephine, Lynn, Marion, Umatilla, Union and Wallowa. Oregon enjoyed a small share of the California copper boom of 1860-1868, when there was considerable activity in southwestern Oregon, notably in Josephine county, where a smelter, one of the earliest on the Pacific coast, was built for treating oxidized copper ores. Josephine county carries the northern extension of the Coast Range copper belt found in Siskiyou and Del Norte counties of California. This belt, about 25 miles wide and approximately 50 miles long, shows large copper veins, usually carrying fair gold values near surface. The ore is mainly chalcopyrite, with occasional bornite, disseminated in pyrite and pyrrhotite. The district has one small but modern smelter, which can work only four to five months yearly, because of the heavy snows and rains that render the mountain roads impassable except in the summer.

Baker county, in eastern Oregon, has a number of developing copper properties of considerable promise. This county carries the western extension of the Seven Devils district of Idaho, along the Snake River. The copper deposits occur mainly in basaltic flows, interbedded with sedimentary rocks of Triassic age, showing fine grains of chalcocite and bornite, with occasional chalcopyrite, in lavas and tuffs, the mineralization apparently following the jointing planes.

The copper production of Oregon is small, but promises to increase.

PENNSYLVANIA. This state has copper ores, and in several cases old copper mines, in the counties of Adams, Berks, Bucks, Chester, Co-

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lumbia, Lancaster, Lebanon, Montgomery and Philadelphia. The first copper producer of Pennsylvania was the Gap mine in Lancaster county, which was opened as a copper mine, late in the Eighteenth Century, and as such was a failure, but was reopened as a nickel mine, circa 1850, and was a successful producer of that metal, with a small incidental output of copper, until 1893, when it was closed by the competition of the richer nickel-copper mines of the Sudbury district of Ontario. The old mines at Cornwall, in Lebanon county, show native copper, cuprite, azurite, malachite, chalcopyrite, chrysocolla and brochantite. In Montgomery county the Perkiomen mine shows fully as long a list of copper minerals. Near Gettysburg, in Adams county, native copper and cuprite are noted, and native copper, cuprite, melaconite, malachite, chalcopyrite, aurichalcite and chryscolla occur in Jones's mine, near Morgantown, and elsewhere in Bucks county. Oxide, carbonate, sulphide and silicate ores of copper have been found in the Frankford stone quarries, in the city of Philadelphia.

RHODE ISLAND. There are no mines of copper in this state, but chalcopyrite occurs near Portsmouth, Newport county, and occurrences of azurite, malachite, bornite and chalcopyrite are reported from other points, though apparently found nowhere in commercial quantities.

SOUTH CAROLINA. Chalcopyrite is noted sparingly at the Fair Forest gold mines of Union county, but no copper deposits of promise have been found in the state.

SOUTH DAKOTA. Copper ores are noted in the counties of Custer, Lawrence and Pennington, all in the Black Hills, and a little copper mining has been done in these counties. Copper ores are used to a limited extent for fluxing refractory gold ores at some of the local smelters. Geologically, the copper measures of the Black Hills are comparable with those of the Ducktown district of Tennessee.

TENNESSEE. This state has important active copper mines in Polk county, small and idle mines in Sullivan county, and occurrences of copper ore are reported from Lawrence county and from Jellico Plains, Monroe county.

The discovery of copper in the Ducktown district of Polk county was made in 1843, by a gold hunter, who mistook crystals of cuprite for gold. As early as 1854 there were two small matting furnaces in commission, and 14 mines were worked, most of the ore being hauled by wagon 40 miles to a railroad, and shipped to Swansea for reduction. The district prospered until 1863, when work was suspended, owing to the American Civil War, and the mine remained idle until 1866, when work was resumed and continued until 1878, after which the entire district remained idle until 1891, when a British company begun work on a modern scale, and has scored a marked success. The Ducktown district lies in the extreme southeastern corner of Tennessee and extends into the adjoining states of Georgia and Alabama. The Ducktown basin is an eroded plateau, enclosed on three sides by mountains rising 500 to 2,500 feet above the general level of the country, the basin having an average elevation of about 1,500 feet above sea-level. The country rock of the Ducktown plateau consists of foliated mica-schist, with intercalary gneiss, and the ore occurs in a fault-zone in rocks of lower Cambrian age. The mines

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show a heavy gossan of fair grade hematite, which is shipped extensively to iron furnaces. The oxidized zone is comparatively shallow, and has been worked out in the active mines, leaving only chalcopyrite, associated with pyrrhotite in a gangue of quartz, epidote and other metamorphic minerals. The sulphide ores average about 2 per cent. in copper tenor, and are neither auriferous nor argentiferous, occurring as great lenses in metamorphic schist, sometimes with sharply defined walls and again grading into the country rock.

TEXAS. Copper ores in this state are noted in the counties of Anderson, Archer, Baylor, Burnet, Clay, El Paso, Hardeman, Haskell, Knox, Lincoln, Llano, Mason, Montague, Presidio, Stonewall, Taylor, Wichita, Wilbarger and Wise. A little native copper is found in Burnet and Llano counties, with chalcopyrite in both counties and argentiferous tetrahedrite in the latter. Along the Brazos river there are Permian red beds showing carbonate and silicate ores in sandstone. There have been occasional sporadic attempts at development of copper mines, but as yet nothing serious has been accomplished, the ores as a rule being low grade carbonates, sulphides and silicates, distributed in beds of Permian age.

UTAH. This state, while now ranking fourth in point of production among American commonwealths, is scarcely second to any in promise, and possesses in one of its camps the largest bodies of ore of any metal known anywhere upon the globe. The copper production is increasing rapidly, and, in 1906, the copper output of Utah was about as great as the production of either Michigan or Montana in 1887, and about as large as the output of Arizona in 1897. The state has copper mines, or attempts at mines, in the counties of Beaver, Box Elder, Davis, Emery, Grand, Iron, Juab, Morgan, Piute, San Juan, Salt Lake, Summit, Tooele, Uintah, Utah, Wasatch, Washington and Weber.

In Box Elder county, near the Nevada line, there are promising copper deposits in limestone, showing good gossans above, and, as a rule, having heavy fluocans along either or both walls.

The first mining in Utah was done in Beaver county, just before 1860. The principal copper developments in this county are in the Cactus district, and at Milford. The richness of the Beaver county ores has been exaggerated, for stock-selling purposes, but one of the mines, under careful management, has reached the point of paying dividends, and it is probable that Beaver county will be given more serious attempts at mining in the future.

Juab county, in the centeral western portion of the state, has a number of old and large producers of silver and lead, and with increasing depth there is an increase in copper values, with considerable gold. The Tintic district, of which Eureka is the principal town, shows Carboniferous limestones, with intrusive quartzite on the west and rhyolite on the east, with ore occurring as contact deposits in both the sedimentary and igneous rocks, the ores being almost exclusively sulphide and carrying good values in lead, zinc, copper, silver and gold.

Piute county has been almost exclusively a gold and silver mining field, but shows considerable copper.

In San Juan county there is a copper field showing sedimentary rocks of Carboniferous age, these including limestone, shale and quartzite,

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which have been intruded and fissured, with extensive metamorphism. Quartzite is the predominate rock form, with intercalary limestone below and Carboniferous shales, sandstones and limestones in the upper part. The lower limestones, of dolomitic nature, carry copper ores, as do the Carboniferous shales of the upper portions. There are many intrusive dykes and sills of monzonite-porphyry. Ore occurs in the intrusive zone in limestone, or at the point of contact in deposits roughly parallel with the bedding planes of the country rocks, which are mineralized in lenticular chutes dipping with the bedding planes, and with moderate pitch.

Tooele county is primarily a gold district, with considerable silver production, and small outputs of both lead and copper, but has copper deposits of promise.

Summit county was originally a silver-lead district, and these metals still predominate in output, but considerable sulphide copper ore is found in the lower workings of the argentiferous lead mines.

Salt Lake county contains three important mining fields, of which one is a copper camp of the first magnitude. The Little Cottonwood district, with Alta as its center, shows good values in lead, copper and silver, and has several good mines. The Big Cottonwood district, with Brighton as its center, shows mainly silver and lead values, but copper indications are promising.

The Bingham camp, known officially as the West Mountain district, in Salt Lake county, already an important camp, is certain to become one of the greatest copper mining fields of the globe. It lies about 20 miles southwest of Salt Lake City, on the eastern slope of the Oquirrh Mountains, with an area of about fifteen square miles. Water is scarce, being supplied chiefly from the mine workings. This is an old camp, worked originally for silver-lead values, and dates from the opening of the Old Jordan mine in 1863. The extraction of gold from the heavy gossans was begun in 1880, but did not prove profitable. The first copper mining, begun in 1896, was done on fissure veins carrying disseminated copper sulphides averaging 3.5 per cent. copper, 2.5 oz. silver and 10 cents to $1 gold per short ton, with irregular but sometimes important lead values, and with occasional sphalerite. Several large and profitable mines have been opened on the sulphide veins which occur in dolomitic limestones near igneous intrusives, the lenticular ore bodes lying roughly parallel with the beds and the country rock, some of these lenses being of great size, ranging up to 200 feet in thickness and several hundred feet in length and depth, and carrying excellent average values.

While the mines opened on the contact deposits of sulphide ore have rendered Bingham an important producer of copper, recent developments on the monzonite ore bodies are of far greater importance. While a limited amount of mining of monzonite ores has been done in Graham county, Arizona, it may be said that Bingham is the first camp in the world to turn country rock into ore upon any large scale. The monzonite ore bodies of Bingham are of the very greatest commercial importance and contain hundreds of millions of tons of ore. The ore concentrates excellently, though there is a loss of nearly 25 per cent. at present, mainly due to slimings, but this probably can be reduced to 20 per cent., and possibly to 15 per cent., eventually, by various minor improvements in milling. The ore of

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the monzonite-porphyry is chalcopyrite, quite evenly disseminated in small grains throughout the porphyritic mass, with occasional veinlets carrying high-grade chalcocite and bornite. The porphyritic ores range from 0.72 per cent. to 1.75 per cent. in copper tenor, and, at the principal property, the average of six thousand assays gave 1.98 per cent. copper, 0.15 oz. silver and 0.016 oz. gold per ton. Owing to the system of mining, by which the monzonite mountains are quarried off by steam shovels, this copper field should give the lowest average mining cost of any in the world, with milling costs nearly as cheap as in the Lake Superior district, and eventually the present smelting costs should be reduced materially.

VERMONT. In this state there are copper mines in the counties of Lamoille and Orange, the latter being the more important, and copper ores are noted also in the counties of Franklin, Madison and Rutland. Copper mining was an industry of some importance in Vermont previous to the opening of the Lake Superior district, and the largest mine of the state was a famous producer for many years. The Vermont ore is chiefly chalcopyrite, and is noted at Brandon and Cuttingville in Rutland county, at Bridgewater in Madison county, at various points in Franklin and Lamoille counties, and at South Strafford, Copperfield, Vershire, Corinth and elsewhere in Orange county.

There are three principal copper districts in Orange county, the northern being at Corinth, where the Union mine is the most important property. The middle district is at Copperfield, where the Ely mines, opened in 1821, were the largest in the state, and the southern district is at South Strafford, where the Elizabeth mine has been a considerable producer. The ore is mainly chalcopyrite disseminated in pyrite and pyrrhotite, with a small amount of other gangue. The Elizabeth mine is the oldest in the state, having been opened in 1793 and long worked for cupriferous pyrrhotite. The Orange county deposits considerably resemble those of the Capelton district in Quebec, to the north, and are somewhat similar to those of the Ducktown district of Tennessee. The country rock is mainly contorted metamorphic sericite schist, surrounded by sedimentary beds of Paleozoic age, with pegmatite dykes. The Ely ore body is 20 to 30 feet in thickness, up to 150 feet in width, and has been mined to a depth of 3,600 feet. According to Weed the mineralization was pneumatolytic, due to emanations from granitic magma.

VIRGINIA. The existence of copper in this state has been known from early colonial days, and copper ores are noted in the counties of Albemarle, Buckingham, Carroll, Charlotte, Culpepper, Fauquier, Floyd, Fluvanna, Franklin, Grayson, Greene, Halifax, Loudoun, Louisa, Madison, Montgomery, Nelson, Orange, Page, Rappahannock, Rockingham and Stafford. In Louisa county the copper ore bodies have strong hematite gossans, which were mined for iron ore at one time. In this county cupriferous pyrite mines are worked, but no attempt is made to save the copper values, except by the leaching of mine waters, from which a little cement copper is secured.

The copper fields of Virginia may be divided into four principal groups, known as the Virginia, Blue Ridge, Gossan Lead and Loudoun-Culpepper districts. In the Piedmont region there also are copper deposits in Albemarle, Buckingham and Charlotte counties.

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The Virgilina district lies in Halifax county, Virginia and in Granville and Person counties, North Carolina. The field is about three miles in width by twenty-five miles in length, and in Virginia runs from the state line to the Hyco River, about 8 miles north. The ore is mainly chalcocite, with occasional bornite, having a gangue of quartz and talcose altered country rock, the ore averaging about 3 per cent. copper, but with chutes of high grade ore running 5 to 25 per cent. in tenor. Selected ores, as shipped average 6 to 10 oz. silver and 75 cents gold per ton. The ores which are highly silicious and require concentration, occur in lenticular chutes of varying sizes, from 6 inches to 20 feet in width, and with an extreme length of several hundred feet, lying in fissure veins cutting schistose rocks altered from andesite and similar volcanic rocks. The average copper tenor of the ores of the district is said to be about 2 per cent.

The Blue Ridge district runs along the mountains in the counties of Warren, Fauquier, Rappahannock, Madison, Page and Greene. This district shows pre-Cambrian basaltic flows, capped by sedimentary beds and intruded by granitic rocks, later faulted and subjected to regional metamorphism. The gossans are not prominent and the copper occurs mainly native and as cuprite, with small quantities of carbonates and occasional bornite and chalcopyrite. This district shows mainly gash-veins, with promising surface ores which do not hold to depth.

The Gossan Lead of Grayson, Floyd and Carroll counties, in southwestern Virginia, shortly above the North Carolina line, is traceable for upwards of ten miles in a fault fracture between schists and slates of Cambrian age and metamorphosed schistose diorite. This district has been worked extensively for iron ore, from its limonite gossans, and produced a little copper in the decade previous to the American Civil War, from chalcocite disseminated in pyrrhotite, but the average copper contents are estimated as slightly under one per cent.

The fourth district includes Loudoun and Culpepper counties, where copper ores are noted at various points, and where there have been some desultory attempts at mining at various times.

WASHINGTON. This state has a number of copper deposits of considerable promise, and bids fair to become an important producer eventually. Copper ores are noted, and there are mines, or attempts at mines, in the counties of Chelan, Clarke, Cowlitz, Ferry, King, Kittitas, Lewis, Lincoln, Okanogan, Pierce, Skagit, Skamania, Snohomish, Stevens and Whatcom.

In Chelan county there are large bodies of ore of low average grade, and the district is regarded as promising.

In Ferry county there are copper ores in the vicinity of Republic, and most of the mines in that camp carry cupriferous values to a greater or less extent.

In King county the Skykomish or Foss River district shows promising occurrences of ore, mainly chalcopyrite, with good outcrops.

In Kittitas county the Cle Elum district shows a cupriferous belt, nearly a mile in width by several miles in length, carrying copper ores of good average tenor that show strong outcrops.

Okanogan county, near the British Columbia boundary line, shows

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numerous bodies of copper ore, mainly of low grade, but of considerable size, and the field is one that may develop important low grade mines in time.

In Pierce county native copper occurs near Eatonville, and various copper ores are found elsewhere in the county.

The Mount St. Helens district lies mainly in Skamania county, with portions in Cowlitz and Lewis counties. There are several promising mines under development in this field.

In Snohomish county the Darrington district, in the Cascade Mountains, has a number of developing mines, opened on a wide ore zone carrying paystreaks of massive bornite and chalcopyrite The Index district of Snohomish county shows a number of properties, on which more or less work has been done, but has suffered severely from wildcat promotions. The veins generally are narrow, and values irregular, occurring in concretions and kidneys of bornite, with small granules of bornite disseminated in a granitic gangue. For concentration the ore must be crushed to about sixty mesh, and slimes so badly that on an average less than half the copper values have been recovered.

In Stevens county the Chewelah district shows chalcopyrite, both massive and disseminated in pyrrhotite, in schist, near a granite contact. This district has been a small producer of copper for many years.

WISCONSIN. Copper ores are noted in this state in the counties of Ashland, Burnett, Chippewa, Crawford, Douglas, Grant, Iowa, Lafayette, Polk and Sauk.

The northern fold of the Keweenawan trap formation extends across the Lake Superior shore of northern Wisconsin, from Hurley to the Minnesota line, carrying more or less native copper in the amygdaloidal portions of various trap beds. The Keweenawan series is fully described in the article on Michigan. Some remains of prehistoric mining have been discovered east of the Fond du Lac mine, near the Brule river, and in the vicinity of the Percival mine, in Douglas county. The first attempt at copper mining, in historical times, was made in Douglas county, in 1845, by the North American Fur Company, which opened a shaft on a lean vein of tetrahedrite. Further mining attempts in this district were made in 1855, 1862, 1873 and 1898. Work was resumed in 1907 on a property on the Minong range, which is on the southern fold of the Keweenawan syncline, in the southern part of Douglas county.

In Crawford county an attempt was made at copper mining just previous to 1860, in the vicinity of Prairie du Chien. Copper ores are noted in the lead and zinc districts of southwestern Wisconsin at Shullsburg, Lafayette county, and at Mineral Point, Iowa county, where some crude attempts at copper mining have been made. Chalcopyrite and malachite have been found in Sauk county, and auriferous and argentiferous copper ore was found in 1902 in a diamond drill hole bored north of Osceola, Polk county. Copper ores are found south of Boscobel, Grant county, and chalcopyrite of good grade occurs near Mellen, Ashland county, where some attempts have been made at mining.

WYOMING. This state has copper mines or attempts at mines in the counties of Albany, Big Horn, Carbon, Converse, Frémont, Laramie, Natrona, Sheridan and Weston. The state has copper fields of consider-

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able promise, but production has been small, owing to lack of transportation facilities in the principal districts.

The Grand Encampment copper district is of immense size, having an estimated area of 2,500 miles, lying in the southern half of Carbon county and the southwestern quarter of Albany county, and being divided into nearly equal parts by the North Platte river. The Sierra Madre Mountains lie to the west and the Medicine Bow range to the east. Gold prospecting was begun in 1898, but was not especially successful, and was followed a year or so later by copper prospecting. The district has been a producer since 1900, hand-selected ores shipped for treatment ranging 30 to 49 per cent. in copper tenor in carload lots, the higher grade ores carrying $8 to $10 gold and silver per ton. The general formation of the Sierra Madre Mountains is an irregular core of red granite, with superimposed Algonkian mica-hornblende schists. Associated with the schist, and conformable in strike and dip, are huge ledges of limestone and altered schist, known locally as lime dykes, being composed mainly of limestone and silica. There are extensive evidences of alteration and replacement in the granite, diorite and schists. The principal ore bodies occur on the contacts between the schists and adjacent rocks, notably quartzite. The gossans usually are of soft spongy limonite, with some hematite and a little quartz. The veins range from mere stringers to 20 feet in width, and the zone of oxidation, as determined, is from 35 to 100 feet in depth, being succeeded by bornite and massive chalcopyrite, the oxidized zone showing mainly azurite and malachite, with a little native copper. The Medicine Bow range shows a core of gray and red granite, flanked irregularly by schist and gneiss, with dykes similar to those of the Sierra Madres. The Rambler mine, in the Medicine Bows, was opened in 1900, for gold, abandoned as worthless, and relocated for copper. This mine is notable for its large quantities of covellite, and for carrying platinum, palladium, osmium and iridium, this being the first known occurrence of platinum in connection with copper.

In Albany county, in addition to a portion of the Grand Encampment district, there are copper mines in the Spring Hill and War Bonnet divisons of the North Laramie Peak district.

The Laramie Hills district runs along the southern boundary of the state, from Laramie through Albany and Converse counties, to Casper, Natrona county. This range shows a granite core, with generally north and south trend, flanked by schists and various sedimentary beds. Copper occurs native, in red altered granite, at Sherman Hill, and as sulphide ores at Hecla, Slate Creek, Cooney Hill and to the northward of Laramie Peak. Laramie county includes the Hartville uplift, in east central Wyoming, showing a considerable geological resemblance to the Black Hills of South Dakota. Copper ores are found throughout the entire uplift in fissure veins and lenses, usually pinching out at slight depth, and also as blanket veins. Some copper mining was done in this vicinity as early as 1881, when 75 men were employed at the Sunrise mine, but the industry was not successful, owing to lack of rail transportation.

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CHAPTER XV.

Copper Deposits of Canada and Newfoundland.

In this chapter the copper deposits of Canada are treated in detail by provinces and territories, and, for geological convenience, Newfoundland is added, although Newfoundland is not a part of the Dominion of Canada, being the oldest colony of the British crown. Because there seems no other place for it, the few lines referring to the discovery of copper in Greenland are added to this chapter, though Greenland is an appanage of the Danish crown.

Although copper has been mined for many years in the eastern provinces of the Dominion of Canada, and the mines of Georgian Bay, in Western Ontario, are of practically the same age as the oldest of the Lake Superior properties in Michigan, the Canadian copper industry did not come to importance until the exploitation of the great nickel-copper deposits of the Sudbury district, beginning with about 1886. Ten years later the production of the Trail district in British Columbia became important, and was followed by far greater developments in the Boundary district of the same province, this field now ranking among the really important copper districts of the world. Despite its considerable present development, the copper industry of Canada must be rated as merely in its infancy, and the dominion must be included in any list of the principal copper producing countries of the present or future.

British Columbia produces more than three-fourths of the Canadian copper output, and Ontario furnishes nearly all the balance of the production, but there are small mines in most of the other provinces, and the territory of Yukon is a potential producer of importance.

BRITISH COLUMBIA. This Canadian province is a kingdom in both area and resources and its developed wealth in timber, minerals, arable lands and fisheries is trivial, compared with its possibilities. The first mining was for gold, in placer washings, shortly after the middle of the Nineteenth Century, after which the mining industry languished, until the completion of the Canadian Pacific railroad, when quartz mining was begun, in a small way, first for gold and silver, and later for lead. It was found, about 1896, that the mines of the Trail district carried considerable copper values, and the copper industry of the province dates from that discovery. In the last years of the century the first copper mines were opened in the Boundary district, and these have become of great importance. Most of the gold and silver mines of British Columbia carry more or less lead and copper, highly useful as fluxing agents, while the copper ores almost invariably have appreciable values in gold and silver, this comity of the metals aiding greatly in the development of the various mining fields of the province, most of which are low in grade, though with large ore bodies.

In 1906 the Boundary district made 75 per cent. of the total copper production of British Columbia, followed with 12.5 per cent. from the

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mines of the Pacific coast, and 11.5 per cent. from the Rossland mines of the Trail district. Nearly all of the other mining districts of British Columbia have copper ores, with small mines, or attempts at mines, but, in 1906, the production of all the other districts combined was 1.25 per cent. of the total output of the province. With better transportation facilities, some of the other districts, now negligible as producers of copper, should become of importance.

The copper smelting industry of the province is well developed, and British Columbia has some of the largest, most modern and best managed copper smelters now in existence, and the Granby mine, of the Boundary district, holds the world's record for low smelting costs.

The Boundary district, lying along the northern border of the state of Washington, includes the Kettle River, Grand Forks and Osoyoos mining divisions, which are contiguous. The mountains are not especially rugged, and as a rule the western and southern slopes are open. The formation includes somewhat altered sedimentary rocks, mainly limestones, with granite, greenstone and other eruptives, the ores of the district occurring mainly in altered limestone near the contacts with igneous intrusives. The ore bodies are almost exclusively disseminated sulphides, very low in grade, but of immense size, slightly auriferous and argentiferous, and self-fluxing, requiring only small charges of coke for reduction. The Boundary district is an important copper field, and must continue to increase in production for many years to come. This district is comparable with the Lake Superior copper field, not only in the low grade of its average ores, but also in the enormous size and certainty of its ore deposits, and the magnitude of the investments and equipments required for profitable copper production. These heavy investments afford assurance of permanent operation, and heavy production, regardless of fluctuations in the price of the metal.

The copper deposits of the Pacific coast include numerous mines on the various islands scattered from Puget Sound to the Alaskan boundary, and also on the mainland. Most of these mines are on Vancouver Island, where copper ores are found along the western side. Ore occurs mainly as replacements in marble and greenstone, along and near the contacts with dykes of igneous rock. The ore bodies are very irregular, and carry magnetite and garnet gangue, with segregations of chalcopyrite and local enrichments of bornite. On Texada Island the nature and occurrence of ore bodies are practically similar to those on Vancouver Island, and, in the main, the coast deposits are of this same class.

The Trail district, of which Rossland is the center, shows an area of eruptive rocks, mainly diorite, cut by many porphyritic dykes of one to eighty feet width, having a mainly north and south strike. Veins are shear-zone fissures, ores consisting of country rock more or less replaced by or impregnated with cupriferous pyrrhotite, the metallic values being mainly in gold but including considerable copper, and a small amount of silver.

The Yale district includes the Similkameen division, with exposures of copper ore, mainly refractory, at many points. Development is slight but the district is of considerable promise. The Aspen Grove field of the Similkameen division shows eruptive rocks in parallel flows, ore occurring

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mainly in a red breccia that carries native copper and chalcocite, intermixed. There also are promising showings of ore at various points in the Keremos section of the Similkameen, the best of these being in the vicinity of Olalla and Princeton.

FRANKLIN. Indications of copper are reported from several points along the eastern side of Baffins Land.

KEEWATIN. In the southern portion of this district, north of the Albany River, native copper is shown in conglomerate, and there are indications of copper on the western side of Hudson Bay. The Copper Mine River, flowing into a bay of the Arctic Ocean, must have been named for some real or fancied exposure of the metal. The district of Keewatin is wild, and but little known, though it gives indications of mineral wealth at various points.

LABRADOR. There are fairly good indications of copper in the Chibougamou district, and also on the East Main River. Labrador is in the peculiar situation of being a district wthout a regular local government, the management of its affairs being divided between the Canadian province of Quebec, which looks after the bulk of the peninsula, and the crown colony of Newfoundland which administers the narrow strip along the eastern shore that is known as Ungava.

MACKENZIE. An immense outcrop of high grade sulphide ore is reported to exist near the mouth of the Mackenzie River on the Arctic Ocean, some distance north of the Arctic Circle, but it is possible that the value and size of this deposit have been exaggerated, as the information comes from whalers, devoid of geological knowledge or practical mining experience.

MANITOBA. Along the eastern boundary of this province, near Lake of the Woods, is a small area of mineral land, and a vein of 18 to 20 inches width, reported to occur between granite and trap and to be traceable for a half mile, showing a cupriferous, nickeliferous and slightly auriferous pyrrhotite, has been prospected slightly at Ingolf station, near the Ontario border.

NEW BRUNSWICK. Copper ores are found in the counties of Carleton, Charlotte, Gloucester, St. John and Westmoreland, and native copper is found in red sandstones of Carboniferous age. These sandstones range nearly to conglomerates, and apparently carbonaceous material has been replaced, to a large extent, by copper sulphides. Attempts have been made at mining both ores and native copper.

NOVA SCOTIA. This province has copper mines in the counties of Cape Breton, Cumberland, Inverness and Pictou. Native copper occurs in the counties of Annapolis, Cumberland, Digby and Kings, and, in addition to these counties, copper ores are found in the counties of Antigonish, Colchester and Sydney. The ores are mainly sulphide, and nickeliferous copper ore is reported from Cape Breton county. At Brier Island, Digby county, native copper occurs as nodules in an amygdaloidal trap, similar to occurrences in the Keweenawan formation of Lake Superior. The deposits of Inverness county are of auriferous and argentiferous chalcopyrite, and those of Cape Breton county are of a similar ore, having a silicious

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gangue, and occurring in veins traversing diorite and felsite. The more important mining developments are in Cumberland, Inverness and Cape Breton counties, the Coxheath mines of the latter county having been the principal producers in the past.

ONTARIO. Copper was discovered on the northern shore of Lake Huron as early as 1770, but the first real mining was begun at the Bruce Mines, on the northern shore of Georgian Bay, in 1846, immediately after the opening of the first Lake Superior native copper mines in Michigan. Copper is found native at numerous points, and in the Sudbury district occurs as nickel-copper sulphides, but the deposits mainly are iron-copper sulphides. As a rule, the oxide and carbonate ores of the alteration zone are missing in Ontario, the iron sulphides, mainly chalcopyrite, reaching to surface with slight traces of change, though small quantities of bornite are noted at times.

Ontario is a large province, and shows a great diversity of geological and topographical conditions, its frontier marching with New York in the east and Minnesota on the west. The province has copper mines in the counties of Frontenac and Hastings and in the districts of Muskoka or Parry Sound, Nipissing, Algoma, Thunder Bay and Rainy River, and, in addition, has copper ore in Lancaster and Lanark counties, and elsewhere.

The Muskoka district lies along Parry Sound, on the eastern shore of Georgian Bay. The surface of the country is glaciated, showing mainly rock exposures. The prevailing rock-forms of the district are gneisses and schists, the formation showing much flexure and faulting, with numerous small quartz veins and frequent pegmatite dykes of large size and great persistence. The topography is rough, and much of the rock is utterly devoid of vegetation or covering of any sort, the bald knobs alternating with marshes and swales in the lower ground. The mineralized zone is apparently about a quarter of a mile in width, with a generally northeast and southwest strike, and has been prospected for about twelve miles in length. Ores occur as extended and approximately parallel series of lenses, with a general trend in line with the mineral belt, practically along the fault zone, lenses varying from 5 to 40 feet in width, as a rule, though occasionally showing much greater width, and usually carrying a limonite gossan. The ore is mainly chalcopyrite disseminated in pyrite, showing occasional chalcocite and bornite, and carrying $3 to $10 gold per ton. Sphalerite is associated with copper, as a rule, and some of the beds are nickeliferous, ranging as high as 2.5 per cent in nickel tenor.

The Sudbury district, discovered 1882, where mining was begun in 1886, is an oval of about 40 miles length by 20 miles width and is considered locally as two ranges, each crescents with ends joined. The principal developments are on the south or old range, running from Sudbury to Carson. The interior of this oval shows a trough of rocks of Cambrian and Silurian ages, consisting of slates, sandstones and volcanic tuffs, flanked on the outside by granite. The ores occur as irregular chutes, in mammoth lenses varying greatly in metallic values, but with an average of 2.5 per cent. to 5 per cent. nickel, and carrying, as a rule, about one-half as much copper as nickel.

Copper developments in the Nipissing district have been overshadowed

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by the sensational discoveries of native silver in the Cobalt field, but there are bodies of copper ore in this district that seem worthy of exploitation.

The district of Algoma is very extensive, and shows copper at many points. Principal development in the past has been in the Bruce Mines district, on the northern shore of Georgian Bay, where the ore is chalcopyrite, with quartz gangue, in strong fissure veins. Between Sault Ste. Marie and Sudbury there are several developing mines of considerable promise, in the Massey Station district, and good sulphide ores have been found in the Goulas Bay region, circa 30 miles north of Sault Ste. Marie. The Keweenawan formation of Michigan is found on Michipicoten Island, and also on the mainland east of the island, at Mamainse Point, about 50 miles north of the Soo, but exploratory work has not as yet shown workable values in the native copper deposits. Michipicoten Island also carries various sulphide and arsenide ores of copper.

In the Thunder Bay district, on the northern shore of Lake Superior, native copper has been found on Battle Island, east of Thunder Bay, on St. Ignace Island, in Nepigon Bay, at Black Bay, on Shebandowan Lake, at Pointe-aux-Mines, and elsewhere. Chalcocite is noted on Spar Island, and chalcocite and malachite are found on Silver Islet, this tiny island having been the location of the first great native silver mine of the world, which was fully as rich as any of the present-day bonanzas of Cobalt. Chalcopyrite also occurs at Neebing and elsewhere.

In the Rainy River district sulphide ores of copper have been found at various points, but the mining in that district has been mainly for gold, in the numerous fissure veins with quartz gangue that traverse granite, and which have an unfortunate habit of going wrong at a depth of 400 to 500 feet.

There are strong evidences of copper in the wild and little known district between Sault Ste. Marie and James Bay, and with the completion of a projected railroad, certain to come sooner or later, this district may prove an important producer of both copper and iron, and very likely of silver as well.

QUEBEC. Copper ores have been found in the counties of Arthabaska, Bagot, Beauce, Browne, Dorchester, Drummond, Levis, Lotbiniere, Megantic, Missisquoi, Richmond, Shefford, Sherbrooke and Wolfe, also on the northern shore of the Gulf of St. Lawrence in the district of Saguenay, and promising specimens of ore have been secured from the Lake St. John district, near Labrador.

The principal copper deposits of Quebec, judged from development in the past, lie in three zones, shortly north of the Vermont border, in Sherbrooke and adjoining counties. These belts average about two miles width, and are about 25 miles apart. The eastern belt has been the principal producer, from mines in the vicinity of Capelton. The western belt is about 60 miles east of Montreal, showing ore bodies in limestone, near igneous intrusives. The ores of the Capelton district are mainly chalcopyrite, or cupriferous pyrite and pyrrhotite. The pyrite of this district occurs in lenses, following cleavage planes, varying from 12 inches to 30 feet in thickness, and up to 100 feet in length. The principal mines have been opened in limestone associated with slate, in contacts with

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diorite and serpentine. The cupriferous pyrites are of good sulphur tenor, and while the Capelton mines carry only 2 to 4 per cent. copper, and 3 to 4 ounces silver per ton, the sulphur values render these low-grade ores profitable, when worked with skill and prudence.

YUKON. The principal copper deposit, and the only developed copper mines of Yukon, are found in the vicinity of White Horse, near the Alaskan border. The White Horse district, at the head of navigation on the Lewes River, is connected with Skagway, Alaska, by the White Pass & Yukon railroad, 110 miles in length, which has such tremendous grades that five 110-ton locomotives are required to take a train over the summit. Copper was discovered in this district in 1898, and a number of small but rich mines have been developed, these being much hampered in production by exceedingly high freight rates, and lack of local smelters or local fuel available for smelting purposes.

The White Horse copper belt is 15 to 20 miles in length, with a generally north and south trend, west of and nearly parallel with the Lewes River, with a width, as developed, of one-half mile to nearly 3 miles. The belt shows copper deposits along the contact of limestone and granite, the contact deposits connecting with fissure veins traversing granite. The developed mines are 4 to 10 miles southwest of White Horse, and the district has been prospected for about 20 miles, with assessment work done on about 200 claims. The zone of secondary enrichment shows occasional carbonates, but principal ores are sulphide, formerly reported as mainly chalcopyrite with occasional chalcocite and bornite, but the ores now developed are mainly bornite. It is probable, however, that pyritic ores will succeed at slightly greater depth. The enriched sulphides carry fair values in both gold and silver, and the ores shipped have been of very high tenor. Exploratory work is hampered by a glacial moraine, which leaves only occasional exposures of ledge-rock. This district is of some present importance, and of much greater promise for the future.

NEWFOUNDLAND. The first copper mines of importance were opened in the Tilt Cove district in 1862, and remain considerable producers. There are deposits of chalcopyrite and cupriferous pyrite at many different points on the island, with occurrences of native copper in Placentia Bay, and elsewhere. The developed mines carry cupriferous iron pyrites, in which the sulphur values are an important factor. The island produced about 1,500,000 tons of cupriferous pyrites to the end of the Nineteenth Century, and apparently has far greater available resources for the future.

The Newfoundland deposits occur mainly in serpentine rocks and chloritic slates lying parallel to the serpentine in rocks of lower Silurian age. The principal cupriferous districts are on Notre Dame Bay, in the northeastern portion of the island, this including the Tilt Cove and Betts Cove fields, at Bay of Islands, in the western portion, and at Lady Pond and Birchy Cove. On Oderin Island, in Placentia Bay, in the southeastern portion of the island, native copper occurs in stratified archaic rocks, and one mass of copper weighing 55 pounds has been taken from a melephyr, in strata of a geological horizon corresponding to that of the Keweenawan formation of Lake Superior.

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The Tilt Cove district, on Notre Dame Bay, in the northeastern portion of the island, has been traced for about 40 miles, and the Tilt Cove mines are the only steady copper producers on the island. The district shows 4 main series of lenses, carrying pyrite, in which is disseminated chalcopyrite having an average tenor of about 4 per cent. copper, 50 per cent. sulphur and $1.50 gold per long ton. The ore is bunchy in occurrence, the ore beds ranging from 4 to 10 feet in average thickness, but being much broken and disturbed, while the veins frequently become barren, and sphalerite is found in frequent connection with chalcopyrite.

GREENLAND. An exploratory expedition, sent to Greenland in 1906, by N. Bernberg, a public-spirited merchant of Copenhagen, reports the discovery of large deposits of copper ore at Alanjarssuak, on the western coast of the island.

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CHAPTER XVI.

Copper Deposits of Mexico.

The Republic of Mexico has made relatively greater progress in copper production, since the beginning of the Twentieth Century, than any other country, and in actual increase of output stands second only to the United States. There is every reason to predict a large and fairly steady growth in Mexican copper output, as all of the essentials of a large and profitable production are found in more than one state of the Republic, such essentials being enormous deposits of ore of medium to high grade, transportation facilities, that in many cases are excellent, and which are being improved by extensive railroad construction, and settled political conditions. Occasionally complaints are made by foreigners, operating mines in Mexico, of unjust treatment by the authorities, but, as a rule, these complaints fall into two classes, the first being due to neglect to comply with the just but stringent Mexican laws regarding titles and methods of keeping accounts, while the second, having a foundation of fact, relates to the petty exactions of petty officials. In cases where the operators of mines have experienced arbitrary or unjust treatment from local officials, complaints to the governors of the states, or to the president of the Republic, have resulted, almost invariably, in the speedy correction of any injustice.

Previous to the Spanish conquest the Anahuac races had acquired considerable mining experience and metallurgical skill. The work of extracting metallic values done by the aborigines of Mexico deserves to be called real mining, as the antiguas of date previous to the conquest show shafts and tunnels of considerable extent. The metals found by Cortez in more or less general use, and for sale in the great market place of Tenochtitlán, included gold, silver, copper, tin and lead. Copper was employed freely in the mechanical arts, the metal being used mainly in the form of bronze, through alloying copper with tin, and was hardened by hammering. The best tools of the natives, made previous to the Spanish conquest, assay about 94 per cent. copper and 6 per cent. tin. Not only did the Aztecs utilize the metals for industrial purposes, but they had, apparently independent of old-world influences, developed a system of metallic currency, with gold in quills and copper coins in the shape of the Gothic letter T.

In 1895 the Mexican copper output was only 11,620 long tons, and ten years later exceeded 55,000 long tons, a growth of practically five hundred per centum in a single decade, being much the largest proportional increase made by any country, and the largest actual increase made by any nation except the United States. At the end of July, 1906, there were mines as follows in Mexico: copper, 956; iron and copper, 209; copper and lead, 25; silver and copper, 773; silver, copper and lead, 310; gold, silver and copper, 1,314, a total of 3,587 copper mines and mines with cupriferous values, as compared with 2,931 different cupriferous mines in the preceding year. In July, 1907, there were upwards of 1,000 copper mines alone.

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and nearly or quite 4,000 mines in which copper values were of appreciable importance. These figures are not for single pertenencias, as is the case in Chile, but are for individual properties, ranging in size from a single hectare to thousands of hectares in the case of the Greene-Cananea and other large mines.

The smelting industry of Mexico is highly developed and is increasing rapidly in importance. The production of copper in a given field depends not only upon the richness and extent of its ores, and the experience and energy of its miners, but also is dependent to a very large extent upon the items of transportation and smelting. The transportation facilities of Mexico are excellent, for so rugged a country, and are being improved steadily, by the construction of new railroads of prime importance. The republic now possesses some of the largest and most modern smelters of copper and lead to be found anywhere upon the globe, and further enterprises of great importance are projected. It is doubtful if any country of equal extent anywhere upon the earth's surface possesses mineral values equal to those of Mexico.

Mexico has copper mines in the states of Aguascalientes, Chihuahua, Coahuila, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, Mexico, Michoacán, Neuvo Leõn, Oaxaca, Puebla, Queretaro, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Zacatecas, and in the territories of Baja California and Tepic. In point of production of copper, Sonora easily leads, with Lower California second, but there are copper developments of prime importance in a number of other states, notably in Chihuahua, Coahuila, Guerrero, Jalisco, Michoacán and Puebla.

Copper in almost every known form is found in some part of the republic, the cupriferous measures being very extensive and including a great variety of types. Argentiferous copper ores are found frequently near the crystalline slates of the Azoic group, a typical example occurring in the district south of Puebla. Copper accompanied by hematite is noted in cretaceous beds of Mesozoic age, while in the Cenozoic group, copper is found in regular veins in hornblendic andesite of the Pliocene system, also in the stratified sedimentary beds of the upper Miocene and lower Pliocene, as at the Boleo mine in Baja California. Copper deposits occur frequently in acid Tertiary rocks. The Sierra Madres are highly mineralized, not only as to the main range, but also, as a rule, in their foothills and outlying spurs. In northern Mexico there seems a preponderance of silver-lead deposits on the eastern slope, and of copper and gold values on the western slope of the cordillera. The principal mining portion of Mexico extends, unbroken, for a distance of fully 1,500 miles, with an average width of 250 miles, from the American border on the north into the state of Oaxaca in the south and the possibilities of Mexican mining developments in the future are past human computation.

AGUASCALIENTES. In July, 1907, this state had 49 registered copper mines, in addition to numerous other properties carrying copper as other than the principal metal. The principal copper developments are in the dioritic rocks of the Tepezalá district, where the ore is mainly chalcopyrite, with silicious gangue. The copper ores of the Pánuco district occur mainly in pegmatite dykes, as chalcopyrite.

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BAJA CALIFORNIA. Though known to the early Spanish conquistadors, little mining was done in Lower California until the middle of the Nineteenth Century, and the first copper mining of real importance dates from the discovery of the Boleo mines, in 1868, and the beginning of their exploitation, in 1871. The Boleo mines occur in a district of approximately three miles width by seven miles length, on a plateau lying parallel with and near the coast. The development of this district has been in the hands of a single company, and it is probable that other deposits of value remain for later development. The Boleo mines are opened on beds occurring in a formation of Tertiary sandstones, conglomerates and tuffs. The cupriferous beds, three in number, of large area, lie upon conglomerates of varying horizons, and are overlaid by argillaceous tuffs, all traversed by fissures. In the upper bed, above the water level, the values are in disseminated oridized ores, such as cuprite, melaconite, azurite, malachite, atacamite, crednerite and chrysocolla, all in quantities of commercial importance. In the second ore bed there are peculiar globular concretions of oxide and carbonate ores, called boleos, whence the name of the mine. The third bed, in addition to the oxide, carbonate and silicate ores, carries the secondary sulphides chalcocite, covellite and bornite. The ores are disseminated in irregular masses, veinlets and concretions, in a clayey tuff, with a marked tendency toward concentration upon the underlying conglomerates, where the ores occur compact in layers of six to ten inches.

In July, 1907, Baja California had 65 registered copper mines, and in addition to the Boleo mines of Santa Rosalia, there are promising beds of copper in the municipalities of La Paz, Mulegé, Comondu, Todos Santos and San Antonio, and in Baja California Norte there are rich copper ores, apparently of considerable extent, near San Fernando and about 70 miles south of San Quintin, with promising ore bodies in the Santa Catarina division.

CHIAPAS. The only developed copper property of importance in this state is the Santa Fé mine, though extensive remains of prehistoric operations are shown, these including surprisingly long tunnels, showing that the ancient miners were both persistent and skillful.

The Santa Fé mine, near the Tabasco line, is a contact deposit of most unusual type, the ore outcropping in strata of wollastonite resting on slate, with underlying massive igneous rocks, as contact deposits in wollastonite and between wollastonite and the igneous intrusives. The ore body is of great size, carrying bornite, chalcopyrite, bournonite and tetrahedrite, with chimneys of oxidized ores, all of the ores being argentiferous and associated with free gold, the ore having a garnet gangue. The ore values average 3 to 4 per cent. copper, 6 to 8 ounces silver and $6 to $30 gold per ton.

There also are auriferous copper mines, slightly developed, in the Pichucalco district.

CHIHUAHUA. This state is mainly a producer of silver and lead, being one of the greatest lead mining fields of the globe. Copper frequently is found associated with silver-lead ores, and there are some deposits in which copper is the predominent factor of value. Copper production is

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increasing steadily and gives promise of much future importance. Copper is produced on a commercial scale, not only at a number of distinctively copper mines, but also from cupriferous sulphide ores in silver-lead deposits. There are copper mines in the districts of Bravos, Guerrero, Jiménez, Ocampo, and Parral, and in addition to these, copper deposits are known in the districts of Arteaga, Galeana, Iturbide and Matamoros.

COAHUILA. In July, 1907, the state of Coahuila had five copper mines, and a considerable number of other mines carrying copper values. The most important cupriferous district, judged by present developments, lies near Jimuleo, a short distance south of Torreón, in which copper ores of excellent average tenor occur in limestone strata in a district showing no igneous outcrops.

COLIMA. In July, 1907, the state of Colima had twelve registered copper mines, all with small development, and oxide and carbonate ores of high grade have been found at numerous points in this state.

DURANGO. There were fifty-one copper mines officially registered in Durango in July, 1907. The principal cupriferous developments are in the Velardeña district, where highly important mines have been developed on copper-lead ores. There are small copper mines in other fields, with numerous occurrences of copper ore throughout the state.

GUANAJUATO. The state of Guanajuato is one of the most famous mining districts of the world, and its silver mines are credited with a production of about $600,000,000, measured by gold values. The silver mining industry of Guanajuato is being rejuvenated by American enterprise and capital, and the future of the district is brighter than for many years. One of the old mines of the city shows considerable copper ore, apparently in workable quantities, but this never has been utilized, because silver was the metal desired. In July, 1907, the state had four registered copper mines.

GUERRERO. The state of Guerrero had 44 copper mines and a number of other mines carrying copper values, in July, 1907. These mines are located in the districts of Ajuchitlán, Aldama, Bravos, Minas, Tavares and Taxco.

The most important copper mines are La Dicha group, in the districts of Bravos and Tavares, south of the Balsas river, on the Pacific coast of the southern Sierra Madre range, and about forty miles from the port of Acapulco, where extensive developments are under way. The ore exposures of this group are more or less continuous for four to five miles, showing mainly chalcopyrite, associated with pyrrhotite, in micaceous metamorphic schist with quartzite bands, the deposits carrying a thin but rich bed of secondary sulphides immediately above the pyritic ores. The average values of the pyritic ores probably are 3 to 4 per cent. There are copper deposits of promise adjacent to La Dicha group, along the Balsas river.

In the Ajuchitlán district, fissure veins with quartz gangue, in granite, carry prominent gossans, showing considerable chrysocolla in the oxidized zone, in addition to the usual oxide and carbonate ores. Auriferous copper veins occur in aplite and Tertiary diorite, in the Minas district.

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HIDALGO. There were five registered copper mines in the state of Hidalgo in July, 1907, the principal copper district being at Zimapán, where considerable work is under way.

JALISCO. The state of Jalisco leads all the others of Mexico in the number of copper mines, official figures showing no less than 302 copper properties in the state in July, 1907. Most of these mines, however, are small, though there are many of considerable promise, and a good start has been made at mining and smelting under modern conditions. Jalisco was the seat of a primitive copper mining, smelting and manufacturing industry of considerable importance, under the Aztec races, previous to the Spanish conquest. The principal cupriferous fields of the state include the districts of Ameca, Autlán, Ayutla and Cacoma, in all of which active copper developments are under way. Auriferous copper veins occur in Tertiary diorite in both the Ameca and Cacoma districts. The ores are mainly oxides and carbonates, with a little chalcopyrite, all strongly argentiferous, and at Autlán in addition to large quantities of malachite, sulphide ores are much in evidence.

MEXICO. The state of México had three copper mines in July, 1907, and shows native copper and tetrahedrite in beds on the border, near Tejupilco, Jalisco.

MICHOACÁN. According to official records there were 95 copper mines in the state of Michoacán in July, 1907. This state is mountainous, and with rather indifferent transportation facilities, these drawbacks retarding development. One present-day property, the Inguarán, was worked extensively in the days of the aborigines, and other copper mines were wrought by the Aztecs.

There are deposits of copper ore of more or less importance in the districts of Angangueo, Ario, Churumuco, Huacana, Huetamo, Oroalo, Patzcuaro and Tacambaro, the principal copper mines as now exploited being in the district of Augangueo and in the Inguarán division of the Tacambaro district.

In the Inguarán field ore deposits are found in micaceous quartzose diorite country rock and granite in several stages of alteration, with a capping of silicious limestone of 200 to 300 feet in thickness. The deposits show oxidized ores above, but the principal values are in disseminated chalcopyrite, with a little bornite, both carrying fair silver values and a little gold, with a gangue of granite-porphyry, the ores being disseminated through the country rock.

The Churumuco district shows high grade ores in fissures in dioritic porphyry. In the Oroalo district veins occur in feldspar-porphyry, similar to those of Real del Monte in the state of Hidalgo.

NUEVO LEÓN. According to the government records there were three copper mines in Nuevo León in July, 1907, but none of extensive development or of unusual promise. There are copper ores at a number of points in the state.

OAXACA. According to government records, there were only four copper mines in the state of Oaxaca in July, 1907, but there were many mines in which there were considerable copper values. There are copper mines in the Ocotlán and Ejutla districts, south of the city of Oaxaca,

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and there are copper ores also in the districts of Miahuatlán, Villa Juárez and elsewhere.

PUEBLA. There were five registered copper mines in this state in July, 1907, including the Teziutlán mines, which are much the most important copper producers in southern Mexico. The ores occur in irregular deposits as an intimate mixture of chalcopyrite, galena and sphalerite, in highly metamorphosed calcareous Cambrian slates. Impregnations of copper in andesite are noted near Colucán, and copper ore exists at various other points.

SAN LUIS POTOSÍ. There were fourteen registered copper mines in this state in July, 1907. In the Matehuala district, which is the most important producer of metal, the copper ores are mainly sulphides, with garnetiferous gangue, occurring as contact deposits between limestone and porphyritic rocks. There are cupriferous deposits of promise in the districts of Catorce and Salinas, and copper ores exist at a considerable number at other points.

SINALOA. There are copper ores in nearly every district in the state of Sinoloa and the number of registered copper mines in July, 1907, was 25. The northern part of this state is a continuation of the Sonoran plateau, but owing to indifferent transportation facilities, no important mines of copper have been developed, though there are several properties of considerable promise. With the completion of two new railroad lines now under way, traversing this state, copper mining should become an important and profitable industry. In olden times considerable high-grade copper ore, mainly argentiferous, was smelted in crude adobe furnaces, near the mines.

SONORA. The state of Sonora, one of the richest in the Republic of Mexico, is of immense size, being nearly twice the area of the state of New York, or as large as Michigan and Indiana combined, and is one of the richest mineral fields in the world. It is much the most important copper producing state of Mexico, and one of the leading copper fields of the globe, with unusually brilliant prospects for the future. According to the government records there were no less than 234 copper mines in the state in July, 1907, in addition to mines carrying mixed metallic values. Considerable copper was produced in adobe smelters, during the years of Spanish domination, and under the republic, previous to the modernization of the copper industry begun in the closing years of the Nineteenth Century. Humboldt predicted, nearly one hundred years ago, that the mineral wealth of the world would be developed in Sonora, which then consisted of the present states of Sonora and Sinaloa in the Republic of Mexico, and the territory of Arizona in the United States. This prediction is being borne out to the letter, as there is no richer mineral field, of equal area, upon the globe.

Sonora, lying on the western slope of the Sierra Madres, is far richer in copper and gold than is Chihuahua on the eastern slope, where the values are mainly in silver and lead. The principal Sonoran copper deposits are of the Carboniferous system of the Paleozoic group. Copper development, which requires the best of transportation facilities, has been hampered by lack of railroads, but a considerable amount of railroad build-

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ing is now under way. The frequent outbreaks of the Yaqui Indians also have caused much trouble in several of the mining fields. There are copper mines in the districts of Alamos, Altar, Arizpe, Hermosillo, Magdalena, Moctezuma, Sahuaripa and Ures.

The Alamos district is essentially a silver field, but contains much copper, this metal being an important by-product from the Quintera silver mines. The Piedras Verdes copper deposit is one of considerable promise, and there is little doubt that copper mines of importance will be opened, in time, in this district.

The Altar district has mines of gold, silver and copper, but developments in the copper line have been on a rather limited scale in the past, though the district has properties of promise.

The Arizpe district is the scene of the most extensive copper mining development in Mexico, and is the site of one of the greatest copper industries of the globe, in the municipality of Ronquillo, generally known as the Cananea field. The Cananea mines were worked as early as the Eighteenth Century, by the Casa Gua, of Chihuahua, later by Don José Perez, and eventually, in the latter half of the Nineteenth Century, by Governor Pesqueira, passing, in 1899, to the predecessors of the the present owners. The Cananea Mountains are an isolated range of about 25 miles length, lying in the free zone of northern Mexico, only a few miles south of the Arizona border, the range being of the short, isolated, variety typical of the Sonoran plateau in both Sonora and Arizona, and to the southeast is the Sierra Manzanal, almost a continuation of the Sierre de Cananea. The Cananea range of mountains consists of shattered and altered Paleozoic limestones, with intrusive masses of diorite and rhyolite, flanked by bedded tuffs. The mountain range has a northwesterly and southeasterly strike, the highest point being Elenita Peak, 7,600 feet above sea-level, and there is a zone of fissuring along the axis of the belt, ore bodies occurring as concentrations and replacements in either limestone or porphyry, the former being of Paleozoic age and the porphyries being largely rhyolitic. The district gives every indication of great volcanic activity at some remote date, followed by heavy erosion. As a rule the gossans are not heavy, much of what appears to be gossan at a short distance proving, on closer inspection, merely stained and weathered conglomerate. There are numerous ore bodies occurring as contacts between limestone and the igneous eruptives, largely as patches surrounded by crystallized rocks. The ores are of a great variety, ranging from native copper, in masses up to a hundredweight or even greater, through the rich oxidized ores and secondary sulphides, down to disseminated chalcopyrite. The ore of the Capote zone is almost exclusively pyrite coated with very thin films of chalcocite, usually with a porphyritic silicious gangue. The Capote ore body occurs in shattered quartzite, the ore being soft and containing sericite, causing trouble in concentration. The mines show a considerable variety of forms of occurrence, including contact metamorphic deposits, impregnated sedimentary rocks and fissure veins.

The principal developments in the Cananea field are in the southeastern half of the range, which is separated into two nearly equal portions by Puertecitos Pass. There is reason to believe, however, that ore deposits of value exist in the northern half of the range, this opinion being based upon personal inspection.

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In addition to the great copper mines developed and developing in the Cananea Mountains, there are other highly promising deposits of copper ore in various other fields of the Arizpe district, including prospects in the Sierra Manzanal, and remarkably rich surface ores in the Sierra Azul, or Ajo Mountains, to the eastward of La Cananea. In fact, nearly every municipality of the district of Arizpe shows more or less copper ore.

The Magdalena district is a gold field, primarily, but each of its six municipalities shows more or less copper, and many of these are not devoid of promise.

The district of Moctezuma ranks in importance second only to that of Arizpe, in the state of Sonora. There are large developed mines in the neighborhood of Nacozari, the hill on which the Moctezuma mine is opened being a body of cupriferous monzonite, too low in grade to work at present, but possibly available at some future time. Good mines of copper, carrying considerable values in silver and lead, are being developed in the vicinity of Cumpas, in the Moctezuma district and exploratory and development work on copper properties is noted at several other points.

The district of Sahuaripa, in the central eastern part of Sonora, has its eastern boundry on the line of the state of Chihuahua. The topography is exceedingly rugged, as a rule, but the district is better watered than some other portions of the state. Rail transportation is lacking, and the Yaqui Indians are very troublesome, at times, but the district is one of great promise for some future period when the Indian uprisings shall have been quieted finally, and cheap transportation is afforded by rail.

The Ures district contains a number of developing copper mines, in addition to mines of other metals, and while its production is small, at present, the time should come when rich and profitable copper mines will be steady producers of the metal.

TABASCO. The state of Tabasco has no copper mines, but is supposed to have copper ores near the Chiapas line, as the Santa Fé mine of Chiapas is but a very short distance from the state of Tabaseo.

TAMAULIPAS. In July, 1907, the state of Tamaulipas was credited with the possession of eleven copper mines, of which only one or two are of present importance. There are copper deposits at a number of points in this state.

TEPIC. In July, 1907, the government statistics of Mexico credited the territory of Tepic with the possession of two copper mines, and there are mines of other metals carrying material copper values. Copper ores exist at a number of points in this territory, though the principal mining industry is based upon gold.

TLAXCALA. There are no recorded copper mines in the little state of Tlaxcala, but beds of copper ore outcrop near Monte Tlatlay.

VERA CRUZ. There are no copper mines in the state of Vera Cruz, but copper ores have been found in the district of Zomelahuacán, and probably exist at other points as well.

YUCATÁN. It is reported, though the statement does not seem fully verified, that for some centuries the Maya Indians have worked cop-

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per mines, in a crude way, in the interior of Yucatán. The greater portion of this state was held, practically undisputed, by the war-like Mayas, from the time of the Montezumas until a recent period, the Spaniards finding it easier to leave the aborigines in undisputed possession of their territory than to attempt a conquest. Under the wise and pacific government of Don Porfirio Diaz the extension of the power of the Federal government over the entire state of Yucatán has been accomplished with very little bloodshed, through the exercise of great tact, patience and firmness. The interior of Yucatán is wild and little explored, but it is probable that considerable mineral values exist.

ZACATECAS. According to government records there were fourteen copper mines in the state of Zacatecas in July, 1907, the principal copper producing districts being those of Mazapil and Conception del Oro, south of Saltillo. The mines of Mazapil show a considerable variety of copper ores, existing in large quantities, and this is a field of promise. The Bolaños and Ramos districts also are of slight present importance, and of considerable future promise.

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CHAPTER XVII.

COPPER DEPOSITS OF CENTRAL AMERICA AND THE ANTILLES.

In this chapter detailed references are made to the copper mines and copper producing districts of Central America and the West Indies. While the production from this field is small, these countries are not devoid of ore bodies of considerable promise.

COSTA RICA. Las Concavas mine, opened in the Eighteenth Century, or possibly earlier, was a small copper producer, at intervals, for many years, but has been idle for some time. There are outcrops of copper ores at several points in the republic, but no serious attempt at mining has been made except at Las Concavas. With the present large investment of foreign capital in Costa Rica, and the rapid extension of transportation facilities, further attempts at the exploitation of copper deposits would seem only a matter of time.

CUBA. The first American copper mines worked by Europeans are said to have been in Cuba, in the province of Santiago. There are copper mines, now idle, in the provinces of Matanzas, Pinar del Rio, Puerto Principe, Santa Clara and Santiago.

In the province of Matanzas copper ores are noted at El Recreo, a vein of one to twenty inches width having been traced for a distance of about a quarter of a mile.

In the province of Pinar del Rio copper is noted near Arroyo de Mantua, in the form of chalcopyrite associated with pyrrhotite, and with occasional chalcocite, occurring as lenticular chutes in metamorphic schist, and carrying strong limonite gossans.

In the province of Puerto Principe there are small mines that were worked many years ago, on fissure veins carrying chalcopyrite with quartz gangue, but none of these seem of especial promise.

The province of Santa Clara has copper ores at various points, including several localities northeast of Cienfuegos, and old copper mines are found at San Juan de Malaja, 6 miles northeast of the city of Santa Clara, and at the Finca San Joaquin, 12 miles west of Manicaragua, and also a short distance from Cumanayagua.

The mines of El Cobre, 8 miles west of Santiago Bay and about 30 miles north of Santiago de Cuba, were opened by the Spanish, A. D. 1532, the first production having been used for the casting of bronze cannon. The various mines were consolidated, in 1832, in the hands of an Anglo-Spanish company, and were worked until the plant was burned by insurgents, in the Cuban rebellion of 1868, producing, according to the custom-house records of Santiago, 610,200 tons of ore, exported to Swansea, averaging about 16 per cent. in copper tenor, and valued at $60,186,225, probably in depreciated Spanish currency. The ores of the Minas de Cobre occur in a mineralized zone of about 200 feet width, and of at least a mile

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in known length, the belt showing several parallel veins, with rocks between much altered, the ore occuring as chutes with extreme widths of about 20 feet, and lengths of 20 to 200 feet, along fracture veins in serpentine. The ore is primarily chalcopyrite, associated with pyrrhotite, with quartz gangue, the grains of chalcopyrite frequently being coated with covellite.

GUATEMALA. The republic of Guatemala possesses considerable mineral wealth, but owing to lack of transport and rugged topography, mining development is limited, being confined mainly to placer gold mining. With the completion of the Ferrocarril Guatemala del Norte, various cupriferous districts will be rendered accessible, and doubtless copper mining developments will follow. There were small copper mines in Guatemala under Spanish domination, as early as the Seventeenth Century, but metallic production was mainly silver.

Small veins carrying massive malachite occur near Ravinal, in the department of Baja Verapaz, also near Cabulco.

In the department of Chuquimula, in eastern Guatemala, there are copper deposits, claimed to average 5 to 20 per cent. copper tenor, but these are idle, though they will be available for exploitation on the completion of the new northern railway. This department is mountainous and isolated, but apparently rich in minerals.

In the department of Huehuetanango, on the southern slope of the Cuchumatanes Mountains, there are contact veins between limestone and granite, showing high grade carbonates. Near Chiantla there is an occurrence of copper ore said to resemble that of the Santa Fé mines of Chiapas, in Mexico. There are developed silver-lead mines in this department.

Copper carbonates are found in sedimentary beds not far from the city of Guatemala, in the department of that name.

HAYTI. There are deposits of copper ore at various points in the republic of Hayti, notably in the Hotte Mountain range, in the southern part of the island, and extensive deposits of copper ore, in and near igneous rocks of andesitic nature, associated with Tertiary limestones, are said to occur at Terre Nueve, about 10 miles from the seaport of Gonaives. There also are exposures of copper ore at Grande Riviere, south of Le Cap, 6 to 10 miles south of the sea, and at Limonade, copper ores carrying platinum, iridium and osmium are noted. Previous mining developments have been of the crudest, but efforts are now being made to develop a copper property along modern lines, with American capital.

HONDURAS. Copper ores occur in nearly every department of this republic, but development is limited, and the mines are of small size. There are copper mines in the departments of Tegucigalpa and Comayagua. In the department of Yoro, in the northwestern part of the republic, promising deposits of copper ore are reported from a district about 40 miles from the Ulloa river. This district is said to show a vein up to 14 feet in width, claimed to be traceable for miles, giving ores assaying 15 to 16 per cent. copper, which seems a statement liable to reduction.

JAMAICA. There is a cupriferous district near the middle of the island, showing several veins of 3 to 4 feet width, on which a little ex-

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ploratory work was done, and from which one small shipment of ore was made, circa 1854. Since that date there have been repeated efforts to organize mining companies, and develop mines, but no permanent results have been secured. Apparently the deposits first opened were of small extent and of low value. There are indications of copper and other metals at various other points in the island.

LEEWARD ISLANDS. Copper ore has been noted on the island of Virgin Gorda, one of the Virgin Island group.

NICARAGUA. A very small amount of copper is produced in Nicaragua, as a by-product from the smelting of silver ores, the copper acting as a carrier in the matting of argentiferous sulphides. Occurrences of copper ore are noted along the Atlantic coast, and there are cupriferous belts on the Escondido and Mico rivers. The most promising ores are noted in the department of Segovia, but development is rendered difficult by a mountainous country and poor roads. Copper ores are noted also in the vicinity of Jinotega in the department of Matagalpa, in the department of León, and near Prinzapulca, on the gulf coast, in the department of Zelaya.

PANAMÁ. This newest of American republics has deposits of copper and other minerals, but lacks developed copper mines.

PORTO RICO. Copper mining in Porto Rico begun in 1869, when La Abundancia mine was opened, in the barrio of Rio Blanco, and this was followed by the exploitation, on a small scale, of several adjacent properties. The Rio Blanco deposits carry a vein of pyrrhotite of 6 to 10 feet width, with a paystreak of 8 to 15 inches, mineralized with bornite and chalcopyrite, the paystreak averaging 10 to 12 per cent. copper. Work was abandoned because of the heavy cost of transportation, after several hundred tons of rich ore had been produced. Copper outcrops are noted at various points along the mountain range that crosses the island from east to west, the richest being in the barrio of Rio Blanco.

Since the American occupation, numerous mining claims have been filed, but no actual mining has been done, except a little placer work for gold. At the end of 1906 eleven claims had been filed for copper, and one for iron and copper, these being mainly in the western end of the island, in the departments of Mayaguez, Arecibo and Ponce.

SALVADOR. Copper ores are noted in the department of Chalatenango, near the Honduranian frontier, and some attempts at mining in a crude way have been made. There also are copper ores near Melapan, in the department of Santa Ana.

SANTO DOMINGO. A little mining for copper is said to have been done by the Spanish, during the Eighteenth Century, but such operations must have been conducted on a small scale. The Sierra de Differencia, constituting the backbone of the island, shows copper ores at various points, the most important occurrences noted being near the Jaina and Nigua rivers, in the province of San Cristobal, on the northern side of the island, and on the southeastern flanks of the mountains, in the same province, about 25 miles northeast of the city of Santo Domingo. At the latter point ores are said to occur in tuffs, near the point of contact with Cretaceous limestone, the ores being chiefly chalcopyrite, associated with limonite, with some malachite and brochantite.

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CHAPTER XVIII.

Copper Deposits of South America.

The cordillera of the Andes carries copper from its northern end in Columbia to Punta Arenas, at the southern tip of the continental mainland. Apparently the copper ores favor the western slopes of the cordilleran belt, as the principal mining fields lie mainly along the coast range, or between the coastal and central mountain ranges, largely in the tablelands between these two Andean ranges. There are occurrences of copper ore in Argentina and elsewhere, on the eastern slopes of the Andes, but these apparently are of less importance than the copper measures to the west. The principal cupriferous developments in South America are in the Republic of Chile, with Perú a good second, and there is every reason to believe that not only these, but other countries, will become increasingly important producers of copper.

ARGENTINA. The republic of Argentina has copper mines in the province of Buenos Aires, near the capital, which apparently are of small extent and little promise, and in the Andean provinces of Catamarca, Córdoba, Jujuy, Rioja, Salta, San Juan and Tucumán, of which the more important are in the province of Rioja. All of the latter named provinces are in the northwestern part of the republic, lying on the eastern slope of the Andes, in a rugged district offering serious obstacles to economical transport.

The production of copper by Argentina has been small for many years, but eventually should become important. The ores are mainly sulphide, but, like those of the eastern slope of the Andes, run largely to arsenical and antimonial forms, enargite being an ore of frequent occurrence.

In the province of Rioja is found the Famatina district, in a field of only about ten by fifteen miles area, which includes the Mexicana, Tigre, Caldera and Cerro Negro sub-districts. The Sierra de Famatina is a great mass of metamorphic rocks, 60 to 100 miles in width, with peaks of nearly 20,000 feet in height. Near Chilecito is a vast upheaval of geologically recent eruptives, showing copper ores in fissures. The district is very rugged, and difficult of access and transport. The mines of the Mexicana district occur at elevations of 13,100 to 14,800 feet, the veins being numerous, narrow and rich.

The Capillitas district, in the province of Tucumán, is very small, having an area of about 4 square miles only. The topography is exceedingly rugged, and there is no wood, and no water, except in the mines, which can feed the boilers, but are unable to supply water for mills. The Cerro de Capillitas shows a mass of fissure veins, forming almost a gigantic stockwerk, in granite, gneiss and porphyry, with a capping of trachyte. The ores developed are cuprite, melaconite, azurite and malachite, with a limited amount of bornite and occasional highly argentiferous tetrahedrite. It is probable that chalcopyrite will come in at greater

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depth, but the richer ores in the alteration zone evidently are of considerable depth, and are both auriferous and argentiferous, as a rule.

BOLIVIA. Mines of both silver and copper were worked in Bolivia by the Incas. Geological conditions are somewhat similar to those found in the adjoining countries of Perú and Chile, but the exploitation of Bolivian copper mines has been hampered by a variety of disadvantages. The mines lie in the high cordilleran plateau and lack of rail transportation has been a serious drawback, but arrangements were made, in 1906, between the governments of Bolivia and Chile, for the construction of a rail line from Arica to La Paz, with a branch to Coro Coro, and the completion of this line cannot operate otherwise than as a great stimulus to production from the rich mines of the Coro Coro district. Most of the copper produced in Bolivia is shipped through the Peruvian port of Mollendo, though occasional shipments are made by way of Tacna, a Chilean port. The mining districts of Bolivia are arid, as a rule, and but slightly developed outside of Coro Coro.

There are copper mines in the departments of Aurora, La Paz, Litoral, Lipez Norte, Lipez Sur, Oruro, Pacajos and Potosí.

There are copper ores and mines at several points in the department of La Paz, but the most important mines of the department, and of the republic, are at Coro Coro. These mines are believed to have been worked by the Incas. The district is arid, and the only available local fuel is coñiga and cagajon. The nearest water supply is the Desaguadero river, 14 miles distant, which is a navigable stream, and copper is shipped by way of the port of Desaguadero. The Coro Coro district lies in the basin of Lake Titicaca, in the cordillera of Chacarilla, between the Andes to the eastward and the Cordillera Real, or coastal mountain range, to the west. This district shows two dissimilar sedimentary strata, apparently of different geological horizons, similar only in their origin and cuperiferous nature. The older and underlying formation, Las Vetas, is an arenaceous conglomerate of argillaceous tendencies, having a generally northeasterly trend. Superimposed upon this stratum is another conglomerate, Los Ramos, having a generally southwesterly trend. The upper conglomerate is much like the lower, but is darker in color and mottled with red and white particles of gypsum and other minerals in the older stratum. The country rocks are eruptive, mainly dioritic, and the copper occurs native as a rule, and but rarely as ores in quantities of commercial importance. The conglomerates range from 2 to 6 feet in thickness, with an extreme thickness of 50 feet in the Veta El Dorado, which has a minimum width of about 3 feet. These conglomerates carry native copper averaging about 5.5 per cent. with copper ores in small quantities, mainly chalcocite and domeykite, scattered irregularly through the beds, and native silver occurs sparingly. The mineralized district has been proven for about one-half mile in width and for about 5 miles in length, but traces of copper are noted for a considerably greater distance, and about 25 miles to the southeast what apparently is a continuation of these beds has been found, and mined slightly, while the same formation also outcrops still further south, in a region west of Poopo. The southerly continuations of the Coro Coro belt are difficult of access, though of considerable promise. The native copper occurs usually in small nodules, though masses, commonly of small size,

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but sometimes large, are encountered at times. The silver associated with copper is mechanically admixed, but not alloyed, this method of occurrence of the two native metals being the same is in the Lake Superior district.

The Bolivian government estimates the average cost of copper production from the Coro Coro district, per quintal of practically one hundredweight, averaging 80 per cent. in copper tenor, at 5.34 bolivars for mining, 3.27 bolivars for milling and 1.39 bolivars for general expenses, a total of 10 bolivars for 80 pounds of fine copper. Cost of transportation to the coast averages 3.24 bolivars via Tacna, and 2.87 bolivars via Mollendo, the latter port taking the major part of the exports, with an average cost of ocean freight to European smelting ports of 2.78 bolivars per quintal, giving an average cost of 15.6 bolivars at Swansea and other principal British smelting points, with an average European price of 20 to 22 bolivars per quintal.

The departments of Lipez Norte and Lipez Sur show extensive remains of Inca workings, obviously for silver, with evidences of later operations by Spaniards. There are promising deposits of highly argentiferous copper ores in these departments.

The smelting point for the mines of Huanchaca, department of Potosí, is at Pulacayo, on the line of the Antofagasta & La Paz railroad, at a distance of 184 miles from the first named city. The Huanchaca mines lie at an elevation of about 17,000 feet. The vein is 3 to 9 feet wide, in intrusive micaceous andesite cutting Silurian slates. Pay ore occurs in chutes, and is mainly highly argentiferous tetrahedrite, associated with chalcopyrite, sphalerite, galena and pyrite, all argentiferous, with quartz and barite gangue. Selected ore is shipped to Antofagasta, where smelted, or forwarded to New York for reduction. Selected ore averages about 6 per cent. copper, 8 per cent. lead, 16 per cent. zinc and 1.5 per cent. silver.

The department of El Litoral is included by the Bolivian government in its copper statistics, but inasmuch as this department has been occupied by Chile since 1879, and is now part of the Chilean province of Antofagasta, and will not be given up by Chile except to superior power, which Bolivia lacks, its inclusion in any article dealing with Bolivia must be considered a patriotic reminiscence, rather than a fact of present importance.

BRAZIL. The existence of native copper and of various copper ores in Brazil has been known for many years, but few systematical attempts have been made at mining, until within the past few years, and official records are lacking in most cases. In fact, but for private enterprise very little authentic information would be available, and credit is due to Prof. A. J. de Souza Carneiro, of Bahia, for much of the information that has been gathered regarding Brazilian copper deposits.

The immense size of the republic of Brazil renders it altogether probable that deposits of copper will be found at numerous points, in addition to those now noted, and as a fair beginning has been made on copper mining and smelting, under modern conditions, in the state of Rio Grande do Sul, it is probable that this republic will become, sooner or later, a considerable producer of the metal.

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A mass of native copper weighing 2,616 pounds was found many years ago in the neighborhood of the city of Bahia, in the state of that name, and now reposes in the royal museum at Lisbon. This state contains numerous copper deposits, but the only active mines of importance are at Carahyba. There are about a dozen districts in the state of Bahia where copper ores have been found in greater or less profusion, and in the majority of cases these copper measures would seem worthy of careful investigation. In addition to the mines of the Carabyba district, copper has been found to the north, near the Cerro de Barracha district, also at Patamuté, Urtigis and Curacá. In the central part of the state copper ore exists at the Cachoeira do Inferno and at Jacobina. In the western part of the state copper ores occur at Chapa da Velha, and in the eastern part ores are known on the Paraguassú river, near Cachoeira, at points near the city of Bahia, at Belem, Genipapo and Murihiba. In the south central part of Bahia copper has been found at Maracás, and in the southern part at Condeuba and along the line of the Rio Verde, near the boundary of the state of Minas Geraes.

In the state of Ceara copper ores exist at a number of points, and have been worked to a slight extent. The principal occurrences are near Buhira, in the municipality of Bucuosa, where abandoned explorations show native copper and cuprite. Copper also exists in the Cerro Cantagallo.

In the state of Goyaz various deposits of copper ore of more or less promise are noted on the Jaurie River.

In the state of Maranhao there are rich copper ores at a number of points, notably in the municipality of Chapado.

In the state of Matto Grosso copper ores of considerable promise are exposed at various points along the Jaurie River, which forms the boundary line between the states of Matto Grosso and Goyaz.

In the state of Minas Geraes, long noted for its gold mines, the occurrences of copper ore probably are of greater promise than are noted in any of the other Brazilian states except Rio Grande do Sul and Bahia. The principal occurrences are noted near Ouro Preto, Sete Lagoas and Lavras. At the latter point copper deposits, found in 1901, gave assays running up to 75 per cent., and a little mining work was done thereon.

In the state of Paraná copper deposits are known at Campo Largo, in the Carapuava district and along the river Parapanema.

In the state of Rio de Janeiro copper ores are noted in the vicinity of Campos and Sao Joao do Barra.

Copper exists in the northern part of the state of Rio Grande do Norte, near the boundary of the state of Ceara.

In the state of Rio Grande do Sul are found the principal Brazilian copper mining operations of the present day, at Camaquam, 3 kilometers from the Rio Camaquam, and about 80 kilometers from Rio Negro, a station on the Southern Brazilian railway. The formation shows an intrusive core of melaphyr, surrounded by conglomerate, ore occuring in the latter as chalcopyrite associated with pyrite, with occasional particles of chalcocite and showing occasional dendrites of native copper, gangue being of quarts. The veins occur as fissures in conglomerate and extend to the adjacent sandstone, but therein are not as rich as in the conglomerate, where four ore bodies are being worked.

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These lack regularity, and even continuity, having an average width of about 4 feet and giving average assays of about 6.5 per cent. copper and 30 grams of gold, per metric ton. Elsewhere in this state copper ores are noted at Cacapava, where two small mines have been opened, and at Guarahina, Sao Gabriel, Cerro Martino and Cerro do Geraldo.

In the state of Sao Paulo chalcopyrite associated with sphalerite and galena has been found, in limestone, near Paranahaiba, but attempts at mining were abandoned, as the ore was found in small pockets only. Copper occurs also in the Sporanga Mountains.

CHILE. This country was, about the beginning of the last quarter of the Nineteenth Century, the largest copper producer of the world, but now holds only sixth place, having been passed by the United States, Mexico, Spain, Japan and Australia. The copper output of Chile has decreased, not only relatively, but actually, owing mainly to the exhaustion of the principal bodies of oxidized ores in the older mines. From this decline in output it must not be inferred that Chile is exhausted as a copper producer; on the contrary, the possibilities of copper production are greater than in almost any other country except the United States, Mexico, Canada and Australia. It will be necessary in the future, however, to obtain a much larger proportion of the product from sulphide ores than has been gained in the past. The production from sulphides of low and medium copper tenor is increasing, and with the increase of railroad facilities, and the better equipment of mines and smelters along modern lines, Chile must become an increasingly large producer of copper. The largest annual production ever made was about 43,000 long tons of fine copper in 1882, and total production from 1844 to 1900, inclusive, is estimated at 1,830,000 long tons of fine copper.

Copper deposits were worked in a limited way before the first white man set foot on the soil of Chile, and a little metal was produced under Spanish domination, but the industry did not gain real importance until during the fourth decade of the Nineteenth Century, after the gaining of independence. Until 1842 the high grade oxide and carbonate ores were smelted in charcoal furnaces, but in that year the first reverberatory furnace was built by Charles Lambert at Coquimbo, and in 1857 the first blast-furnace was built by the same pioneer. The period of greatest prosperity of the Chilean copper industry includes the three decades from 1850 to 1880, followed by twenty years of slow but fairly steady decline, with a turn of the tide, followed by improvement, setting in with the beginning of the Twentieth Century.

In 1903, according to the official records of the republic, there were in Chile patented mines as follows: copper, 7,106; gold and copper, 124; silver and copper, 427; copper and iron, 16; copper and lead, 4; gold, silver and copper, 38; silver, copper and lead, 14; silver, copper and cobalt, 1, a total of 7,730 cupriferous mines. The number of working properties was 748, not quite 10 per cent. of the total. In this connection it should be explained that a mine in Chile consists of one hectare, or pertenencia, many of the properties including a considerable number of pertenencias. The mining laws are very liberal, and the government cannot be accused of retarding the mining industry. Each holder of one pertenencia, of practically two and one-half acres, is taxed $10 yearly, and, after officially

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surveyed, the property is freehold as long as taxes are paid regularly. Transportation facilities are poor, and there is considerable complaint of dishonesty and favoritism in the management of the state railroads.

Chile has two parallel copper belts, running nearly due north and south, along the axis of the Andes, these belts being approximately one hundred miles apart. The principal developments have been secured in the western or coastal belt, because of better transportation facilities. The cupriferous fields of Chile show mainly strata of the Permian system, with sandstones predominating. These have been much faulted, twisted, broken and upheaved by eruptive rocks, largely diorite. The auriferous copper veins of Atacama and Coquimbo usually are associated with highly silicious eruptives, while the argentiferous copper veins are associated commonly with diabase. General geological conditions are somewhat similar to those of the Mansfeld district of Germany, and in the Ural Mountain range of Russia, though the topography of Chile is much more rugged. The cordilleran belt, on the main chain of the Andes, lies back from the coast some distance, and the country is so mountainous, and the altitude is so great, and transportation facilties so poor, as a rule, that mining developments are on a scale that is trival, compared with the possibilities of great production from this belt. The two parallel cupriferous belts stretch from Perú on the north to nearly the southern end of Chile, in what formerly was called Patagonia, a wild country that has been divided between Chile and Argentina, the Andes forming the line of division. In the desert regions comprising the greater part of Chile, the oxidized zone usually is of great depth.

There are copper mines in the provinces of Aconcagua, Antofagasta, Atacama, Colchagua, Coquimbo, O'Higgins, Santiago, Tacna, Tarapacá and Valparaiso, with copper ores known to exist in practically all of the other provinces. Antofagasta, Coquimbo and Atacama lead in production and in the number of important mines.

The principal copper mines of the province of Aconcagua are in the department of La Ligua, where there are a number of important mines, and in the departments of Petorca and Putaendo.

In the province of Antofagasta there are mines of importance in several districts, including Calama, San Pedro de Atacama and Tocopilla, the latter being an old field. Important mines are being opened in the department of Gatico, under modern methods. In the Chuquicamata district the copper mines were worked originally for atacamite, this assaying 2 to 3 per cent. only in copper, but being reduced easily. Developments at depth, however, have shown much richer ores, ranging from 5 to 20 per cent. in copper tenor, and important developments are under way. The center of this field, 163 miles by rail from Antofagasta, has an average elevation of about 9,000 feet above sea-level. The richer ores, principally atacamite, occur in small veins, with gangue of quartz and feldspar, and ore as now mined averages 10 to 12 per cent. copper. In the Taltal district the rich gold mines of Guanaco have become copper mines at depth, a phenomenon noted at numerous other points in the world.

The province of Atacama has copper mines in a large number of departments and includes several of the most important copper districts of Chile. The ores mined in this province must average about 6 per cent.

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in copper tenor to be profitable, unless specially suited for fluxing purposes, in which case lower grades are utilized. Labor is inefficient, and power drills run by compressed air prove unsatisfactory, owing to the great altitude, while electric drills, for some reason not apparent, have not given satisfactory results. The department of Copiapó has a number of famous old producers, and some new mines of importance. Production in 1903 was 6,605 metric tons fine copper, from about 40,000 tons of ore, giving an average extraction of better than 15 per cent. for the entire district. The department of Chañaral was the second largest producer in 1903, ores as smelted giving average returns of 8.6 per cent. copper. The Cerro Blanco district is in the cordillerean zone, with mines mainly in trachyte, opened for silver, but changing to argentiferous copper values at an average depth of about 600 feet, and deeper to copper sulphides of good average value, the deepest workings being about 1,500 feet. In the department of Chañaral there are old and important mines, and the departments of Carmen Alto, Carrizal Alto, Freirina, Puquois and Vallenar have copper mines of importance.

In the province of Coquimbo there is very general complaint about of San Vicente, but there are copper ores at numerous other points.

In the province of Coquimbo there is a very general complaint about both the scarcity and inefficiency of labor. In this province there are important mines in the departments of Coquimbo, Combarbalá, Guayacan, Illapel, La Higuera, Ovalle, Tamaya, Tongoy and Vicuña.

In the territory of Magallanes, in the extreme southern part of Chile, two veins of 5 to 7 meters in width have been found, carrying bornite and chalcopyrite, associated with hematite and limonite, with a quartz gangue.

In the province of O'Higgins there are copper mines, of more or less importance, in the vicinity of Rancagua.

In the province of Santiago the principal copper mines are at Lo Espejo and Melipilla, and in the department of Victoria.

The province of Tarapacá has copper mines, mostly small, near Iquique, Huantahaya, Huara and Tarapacá. Production by these mines is small, though they are by no means devoid of promise.

In the province of Valparaiso there are copper mines of some present importance, and of considerable future promise, near Llai-Llai and Quillota.

COLOMBIA. The production of copper is an industry of great age in the republic of Colombia, but one that never has assumed great importance. Considerable copper was secured during the centuries of Spanish government, mainly from the rich oxidized ores at and near surface, extracted and smelted along primitive lines. There are old copper mines in the provinces of Antioquia, Tolima and Boyeca, the mines of the latter producing a little copper for purely domestic uses. Copper also is found in the departments of Bolivar, Cauca, Cundimarca and Santander. The principal deposits of Cauca are at San Lorenzo, Yocoto, Coli, Pichinche and Andagueda. In the province of Colima copper ores exist near Anchique, and at Nacoroco, southwest of Natagaima. With the improvement of transportation facilities, and the introduction of foreign capital that will follow the more settled political conditions brought about by the wise government of General Rafael Reyes, the copper industry of Colombia,

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now of merely academical interest, should take upon itself proportions of commercial importance.

ECUADOR. This republic has copper deposits in the provinces of Azuay and Loja, and an attempt at mining on a modern scale was made, some years ago, but did not prove successful. Mining operations are confined mainly to the production of gold from a number of small mines, and copper ore is found frequently in small quantities in these mines. It is altogether probable that Ecuador possesses copper deposits of prime importance, in its mountainous mining fields, but developments to date are trivial.

PARAGUAY. There are deposits of copper ore at various points in the northern part of Paraguay, from which specimens of native copper have been taken, but no mines have been opened. Copper ores also are noted near Incarnacion, in the southern part of the republic.

PERÚ. This country was a small producer of copper for some hundreds of years, but about the middle of the Nineteenth Century the industry fell into decay, and its rejuvenation dates from shortly after the decline in the price of silver, around 1885, which caused the mines of the Cerro de Pasco district to utilize their rich ores of copper, previously thrown aside in the search for silver values. The immense investment of American capital in the Cerro de Pasco district, estimated at $17,000,000 gold, promises to revolutionize the copper industry of Perú. Among the disadvantages of Peruvian mining are the tremendous height of the mountains, which have taxed the engineering skill of man to pass, the lack of fuel in certain districts, and the inefficiency of labor, which is inclined to be both drunken and lazy, a state of affairs scarcely to be wondered at, in view of the padrone system in quite general use.

Perú is the second largest copper producer in South America, and in 1906, made 13,474,332 kilograms fine copper, a gain of 1,261,332 kilos over the preceding year, the production amounting to about 2 per cent. of the world's total supply of the metal. According to the official Peruvian statistics of 1900, there were in Perú 104 copper mines, 104 mines of silver and copper, and 2 mines of gold, silver and copper, which number had increased, in 1905, to 349 copper mines, 1,022 silver and copper mines and 351 copper and lead mines, a total of 1,722 cupriferous properties, showing a gain of more than 700 per cent. in five years.

Perú has the usual ores of the Andean cordillera, with geological surroundings similar to those of Chile. Copper ores are scattered all along the Peruvian Andes, and down to the coast. The principal ores are bornite, chalcopyrite, enargite and tetrahedrite, there being an unusual proportion of arsenical and antimonial minerals among the minor ores, found in considerable quantities in various places, with occasional native copper, cuprite, malachite, bournonite and chalcanthite, usually associated with sphalerite and frequently with galena, all ores being more or less argentiferous.

In addition to copper ores in practically all of the other departments, Perú has copper mines in the departments of Ancachs, Arequipa, Cajamarca, Huancavelica, Huánuco, Ica, Junín, Libertad, Lima and Puno.

In the department of Ancachs the production of fine copper in 1906

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was 440 metric tons, the district of Pallasca leading with 229 metric tons, followed by Recuay with 154 metric tons, balance of production being from the districts of Bolognesi, Cajatambo, Huallas and Huari.

The department of Arequipa produced 102 metric tons of fine copper in 1906, from the districts of Arequipa, Acarí, Camaná and Islay, the formerly important district of Acarí furnishing less than 9 tons of this small output.

The production of the department of Cajamarca, in 1906, was 162 metric tons, the Cajabamba district leading with 137 tons, with small products from the Contumazá and Hualguayoc districts.

In 1906 the production of fine copper from the mines of the department of Huancavelica was 254 metric tons, the district of Castrovirreina leading with 234 metric tons, followed by small products from the districts of Angaraes and San Juan. This department, which lies a long distance nearly due south of Cerro de Pasco, shows copper ores in promising quantities, mainly in eruptive rocks. The ores smelted in 1905 averaged about 25 per cent. copper, and 0.1 to 0.135 per cent. silver.

The department of Huánuco produced, in 1906, fine copper to the extent of 235 metric tons, of which the district of Huánuco made 141 metric tons, and the district of Huallanco 94 metric tons.

The 1906 production of the department of Ica was only 28 metric tons fine copper, all coming from the district of Ica, which was worked extensively at one time, but was practically abandoned in 1892. The largest mine was the Canza, with selected ores averaging about 30 per cent. copper, lower grades being rejected. Disadvantages in this district are lack of water and of decent roads for transportation.

The department of Junín is much the most important copper field of Perú, and is of great promise. The output of fine copper, in 1906, from the various districts of this department, was 9,440 metric tons, of which 6,741 metric tons came from the Cerro de Pasco district, with 2,697 metric tons from the Yauli district. The district of Huancayo produced only 2,156 kilos fine copper.

The Cerro de Pasco district, worked for nearly 300 years for silver, and an enormous producer of that metal, has become a very important copper field, since 1890, and is now mainly in the hands of a single American corporation. Unlike most of the other Peruvian mining fields, which are arid, there is an excess of water at Cerro de Pasco, and there are numerous streams that could be made to furnish power. Timber is scarce, except in a few districts difficult of access, but coal of fair quality is found in abundance, within 20 miles, and a branch railroad has been built to the coal fields. An extension of the Meiggs railroad has been built from Oroya to Cerro de Pasco, cutting to a comparatively trivial sum the former freight rate of $40 per ton for this distance, all transportation having been on the backs of mules and llamas. The Cerro de Pasco district is a basin of approximately one mile width and two miles length, entirely mineralized and bounded on the west by andesite, with limestone on the three other sides. The formation is in some doubt as to age, but apparently is lower Cretaceous, with strata of slate, sandstone and limestone, upon which is superimposed a mass of limestone conglomerate, of marshy rather than marine origin, fractured by eruptive acid andesite rocks, that

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in many cases engulf the sedimentary strata, the limestone being highly metamorphosed. Apparently the entire basin in a mammoth stockwerk, with impregnations of silver and copper ores, the ore occurring in immense pockets, up to hundreds of thousands of tons in weight, and largely, though less frequently, in veins. The deposits are said to be metasomatic at the western end, east of the andesite, occurring mainly as veins in or near the andesite, while to the eastward, west of the limestone, the ore occurs in large pockets, in and near the limestone. The alteration zone is 200 to 300 feet in depth, succeeded by a zone of lean cupriferous pyrites, followed in turn by highly argentiferous sulphides and arsenides. Below the water-level the ores include bornite as well as chalcopyrite, with considerable tetrahedrite, associated with sphalerite, galena, arsenopyrite and pyrite.

The Huayllay division is about 25 miles southwest of Cerro de Pasco, at an elevation of about 15,000 feet. Copper occurs at various points, mainly as enargite, with considerable tetrahedrite and some chalcopyrite. Bismuthinite is shipped in considerable quantities from one property, and there are a number of old copper mines, mostly small, in this field.

The Yauli division of the Cerro de Pasco district is a short distance east of Oroya, the principal copper deposits occurring between wollastonite strata and andesitic rocks, such as dacite and prophyllite. The Morococha sub-district of the Yauli division has a number of important producing mines, and is located on a 10-mile spur of the main line of the Oroya railroad that runs from the western end of the Galera tunnel, which passes under Mount Meiggs. The Yauli mines, including the Morococha sub-division, are located at an average elevation of more than 13,000 feet above sea-level.

The department of Libertad produced, in 1906, only 74 metric tons fine copper, of which 73,654 kilograms came from the district of Santiago de Chuco, and only 690 kilos from the district of Salpo.

The department of Lima is the second largest producer of Perú, having made 2,547 metric tons fine copper, all from the district of Huarochirí, in 1906.

The American consul at Iquitos writes that prospectors on the upper Maranón river, an affluent of the Amazon, found copper in the dumps of a half dozen abandoned mines, worked by Spaniards previous to the Peruvian War of Independence, at a distance of three weeks journey from Iquitos.

The production, in 1906, of the mines of the department of Puno, was 187 metric tons fine copper, all from the district of Lampa.

URUGUAY. Mining is but little developed in this republic, and while copper ores have been found at various points, no serious attempts have been made at developing copper mines.

VENEZUELA. Venezuela has produced no copper since 1894, but was a producer of importance at one time. Copper ores are known to occur in the departments of Baraquisimetó, Carabobo, Lara and Mérida, but the only mines of importance have been developed in the department of Lara.

There are traditions that the Quebrada mines, in the Aroa district of Lara, were worked by aborigines, before the coming of the Spanish. In the first half of the Nineteenth Century a Baltimore company operated

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several of these mines, securing therefrom about 43,000 tons of high grade carbonate and oxide ores. Later the mines were taken over by local capital, and circa 100,000 tons of medium and high grade ores extracted. The principal period of production was in the years 1872 to 1894, when fine copper to the extent of about 65,000 tons was produced. The Quebrada mines are developed on the Narvaez or Bolivar tract, of 1,150 square miles, between the Tocuyo and Yaracuay rivers, granted to one Narvaez, by the Spanish crown, in 1598, and passing, in 1802, by marriage, to the ownership of Simon Bolivar, the liberator. The developed cupriferous portion of this tract shows strata of slate and limestone, intruded by various eruptive rocks, the ore occurring in lenses, frequently of considerable width and length, and of unknown depth, the lenticular bodies occurring in series with a strike of nearly north and south. The usual oxidized ores are found at and near surface, succeeded by chalcopyrite at slight depth.

The copper measures of Venezuela obviously are of importance, even if judged solely by past production from a single district, and when the present unsettled and unsatisfactory political conditions are adjusted, Venezuela will resume its position among the important copper producing countries.

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CHAPTER XIX.

Copper Deposits of Europe.

The copper deposits of Europe are described briefly in this chapter, in alphabetical order, by countries.

AUSTRIA. Copper has been mined and smelted in Austria for centuries, and it is probable that copper mines were worked in Roman times. The industry is now of comparatively little importance, employing only about 1,000 men, with an average annual production of between two and three million pounds fine copper. The principal mines of Austria are in the Tyrol, where there are about a half dozen small mines in operation. In southeastern Bohemia there is an extensive area of sandstone and slate, containing veins carrying impregnations of copper ore, mainly chalcocite, and the Graslitzer mine of this district was perhaps the most celebrated copper mine of mediæval times. There also are a few small mines in Salzburg, near the city of that name.

BOSNIA. The production of fine copper from the mines of Bosnia was only 39 metric tons in 1905, a heavy falling off from the output of 237 tons in 1901, in which year the output was secured from 4,747 tons of ore smelted, giving an average extraction of almost exactly 5 per cent. A little ore is mined and smelted at Sinjako, and small quantities of ore are sent to Hungary for smelting.

BULGARIA. The principality of Bulgaria has copper mines in the provinces of Bourgos, Vidin and Vratza, and 1,400 tons of ore are estimated to have been produced in 1904. There are evidences of copper mining operations in Roman times, and possibly at an even earlier period. In the province of Vratza, near where modern mines are operated, there are considerable slag-piles, remaining from ancient smelters of a date so remote that no vestiges are found of the works themselves, and in other provinces there are similar but smaller slag-dumps, with waste-burrows containing mere traces of lean ore, the values of which have been leached most effectually by the rains of twenty centuries.

At Plakalnitza, in the province of Vratza, the ore is mainly bornite, with occasional chalcopyrite, and a little malachite in the upper workings.

In the province of Bourgos, chalcopyrite in considerable quantities is found at Kara Balr, immediately west of the port of Bourgos, on the Black Sea, and there are remains of copper mining operations dating from some remote period. At Kara-Tepe and Soulon-Dere there are ores ranging up to 40 per cent. in copper tenor, on which some mining has been done, in no case exceeding 100 feet in depth.

At Belogradchik, in the province of Vidin, mines are being developed on ore bodies yielding mainly chalcopyrite. At Milkiovtzy, in the district of Trn, there are small ore bodies showing malachite, chalcocite and chalcopyrite, with gangue of barite.

In the department of Sofia, not far from the capital, in the extreme

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western part of the principality, chalcocite is found at Gornya-Danya and at various other points. Native copper and rich oxidized ores have been noted in the districts of Sleven and Samakof, and elsewhere.

CORSICA. The island of Corsica has a cupriferous district about 20 miles wide by 50 miles in length, showing copper ores, mainly sulphide, in contact deposits between limestone and igneous intrusives. In this district there are a number of small and unimportant mines, mostly of considerable age, of which the Lancone mine was once a considerable producer. The present copper production of Corsica is trivial, coming mainly from a single small mine that ships about 200 tons of ore yearly to Great Britain.

CYPRUS. The Latin word cuprum, from which comes the English word copper, and its equivalents in most of the other European languages, is derived from aes cyprium, the earliest Latin name of copper, derived from the name of this island, where the Romans first secured their supplies of the metal, and it is probable that copper mines were worked by the Greeks before the Romans. The latest attempt at modern mining, early in the Twentieth Century, was in the vicinity of Limassol, but the island now has no active copper mines.

ENGLAND. English tin was known to the Phoenicians nearly or quite three thousand years ago, and copper has been produced, in all likelihood, for as many years as tin, the same veins carrying both metals, in Cornwall and Devon. At the close of the Eighteenth Century England occupied relatively the same position in the copper industry as held by the United States one hundred years later, producing 55 to 60 per cent. of the copper supply of the world, and, including the Welsh mines, then large producers, Great Britain was as important a factor in the copper trade, at the beginning of the Nineteenth Century, as North America is in the same trade at the present time. In 1799 the output of copper by English mines was 4,923 long tons, but had shrunk, in 1899, to 367 tons.

The mines of Cornwall and Devon, adjoining counties in the southwestern corner of the island, have been important producers of tin for a hundred generations, and it is no wonder that the Cornishmen are counted the world's best practical miners. A small, though relatively important production of copper, was secured from these counties during the middle ages, but systematic copper mining may be said to date from about A. D. 1700. The quantity of copper ore produced by the mines of Cornwall and Devon, during 126 years ending with 1865, was 7,844,305 long tons, valued at £50,964,388. The average yield for the last 70 years of this period was about 8 per cent. fine copper. The metalliferous belts of Cornwall and Devon may be considered as one geographically, occurring in a district showing metamorphosed sedimentary rocks, mainly clay-slates of the Devonian system, with frequent bosses of granite, both slate and granite being intruded by a quartz-porphyry of later age. There are numerous fissure veins cutting all of these rocks, these averaging 2 to 3 feet only in width, and frequently showing prominent gossans, the cappings being more numerous and stronger above copper ores than above the tin ores. The same veins carry ores of tin and copper, but there is a marked segregation of these minerals, governed by the nature of the wall-rocks, tin occurring mainly in portions of the fissures traversing granite, while copper favors

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the slates. There are exceptions to this rule, and in places tin and copper alternate in occurrence, but, in the main, the metals favor the different rocks as noted. As a rule the veins are best mineralized where having the sharpest dip. The copper ore is mainly chalcopyrite, with quartz gangue, but the upper workings show the usual oxidized ores and native copper. One mass of virgin metal, weighing three tons, was secured from a mine near Mullion, Cornwall. The secondary sulphides are found to some extent, and copper silicates occur in small quantities, while there are occurrences of many of the rarer copper minerals, of scientific interest rather than of commercial importance.

The county of Cumberland was a producer of copper from a number of mines at one time, but these have been idle for a century or more. The Goldscope, in this county, was the most famous English copper mine during the Tudor era, working a fabulously large force of men to obtain the very moderate amount of copper secured.

The county of Cheshire contains numerous deposits of oxidized ores, averaging about 1.5 per cent. in copper tenor, disseminated in sandstone, which are not of present commercial importance, though possibly of future value.

There are deposits of copper in western Shropshire, along the Welsh border.

In Staffordshire the Ecton mine, owned by the Duke of Devonshire, was opened in Roman times, and was operated as recently as 1840. This was the first English mine to use gunpowder for blasting, in 1677.

The Laxey mines, in the Isle of Man, produce lead, zinc, copper and silver, the principal values being in the two metals first named.

FAROE ISLANDS. On the western side of the island of Luderö there are a number of superimposed cupriferous amygdaloidal traps. The copper occurs in thin vertical sheets, as virgin metal, of about one thirty-second inch in average thickness, and some of the gangue rock, from which metallic copper of appreciable size had been removed, assayed 1.88 per cent. copper.

FINLAND. The grand duchy of Finland, which, though closely bound to the Russian Empire, is not a portion thereof, as quite generally considered, has copper mines in the provinces of Viborg and Kupio. The most important is the Pitkaranta, on the northern shore of Lake Ladoga, in the province of Viborg, where mining dates from about the middle of the Nineteenth Century. The ore is mainly chalcopyrite, occurring in veinlets and disseminated in beds of "skarn," or sahlite, which is a granular mixture of augite, granite and ferromagnesian silicates, traversing granite. The ore body averages about 15 feet width, and is low in grade, but has been developed more or less extensively for about one and one-half miles in length.

FRANCE. There are no copper mines of present-day importance in France, the old mines of Chessy, which were famous properties and considerable producers in the middle ages, having been exhausted and idle for many years. In 1903 French copper production was 10,900 metric tons of cupriferous pyrites, of an average value of $13.25 per ton, a considerable portion of the value being in the sulphur contents, coming mainly from the department of Ariege, with a small output from the department of

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Gard. The production is principally from mines of cupriferous pyrites at St. Bel, northwest of Lyons, where the ore occurs in series of lenses having a known length of about 1,300 meters. One of the lenticular masses is of mammoth size, having an ascertained thickness of 140 feet, at the depth of 544 feet, with a known length of 1,968 feet, consisting of massive pyrite with a little intruded quartz, slightly cupriferous. There also are small mines of argentiferous tetrahedrite in the department of Ariege, and in 1900 the production of such ore was 1,184 metric tons, valued at 612,393 francs, mainly in silver, sent to Great Britain for smelting.

There also are small copper mines in the department of Var, and in Savoy. There are very small copper mines in the department of Isere, and in the Basses-Pyrenees some exploratory and development work was done in the early years of the century. At Cap Garonne, near Toulon, there are Permian quartz-conglomerates carrying a cupriferous bed of 2 to 4 feet thickness, the lower portion mineralized with chalcocite and melaconite.

GERMANY. In production and importance, the copper mines of Germany rank second in Europe only to those of Spain, and the Germanic copper industry is of considerable antiquity, the Mansfeld mines having been important producers in the middle ages. In 1799 Germany produced only 372 long tons of fine copper, nearly all from the Mansfeld mines, and one hundred years later made 20,875 long tons, of which about 90 per cent. was from the Mansfeld mines.

There are copper mines of greater or less importance, and other mines carrying cupriferous values, in Bavaria, Brunswick, Elsass, Hanover, Hessen-Nassau, Prussian Saxony, Rheinprovinz, Saxe-Coburg-Gotha, Saxe-Meiningen, Saxony, Silesia, Weimar and Westphalia.

The copper mining industry of Saxony is of overwhelming importance, values being secured mainly from a single property in a single district, though there are cupriferous quartz veins in Schneeberg. The production of Saxony, in 1904, was 710,911 tons of ore, from three mines, of which one, the Mansfeld, is one of the world's greatest copper producers, while a second, the Rammelsberg, is of considerable importance.

The Mansfeld mines are at Eisleben, in the southern Harz Mountains. In this portion of the Ober Harz the copper occurs in rocks of the Permian system, resting unconformably upon crystallized strata of Paleozoic rocks, the metalliferous bed lying in the Zechstein, a member of the Permian formation. These horizons of the series consist mainly of unstratified gypsum, associated with bituminous dolomitic limestones, beneath which is a stratified fetid limestone, below which lies the true Zechstein, giving name to the formation. At depth this passes into a bituminous marly shale, the lowest part of which, ranging from 18 inches to 3 feet in thickness, forms the cupriferous strata, carrying disseminated copper sulphides to the extent of 2 to 5 per cent. copper, with an average tenor, as mined, of about 2.8 per cent., and carrying an average of about 0.15 kilos silver per metric ton. Under the cupriferous shale is a calcareous sandstone-conglomerate, sometimes carrying disseminated copper carbonates, and containing also small values in cobalt and nickel, all of the ore being more or less argentiferous. The copper-bearing shales of the Mansfeld district are about 200 square miles in area.

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The Rammelsberg deposits, in the northern Harz Mountains, two miles south of Goslar, Prussian Saxony, occur in lenticular bodies of banded ore, with layers conformable to the bedding of the Goslar slate, in folded beds of Devonian age. The Rammelsberg is the second largest copper producer of the German Empire.

In 1904 the production of Westphalian mines was 47,718 metric tons of ore, secured from three copper mines and as a by-product from eighteen mines of other metals, and in the same year two copper mines in Silesia produced 1,760 metric tons of copper ore.

GREECE. The first Grecian copper mining was done at Chalkos, in the island of Eubœa, in semi-historic times, and the Greek name of the metal, chalkos, came from this source. The eastern coast of Attica shows argentiferous sulphide ores of lead and zinc, including the important silver-lead mines of Laurium, the argentiferous galena and sphalerite carrying occasional chalcopyrite. Copper ores occur in small veins only, as a rule, in eastern Attica, but in 1907 one copper mine was being worked, in a small way.

There are deposits of copper ore in Thessaly, but apparently these are not of large size or especial promise.

HERZEGOVINA. This country, nominally under Turkish suzerainty, but actually administered by the crown of Austria-Hungary, has a few small and exceedingly primitive copper mines, but none worthy of serious consideration, as now developed.

HUNGARY. Copper mining is an industry of great antiquity in the kingdom of Hungary, and there is a considerable number of old mines, mostly worked out or idle, and nearly a dozen copper smelters, all small and antiquated in design. Sulphide ores predominate as a rule. In 1901 the production of copper ore in Hungary was 161,547 metric tons, from 16 working mines, of which five produced the bulk of the ore won, and, of the larger producers, three mines were owned by the government and two were under private ownership.

There are copper mines in Transylvania, in the eastern portion of Hungary. The copper measures of the Banat, formerly worked for copper values, are now producers of iron ore only, though auriferous copper ores are found as contact deposits at the junction of garnetized Tertiary limestone and intrusive monzonite. At Herrengrund, north of Neusohl, near the Galician boundary, there are small copper mines, and at Dognacska there are very old and very small mines, that are limited producers of copper sulphides.

IRELAND. In 1906 the copper production of Ireland was about 3,000 tons of low grade cupriferous pyrites, valued at about £4,000 only, a considerable proportion of the values being in sulphur. At one time the Irish copper mining industry was of much importance, the production of the Connecree mines being 677 tons of fine copper in 1799, equivalent to nearly 8 per cent. of the world's production in that year, while in 1899 the Irish output was only 17 tons of fine copper, all obtained by leaching and cementation. The Irish copper ore sold in Swansea and Liverpool, from 1875 to 1882, amounted to 670,681 tons, of 21 cwts. each, valued at upwards of £1,000,000, but after 1882 the copper mining industry was practically extinct for

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twenty years, though efforts are now under way to revive the industry. The Irish copper mines, however, have been material contributors to the progress of the industry, the wire rope tramways now in general use having been invented by Chas. Hodgson, of Wicklow, for use in the local mines, and the single rail was first utilized by Capt. Geo. Oates at the Cronnebane mine.

The Irish copper ores are mainly chalcopyrite and cupriferous pyrite, and there are copper mines in the counties of Cork, Kerry, Waterford and Wicklow, and in addition there are copper deposits in County Tipperary.

In County Cork the principal cupriferous districts are in the western part, including the Berehaven district, where mines were worked early in the Nineteenth Century, the Schull district and the Crookhaven and Kilcrohane districts.

The copper measures of County Cork extend into the adjoining county of Kerry, where mines have been opened at various points, including Ross Island in Lake Killarney. The Mountain and Keallonge mines, operated during the early decades of the Nineteenth Century, were each more than a quarter of a mile in depth, and were considerable producers in their day.

In County Waterford the Knockmahon mines were large producers at one time, the output of finished copper from the mines of this county exceeding 900 long tons in 1843. The ore is mainly cupriferous pyrite, occurring in large bodies in clay-slate, and, as selected, gave average returns of about 10 per cent. copper. The cupriferous measures of this county would seem worthy of serious exploitation.

In County Wicklow the Cronnebane mine was the principal property, and, as early as 1799, the Connecree mines yielded 677 tons of fine copper, rendering this one of the largest copper mines of that period. Copper mining practically ceased about 1840, but there was a small production of more or less cupriferous pyrite from the old copper mines for several decades later. In the Ovoca Valley of Wicklow, sulphide ores occur in clay-slates, as in the adjoining county of Waterford, and as in Cornwall and Devon. The ore occurs as chalcopyrite, in small veins, and as cupriferous pyrite, in lenses in Silurian slates, near granitic intrusives. The Ovoca copper belt is about six miles in length, and is of considerable promise, though the average grade of the ore is low.

ITALY. Copper was mined in Italy by the Romans several centuries before the Christian era, and, before their day, in semi-historic times, mines were worked by the Etruscans. The copper production was small during the middle ages, but the industry never has suffered complete cessation since its birth. Several of the Italian copper mines are well equipped, and managed with technical skill, and production is increasing. In 1902 the output of all Italian mines was 101,142 long tons of copper ore, and in 1907 probably was considerably more than twice as large.

The Italian copper deposits of commercial value occur mainly in the Appenines of Northern Italy, in the departments of Liguria, Piedmont, Tuscany and Venetia, those of Tuscany being of the greater importance. The principal mines are in the districts of Volterrano, Grosetto, Liguria and in the western Alps.

Principal developments and production are in the Grosetto district, where the largest Italian copper company is operating, in the vicinity of

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Massa Marittima, the Massa Metallifera of Roman days. The Grosetto district lies ten to twenty miles southeast of Leghorn, in the foothills of the Etruscan Appenines. The principal ore bodies occur in fissure veins, in a great laccolith of gabbro and diorite intruding Eocene limestone, the intrusive rock being strongly basic, with an altered crushed zone of serpentine. In this district are to be found the largest Italian producers.

The Ligurian mines, above Genoa, lie near the Mediterranean coast, the ore bodies occuring in stratified Azoic rocks, as contact veins between diorite or serpentine and the metamorphic rocks, the ores being mainly sulphide, with quartzose gangue.

The ore of the Volterrano district is mainly chalcopyrite, with a small quantity of chalcocite found in fissures in a red gabbro, known locally as porfido rosso. This district has been the scene of copper mining operations from very early times.

In the Piedmont district mines were worked in Roman days, and traces of old workings are to be seen at many points. The ores occur in stratified archaic rocks, no fissure veins being found, and nickel and cobalt frequently are associated with copper.

In the island of Sardinia there are copper deposits near Freigas, on Monte Tramento, in a bed of clay-slate alternating with limonite schist, the copper ores occuring near the contact and showing considerable chrysocolla above, with chalcopyrite below. There are minor copper deposits, mainly in small bodies and of low grade, at several other points in Sardinia. In 1905 the production of Sardinia was 98 metric tons of copper ore, all from the province of Cagliari.

LUXEMBURG. There is a small copper mine at Stolzenburg, near Diekirch, opened 1896. The vein averages about 20 inches in width and carries ore of good copper tenor.

NORWAY. The copper mining industry of Norway is of considerable antiquity, and in 1799 Norway produced 480 tons of fine copper, mainly from the Röros mines of Trondhjem, and one hundred years later the output was 3,935 long tons of fine copper, Norway being one of the few European countries to increase its copper output during the Nineteenth Century. Most of the Norwegian mines are opened on lenses of cupriferous pyrite, some of these lenticular masses being of large size. As a rule the lenses have a nearly vertical dip, but are deep rather than wide, being comparable in shape to eggs on end, rather than to the ordinary lenses having their greatest length along their axes of strike.

There are copper mines in the provinces of Christiania, Christiansand, Trondhjem and Tromsö. The principal mine of the present day is the Sulitjelma, in the amt of Nordland, stift of Tromsö, north of the Arctic circle. The country rock is mica-schist, of lower Silurian age, with eruptive greenstone flows conformable with the schist, the ore bodies occurring as extended lenses, very persistent in strike and dip, on the contact of the schist with metamorphosed amphibolite and olivenite gabbro, the ore being exclusively cupriferous pyrite, averaging 2.25 per cent. copper, with small quantities of nickel and silver, and of good sulphur tenor.

In the stift of Trondhjem are the Röros and Meraker districts, the oldest copper fields of Norway, and among the oldest in northern Europe, which

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remain producers of some present importance. In these districts the ores occur as sulphides, in schist and slates of lower Silurian age.

In Telemarken, Christiansand, there are a number of old mines carrying numerous veins of sulphide ore, mainly of narrow width but great persistence.

PORTUGAL. The important copper mines of Portugal are all in the province of Alemtejo, near the border line of the Spanish province of Huelva, but there are a few small properties in the southern province of Algarve, next south of Alemtejo. As the mines of Alemtejo are opened on the western extension of the Sierra Morena, their geology is practically the same as that of Huelva, described in the article on Spain. The principal Portuguese mines are in the districts of San Domingos, Grandola and Aljustrel, production averaging about 500,000 long tons of cupriferous pyrite annually.

ROUMANIA. There are no large copper mines in this kingdom, the principal producers, all very small, being in the Mehedintze district. In the Carpathian Mountains carbonate ores and chalcopyrite, slightly argentiferous, are found at Valea Choboroasa. Copper ores also exist near Salishtea and in the district of Dobroudja, at the towns of Balabancea, Islam-Geafer and Carapelit, also at Altan-Tepe, near Tcheamourli.

RUSSIA. There are extensive cupriferous districts in the Russian Empire, those of Siberia being treated separately in the chapter on copper deposits of Asia, with the exception that the Transcaucasian copper mines are included in this article on Russia, as also are the copper measures on the eastern slope of the Ural Mountains, that lie in the governments of Perm and Orenburg, each of these divisions lying partly in Europe and partly in Asia.

There are copper mines in the governments of Perm, Orenburg, Ufa and Samara along the Ural Mountains, and in the governments of Viatka and Kasan, next west. In Transcaucasia there are mines in the governments of Elizabethpol, Kutais and Tiflis. In the Russian Empire there are a considerable number of copper mines and nearly or quite 30 smelting plants, mainly small and antiquated in design, though a few properties, notably the Kiadebek, have modern reduction works. The comparatively small output of Russian copper is no criterion of the possibilities of production inherent in the copper measures of this, the greatest empire in existence, and there are various fields of much promise awaiting extensive exploitation at some future time.

The Permian formation, taking its name from the government of Perm, is very extensive, being found in the governments of Perm and Orenburg, on both sides of the Urals, and in the adjoining governments of Ufa, Samara, Kasan and Viatka. The mines of these governments are opened in Permian and Triassic formations, the ores occurring oxidized, and of low average tenor, not to exceed 2 to 3 per cent., but with occasional enrichments, notably as massive malachite, of excellent average tenor. The bedded deposits of the western slope of the Urals are mainly of Permian age, with some cupriferous strata of Triassic age. Among the Permian mines of interest is the Miednoroudiansk, where a single body of massive malachite weighing 339 tons was extracted in 1836. At depth the pockets of carbonate and oxide ores pass into chalcopyrite and cupriferous pyrite.

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The Transcaucasian mines, in the three governments of Elizabethpol, Tiflis and Kutais, furnish about half the copper production of the empire. In the Kedabenski district of Elizabethpol, ore occurs as irregular lenses, often of large size, in veins with quartz-porphyry gangue, with walls of diorite and diabase porphyrite, the lenses shading gradually into the country rocks. The ore is a mixture of slightly auriferous and argentiferous covellite and chalcopyrite, carrying sphalerite and occasional galena, associated with pyrite and pyrrhotite, with a heavy barite gangue.

Copper ores were worked in a small way, toward the end of the Eighteenth Century, near Kielce, in Russian Poland, and were reopened for a short time in 1904. There also are old copper mines at Chenciny, Poland, carrying mainly carbonate ores, on which some efforts at mining have been made since the beginning of the Twentieth Century.

SCOTLAND. There are old copper mines, which never were of importance, in Renfrewshire and Rosshire, with deposits of chalcopyrite, apparently of some promise, in Perthshire, and occurrences of copper ores are noted in Kirkcudbrightshire.

SERVIA. There has been a small but fairly continuous copper industry in Servia for some hundreds of years, and it is possible that copper mines were operated by the Romans. The production of fine copper by Servian mines in 1900 was 270 metric tons.

The principal producing copper field is in the vicinity of Majdenpek, and in the adjoining districts of Rebelj and Wis, in northwestern Servia, in the basin of of the Yablonica river, the copper belt running for about 15 miles northwest and southeast along the northern slope of the Povljen Mountains. The Rebelj deposits occur in serpentine, with intercalated argillaceous limestone, in lenses up to 100 feet in length, carrying a core of crystalline pyrite with disseminated chalcopyrite averaging about 5 per cent. copper, with the outer shell of the lense carrying ore up to 15 per cent. in copper tenor. There also are deposits of copper ore at Radanovci, Staninareta and Wuinovatz.

SPAIN. Of all the producing copper fields of the present age, the Hispano-Portuguese cupriferous measures of the provinces of Huelva and Sevilla in Spain, and the provinces of Alemtejo and Algarve in Portugal, are the most ancient. The first copper mining on the Iberian peninsula was done, in all likelihood, by the Phœnicians, some three thousand years ago, and was continued by their kindred, the Carthaginians. Upon the destruction of Carthage by the Romans, that people succeeded to the dominion of the peninsula, and extensive traces of their work remain observable to this day in the copper mines of the Sierra Morena. Mine timbers, in all likelihood set by Roman workmen nearly or quite two thousand years ago, remain in place, effectually protected from the gnawing tooth of time by the preserving action of copper sulphate, with which the mine waters are strongly charged. Upon the disruption of the Roman Empire, Spain and Portugal fell to the lot of the Visigoths, and, a few centuries later, the Moors conquered the southern half of the peninsula, remaining in possession for some seven centuries, and operating the Huelvan copper mines to some extent. Upon the expusion of the Moors by Ferdinand and Isabella, late in the Fifteenth Century, the Spanish gained possession of the

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rich mines of the Sierra Morena, and the larger of these old properties were worked, in a spasmodic way, with frequent hiatuses, until 1860, when the Tharsis mine—supposedly the Tarsish of the ancients—was reopened, and worked along modern lines. The Rio Tinto, much the greatest of Spanish mines, and one of the four greatest copper mines in the world, passed into the hands of the present owners in 1873, and was reopened in 1876. Further particulars of interest in this connection will be found in the article descriptive of the Rio Tinto mine.

Spain ranks third among the copper producing countries of the world, and was second only to the United States as recently as 1902, having been passed by Mexico in 1903. As recently as the early years of the ninth decade of the Nineteenth Century, the production of copper by Spain, Chile and the United States was practically on a parity. There is no other copper field in the world that has been worked, practically continuously, for three thousand years, notwithstanding which the outlook for the Spanish copper mining industry is excellent.

In the kingdom of Spain there are copper mines of more or less importance in the provinces of Almería, Asturias, Barcelona, Burgos, Cuidad Real, Córdoba, Coruña, Gerona, Granada, Huelva, Huesca, Jaen, León, Madrid, Menorca, Navarra, Palencia, Santander, Sevilla, Teruel and Zaragoza.

In 1901 the official Spanish returns gave 271 productive copper mines in the province of Huelva, but in many cases these counted separately numerous mine openings held by a single company, hence the number of actual producers was much smaller, including only about a dozen with outputs of importance. The active portion of Huelvan cupriferous belt is a zone of about 15 miles average width, with an extreme length of about 80 miles, running practically east and west through the entire province of Huelva, with its eastern end in the province of Sevilla and its western extension in the provinces of Alemtejo and Algarve in the kingdom of Portugal. This district lies along the Sierra Morena, and, in addition to the dimensions before given, which are those of the fairly proven copper territory, there are indications of copper, of more or less promise, in a district of about 30 miles extreme width by 125 miles or more in length, along this range of mountains and beyond its limits. The Sierra Morena, or Andevallo, cupriferous belt, is divided into four zones, the eastern, known as the Cerro Muriano, including various mines near the city of Sevilla, while the western zone lies in Portugal, with the village of Grandola as an approximate center. The northern zone includes the principal mines of Huelva and Alemtejo, while the southern zone includes a number of mines of considerable importance, the largest being the Tharsis. All of these zones present the same general characteristics, carrying lenticular masses of ore, usually at the junction of slates of the lower Carboniferous system with intrusive syenite and diabase. The ore bodies lie parallel with the slate, with northwesterly strike, and dip to the north. The slates are of a yellowish cast at surface, where weathered, but are bluish at slight depth. Apparently the ore bodies, while occurring as immense lenses, may be considered true contact veins. The deposits are of varying size, sometimes of immense proportions, the largest, owned by the Rio Tinto, reaching a length of nearly 4,000 feet, with an extreme width of 500 feet. The ore bodies have, or once had, iron cappings, and the richer ores above ranged about

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5 per cent. in copper tenor, being succeeded, at a depth of about 200 feet, by a sulphide zone carrying an intimate mixture of chalcocite and pyrite, with values averaging 3 to 4 per cent. in copper, with some ore of high grade. The decrease in values is fairly steady from the top of the deposits below the altered zone, and at a depth of about 500 feet values range only about 1.5 to 2 per cent. copper, and at still greater depth the copper tenor declines to about one per cent. with indications that the bottom of the immense lenses will carry less than one per cent. copper, though probably they will remain workable, owing to the sulphur values in the pyrite. All ores are slightly argentiferous and auriferous, the precious metals being extracted closely, and while the amount per ton in gold and silver is very small, the aggregate values so saved are very great, owing to the immense tonnage of ore that is treated.

The mines of Sevilla probably rank next to those of Huelva in present importance and future promise, though the production is trivial as compared with the immense Huelvan output. In 1903 there were 23 productive copper mines in Sevilla, which yielded only 2,204 metric tons of copper ore, but production has increased largely since.

In 1902 the province of Gerona had 25 mines of copper and 4 mines carrying copper in connection with other metals, all of which were idle.

In the Guadix district, about 15 miles from the city of Granada, in the province of that name, rich copper sulphides are found in a bed of marl, on which some mining has been done.

The province of Huesca has old copper mines and other mines carrying considerable copper values, but copper mining is practically non-existent.

In 1902 there were 41 copper mines, all idle, in the province of Lérida.

The northern part of the island of Menorca shows a copper belt of 16 to 18 miles length, with ore occurring in a bed of marl of one to two feet thickness, lying in clay-shales and sandstones of the lower Triassic system. The Puebla mine shows ore under peculiar circumstances, mainly as chalcocite and chalcopyrite in connection with lignite, the conclusion being inevitable that the copper values were precipitated by the carbonaceous material.

There are copper deposits and attempts at copper mines in the province of Teruel, and the same may be said of the province of Zaragosa. There also are old mines of small importance, now idle, in a considerable number of other Spanish provinces.

SWEDEN. The famous copper mines of Falun have been producing copper for more than 600 years. Copper mines are found in the läns of Dalarne, Östergothland, Kopparberg, Malmöhus, Norbotten, Orebro and Vestmanland. The copper production of Sweden was about 850 long tons in 1799, and 100 years later was only about one-half as much.

The famous mines of Falun are worked by what probably is the oldest stock company now existing, its charter dating from A. D. 1288. The Stora Kopparberg is the best known mine of the district, and furnishes much of the copper and practically all of the gold produced in Sweden. The ore deposits resemble those of the Rio Tinto, and carry 2 to 3 grams gold per ton, occasionally with much higher gold values. The ore is chalcopyrite, disseminated in pyrite, and is divided, as mined, into two classes, known respectively as hard pyrites, carrying about 3.5 per cent. copper, and soft

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pyrites, carrying about one per cent. copper only. The sulphur values are of considerable importance in these ores.

SWITZERLAND. Copper ores, mainly bornite, occur in a conglomerate stratum of Permian age near Murtschenalpe, in the canton of Glarus, but apparently no mining ever has been attempted.

TURKEY. Extensive copper deposits are noted at several points in the Balkan Mountains. The present copper production of the Turkish Empire, including holdings in both Europe and Asia, probably is about 3,000 metric tons yearly, with exports of 1,000 to 2,000 tons, the principal mines and production being in Asiatic Turkey. In European Turkey there are copper mines along the southern part, and there is a copper mine at Yardimli, in the Rhodope Mountains. Copper mines belonging to the crown are found in the island of Thasos, and an island in the Sea of Marmora shows copper sulphides, with evidences of extensive mining operations in the past.

WALES. The copper mines of Anglesea were worked by the Romans, and possibly by the Phoenicians before them. Up to about 1830 Wales was a considerable producer, and, in 1799, made about 1,900 long tons of fine copper, rendering this the second copper producing district of the world, but in 1899 the production was only 49 tons, nearly all secured from leaching the mine-waters from old properties.

The Mona and Parys mines of Anglesea, among the most ancient in the world, show sulphide ores with quartz gangue in contact veins of 5 to 60 feet width, between Silurian slate and felsite, copper occurring also as impregnations in felsite.

In addition to the mines of Anglesea there are old copper mines, now idle, in the counties of Caernarvon, Cardigan and Merioneth.

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CHAPTER XX.

Copper Deposits of Africa.

The copper deposits of the various countries, colonies, districts and spheres of influence in Africa are treated in detail in this chapter.

ABYSSINIA. Copper deposits exist at various points, but details are indefinite. Abyssinia is a mountainous country, lacking both railroads and good wagon-roads, and the development of mines, especially of copper, is apt to await better transportation facilities.

ALGERIA. The production of Algeria in 1906 was only 440 tons of copper ore, from copper mines in the departments of Alger and Constantine. The argentiferous gray copper ore of Kabylia occurs in rocks of Jurassic age. The Aïn-Barbar mine, in the department of Constantine, near the Tunisian frontier, has a rather remarkable lense of sulphide ore, absolutely isolated and enclosed in Ligurian schist, ore being chalcopyrite associated with galena and sphalerite, and claimed to average 8 to 15 per cent. copper, which obviously is much too high. Along the Mediterranean coast, in the same département, are found a number of small deposits, apparently gash-veins, carrying sulphide ores with quartz gangue. Near Aïn-Sefra an ore body claimed to show 600,000 tons of copper ore was discovered in 1904. In the department of Alger there are several idle mines of argentiferous antimonial copper ores.

ANGOLA. This Portuguese province, in western Africa, shows copper deposits at several points. At Senza do Itombe, 12 miles from the Cuanza river, and near a railroad, there is a conglomerate carrying ores that are oxidized above, with chalcocite, associated with galena, occurring at depth. There also is a mine at Bembe, said to average 12 per cent. in copper tenor, but this has poor transportation facilities, and has not proven a success in operation.

ASHANTI. The occurrence of native copper, apparently in dendritic forms, in a district several days' journey back from Sekondi, on the Ivory Coast, was reported in 1902.

BASUTOLAND. This district, while attached to Cape Colony, is managed directly by the British crown. Strong copper indications are shown at various points, but white settlement is forbidden, precluding all development of minerals.

BRITISH CENTRAL AFRICA. This protectorate shows a cupriferous belt of roughly 25 miles width by 175 miles length, between the Zambesi and Congo rivers, and a little crude mining and smelting of oxidized ores has been done by natives.

CAPE COLONY. Though copper exists elsewhere, the developed mines of the Colony of the Cape of Good Hope are exclusively in Little Namaqualand, on the western coast, in the vicinity of O'okiep and Wittwater, all exports and imports being made through Port Nolloth. Attempts at mining in this district were made by Governor Van der Snell, near Spring-

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bokfontein, in the Concordia district, as early as A. D. 1685, and these attempts were repeated in 1799, but the first shipment, of eleven tons of ore, was not made until August 31, 1852, since which time production has been continuous. The ore occurs in leases, often of great size, in granitic rocks. The predominant rocks are gneiss and schist, with a generally east and west trend, and flat dip to the north, traversed by series of fractures, with diorite dykes, in which occur lenses of sulphide ore, mainly chalcopyrite, but with an appreciable percentage of bornite, with dioritic gangue. The principal ore bodies occur at or near the point of intersection of the diorite dykes with barren fissures. The ores range from 7 to 21 per cent. in copper tenor, after careful selection.

CONGO FREE STATE. The principal copper deposits of Congo Free State, as now known, are in Katanga, the southeastern province, around the headwaters of the principal affluents of the Congo river. Principal mining operations of the present are between the Lualaba and Lufira rivers, where a considerable area shows oxidized and sulphide ores, occurring in blanket veins, impregnations and stockwerks, mainly in talcose and siliceous schists. These ore bodies are of unusual size, and are said to be of unusual richness, averaging 15 per cent. copper, but apparently this reference is to the enriched ores of the upper workings, and such values are not likely to hold to great depth. There are considerable remains of native workings, and a limited production is secured by natives. More than eighty old workings are shown in one district, where the oxidized ores are smelted in pits, with charcoal, and the product is used for ornaments, buttons and various utensils. This district is of considerable promise.

EGYPT. There are copper deposits in the Nubian region of the Upper Nile, but no attempts at serious mining have been made in historic times.

FRENCH CONGO. Malachite and chalcocite have been found in place in Triassic sandstone, in the Crystal Mountain range, near the coast of Gaboon. Near Comba, between Brazzaville and Loudima, along the line of the Congo Free State, there is a cupriferous district in the Kouilou-Niari basin, ore occurring in cupriferous sandstone above limestone. These deposits have been worked by natives in a primitive way, for centuries, and a considerable trade once existed in copper manufactured from these mines, but this became extinct with French occupation. The native workings are pits and trenches not exceeding about 35 feet in depth, and show azurite, malachite, chalcocite and tetrahedrite. The deposits apparently are of low average tenor, but cover a considerable area. This district has been but slightly explored by Europeans, though some work has been done at the Mindouli mine, which seems the principal deposit. The district is about 300 kilometers from the coast, and probably copper mines would not be workable without railroad transportation, now lacking.

GERMAN EAST AFRICA. Copper ores exist at various points in this protectorate, but no mines have been developed.

GERMAN SOUTHWEST AFRICA. This protectorate has copper deposits in Damaraland, Ovamboland and Hereroland, the latter containing the notable Otavi mines. The copper mines of the Otavi Mountains were worked to slight depth, in a primitive manner, by the natives, apparently for some hundreds of years. A great block fault, in limestone, traversed

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by numerous cross-faults, producing diverse deposits, shows ore occurring mainly in sandstone, laid down in sink-holes. This district includes Otavi, on the southern side of the range, and Tsumeb on the northern side. The mine shows native workings, deepest about 85 feet only, over an area of about 200 by 500 feet, with irregular fault veins, carrying mainly chalcocite, with occasional malachite, associated with galena, in masses ranging from microscopic size to two tons in weight, with sandstone gangue, and impregnations in both walls.

In Damaraland there is copper in the Rehoboth district and on Gross and Kleinen Spitzkopf, 20 kilometers northeast of Rehoboth. The ores, as developed, are mainly malachite and chalcocite, with quartz gangue. From the Otyizongati district, about 40 miles east of Okahandja, 100 tons of carefully selected ore sent to Germany in 1904 gave returns of 28.5 per cent. copper.

LIBERIA. Copper ore is said to exist in the interior of this country, but the extremely dense forest growth operates to prevent the acquisition of definite knowledge. Copper has been used to a limited extent, in the making of weapons, by the Mandingoes, a tribe in the far interior. The law prohibits the holding of land by other than Liberian citizens, and until this law is repealed, modified or evaded, there can be no copper production of importance from Liberia.

MADAGASCAR. Copper ores have been smelted by natives, in a primitive way, and to a limited extent, for generations. There are small native mines at Ambataofaugehana in the district of Ambositra, and at Vohinana. The ore is mainly malachite, surface workings giving returns of 10 to 45 per cent. copper. Ore is reported to occur in mica schists, and the mines are said to be nearly worked out. Native mines are reported also from the Betafo country, and in the district of Imerinarive. In the Cercle de Tsiafahy native copper has been found, and virgin metal is reported also from the district of Vonizongo. Rich ores are said to exist near Lake Kinkony, in the Cercle de Mahavavy, and traces of copper are reported from the province of Vohemar.

MOROCCO. Copper ores exist at a number of points in this country, and about 1860 were mined and smelted, in a small way, near Tarudant, capital of the province of Sus. There are occurrences of copper ore near Tangier, also at Tablah, near Mequinez, and at Mesfiwa, in the vicinity of Mogador.

NATAL. There are a number of known occurrences of copper ore in Natal, but the colony lacks producing mines. In Zululand sulphide and silicate copper ores are noted near the Inuzi and Umhlatuzi rivers, in the N'kandhla district, but these lack adequate transport. A syndicate was formed, in 1905, to exploit copper deposits on the Buffels River, along the border of Natal and Zululand. Various local syndicates have done more or less exploratory work at Undweni and vicinity, near the Vryheid border, in Zululand, where a vein, said to be traceable for several miles, shows rich carbonate, silicate and sulphide ores, usually zinciferous, occurring largely as impregnations, but with erratic distribution. The Dania and Magdalen properties, in this district, show fine samples of copper ores.

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PORTUGUESE EAST AFRICA. This colony has copper ores in Mozambique, Nyassaland and Zambesia, the latter district showing considerable traces of old mining operations, apparently conducted mainly for gold, but copper ore exists at numerous points, and apparently in promising quantities.

RHODESIA. There are remains of ancient mining operations, for both gold and copper, in the colony of Rhodesia, and it is evident that the ancients possessed small and crude furnaces for smelting. The mining laws of Rhodesia are very liberal, and the harnessing of the Victoria Falls of the Zambesi river should greatly stimulate mining and other industries, through furnishing the first cheap power known in Rhodesia.

Copper ores have been found at a number of points, but principal developments are in the northeastern section, in the Victoria district, mainly along the northern reaches of the Kafue river, an affluent of the Zambesi. The cupriferous zone is a limestone belt, lying approximately east and west, with a width of about six miles and length of about sixteen miles, bounded mainly by Cambrian and Silurian schists, carrying deposits with shallow surface zones of oxidized ores, succeeded at little depth by sulphides, these deposits occurring occasionally as pipe veins, and being more or less argentiferous. The Lomagunda district of Mashonaland, circa ninety miles northwest of Salisbury, shows copper impregnations in silicious and calcareous schists, ores being mainly malachite, with some chrysocolla. The Blue Jacket mine shows old workings to a depth of 100 feet, with lateral workings of 10 to 400 feet in length, on ore bodies occurring in limestone and schists. Apparently these mines were worked to the depth of the oxidized ores, the ancient miners stopping when base ores were reached. It is obvious from the depth and extent of these workings, and the remains of crude smelters, that the work was done by some race much further advanced in civilization than the present natives.

SENEGAL. The existence of copper ores has been reported from various points along the Senegal river, but no mines have been developed.

SUDAN. Prospecting has been done in various parts of the Anglo-Egyptian Sudan, but nothing of importance found, though there is believed to be copper in the Suakin district. The only producing copper mine is the Hofret-el-Nahas, in southwest Kordofan, where mining and smelting are conducted on a primitive scale, to secure copper used for purely local consumption.

TRANSVAAL. Apparently copper was worked to some extent by the ancients, and there are numerous remains of prehistoric diggings, especially near the Messina mines, in the Zoutpansberg district of northern Transvaal. There has been considerable activity in copper development, and even greater activity in the formation of small local mining syndicates, since 1905. Copper ores occur in the districts of Lydenburg, Middelburg, Potchefstroom, Pretoria, Rustenburg, Waterburg, Zeerust and Zoutpansberg.

The most promising copper developments are noted at the Messina mines, near the Limpopo river, in the Zoutpansberg district, and there are numerous smaller developments, on which a little work has been done, in this district. Work is under way at Barberton and vicinity, in the Middel-

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burg district, and there is a copper belt, on which a number of explorations are being made, near the Olifants River, about 45 miles northeast of Pretoria. Some of the copper prospects of the Transvaal are of promise.

TUNIS. Copper ore exists at various points in Tunis, occurring mainly as oxidized ores in small bodies, and tetrahedrite, frequently rich in silver, these ores being found mainly in limestone, with ochrous iron gangue. Mines have been worked at Chouichia for some time, the production, which is small, being shipped to Europe, as a matte of 35 to 50 per cent. copper tenor. On the little island of Galita, off the northern coast of Tunis, a small mine has been opened on a vein of about 3 feet width, traversing diorite. The ore is mainly chalcopyrite, averaging about 5 per cent. copper and the vein is traceable for several hundred meters. There are several parallel veins, one of which, slightly developed, shows carbonate ores giving average assays of about 12 per cent. copper.

UGANDA. The British protectorate of Uganda, in Central Africa, near Lake Tanganyika, has copper ores in the Central Province, but apparently no serious attempt has been made at development, transportation facilities being poor.

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CHAPTER XXI.

Copper Deposits of Asia.

The copper deposits of Asia are treated herein, by countries, in alphabetical order, as in the preceding chapters.

AFGHANISTAN. The northern part of Afghanistan is said to be rich in copper, and in this section there are small local mines, worked by old methods for some centuries. The copper deposits are considered valuable, but the government refuses to grant either railroad or mining concessions to foreigners, and will not allow a white man to take up permanent residence in the country, hence until the present policy is changed there can be no copper developments of importance.

ANNAM. Copper ores are known to occur at various points in the province of Quang-Nam, but nothing has been done in the way of modern mining.

ARABIA. The ancient Egyptians mined both copper and turquoise at Maghara, in the Sinaï Peninsula, and it is evident, from old inscriptions, that copper was smelted at that point in both the Fourth and Twelfth Dynasties. These mines evidently never were rich in metal, but probably were among the very first copper mines ever opened, and the date of the first mining probably is as remote as 5000 B. C. These mines were the cause of various wars between the races coveting them, but were held mainly by the Egyptians, for several thousands of years. It seems probable that after being worked, more or less steadily, for about three thousand years, they were abandoned finally, before Moses led the children of Israel out of Egypt, and about a thousand years before the opening of the Rio Tinto mine which occurred circa 1,000 B. C. An attempt at reopening some of these ancient mines was made, early in the Twentieth Century, after about four thousand years of idleness. The ore is mainly chrysocolla, associated with turquoise, in porphyry, and there are remains of ancient furnaces and old slag-piles near the adits. Analyses of the slags do not show the use of fluxes in the reduction of the ores, and it is probable that they were smelted with charcoal, in small brick kilns. There are deposits of copper ore at other points in Arabia Petrea, lying along the shores of the Red Sea.

BURMAH. The discovery of a body of promising copper ore was reported from Mimbu, in 1906, and several copper mines are being opened in the Upper Shan states.

CHINA. Copper ores occur in more or less profusion at a considerable number of points in the vast Chinese empire, and copper mines have been worked in several provinces, notably in Yun-Nan, certainly for many centuries, and probably for several thousand years, remaining active to this day, the ores being mined and smelted in a primitive manner. The production of the empire is estimated at five million pounds yearly, all of which is required for domestic consumption, in addition to heavy imports.

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Owing to the existence of vast coal measures of prime quality, and a large and steady supply of efficient and tractable labor, the development of copper mining and smelting, when once begun in earnest, along modern lines, should be rapid, and China should become, during the second or third decade of the Twentieth Century, an important producer of the metal.

A few mines, operated in a primitive manner, with correspondingly small production, are found at San-Kia-Tschang, in the province of Ho-Nan.

In the province of Hupeh, near Ichang, there are large beds of cupriferous shale, containing disseminated ores of low average tenor.

There are deposits of copper ore at various points in the province of Kwang-Si, with a few small mines developed along primitive lines.

There are copper mines in the province of Kwei-Chau, in southern China, of considerable antiquity, as evidenced by extensive slags resulting from old smelting operations. The ore bodies of Kwei-Chau resemble those of Yun-Nan.

The mountains of Manchuria contain promising deposits of copper, at several points, and some of these have been worked by natives, in a small way, along very crude lines. The most modern mining and smelting plant in the Chinese empire is found near Kaya, this having been installed early in the Twentieth Century.

Copper deposits and small copper mines are found at several points in the province of Shan-Tung, and this province is believed to be rich in minerals.

A limited copper production is secured from a few small and ancient mines in the province of Sze-Chuan, where the metal is extracted mainly from low grade cupriferous sandstones.

The province of Yun-Nan has the principal copper mines of China, and furnishes the moiety of Chinese copper production, the annual ouput of the mines of Yun-Nan being estimated at one to two thousand tons of fine copper. The copper mines of northeastern Yun-Nan have been exploited for many centuries, and in the aggregate their production is by no means trivial. The ores are mainly sulphide, and are slightly auriferous and argentiferous. The principal centre of copper mining and smelting is at Tung-Chau.

FEDERATED MALAY STATES. In this British protectorate there are copper deposits, some apparently of promise, at several points, but these remain undeveloped, mining efforts having been centered upon tin.

FORMOSA. Copper ores exist at various points on this island, now held by Japan. In the Kinkwaseki gold mines, in the Keelung district, copper ores have been discovered, and their exploitation was begun in 1906.

INDIA. The beginnings of the copper industry of India antedate reliable historical records, but it is known that copper ores have been mined and smelted for a score or more of centuries. India was a considerable producer of copper during the middle ages, and up to about the middle of the Eighteenth Century, after which the output fell off slowly, and has dwindled to merely trivial figures. During the first half of the Eighteenth Century India shipped large quantities of copper to Europe, but in the latter half of that century the current was reversed, and the Indian imports of

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copper for 1901 were 7,998 long tons, and at present must range in the neighborhood of 10,000 long tons yearly.

In Bengal there are old copper mines at various points. The last active mining was done from 1887 to 1891, at Baragunda, Hazaribagh, but proved unprofitable, all ore being carted 24 miles to a smelter at Giridhi. The ore occurs as chalcopyrite running 1 to 3 per cent. copper, with gangue of country rock, in mica schist. A single small pocket of ore discovered in the Singhboon district produced a small quantity of 13.5 per cent. ore in 1892, but additional pockets were not found. The Chota Nagpur mines, approximately 150 miles from Calcutta, are in about the center of a cupriferous belt of about 75 miles length, showing numerous old workings, and paralleled by a railway. The extensive remains of former work evidence considerable activity, and a respectable production, at some time in the past.

Copper ore exists at various points in the Central Provinces, and a mine is being developed near Sleeminabad, 40 miles from Jubbulpore, in a formation of Silurian age showing dolomite, slate, quartzite and mica schist, folded and metamorphosed, with numerous porphyritic dykes, ore occurring in the stratified rocks near the intrusive porphyries. The veins, having well defined walls and average width of about 6 feet, have been traced by outcrops for nearly two miles. The ores are auriferous and argentiferous malachite and argentiferous tetrahedrite, giving assays up to 25 per cent. copper, 197 oz. silver and 15 dwts. gold per long ton. In 1901 twenty-five long tons of ore were mined in Rajputana, where chalcopyrite occurs disseminated through black Paleozoic slates. These deposits have been worked in a very small way for centuries.

In the Northwest Provinces copper ores of some promise are found in the Kumaon division, lying in the Himalayan region between Nepal and the Punjab, the Rai mine being the principal property. The ores of the Rai district occur in fissure veins showing gossan cappings, with the usual oxidized and sulphide ores, with quartz gangue, and occur at times as impregnations. Labor is plentiful, cheap and poor, and transportatior facilities are inadequate, but the district is considered of some promise In the division of Garhwal considerable copper mining has been done in the past, at Dhanpur and elsewhere. The Dhanpur deposits occur as bornite and chalcopyrite, in the joints of calcareous clay slates, and in silicious limestone, near igneous intrusives, the workable deposits occurring at the intersections of vertical and horizontal bedding and jointing planes, with quartz gangue.

At El Agur there is a stockwerk in quartzite, carrying carbonate ores, chalcopyrite and tetrahedrite, of an estimated average copper tenor of about 5 per cent., the zone being traceable for nearly fifty miles, and being worthy of careful study when adequate transportation facilities are furnished. Small pockets of rich ore have been found at various other points, but the uncertainty of these has not permitted continuously profitable mining.

JAPAN. Copper was discovered in Japan about the beginning of the Seventh Century, and until well toward the close of the Nineteenth Century, mining and smelting were done along primitive lines, the ore being reduced in clay pits, with charcoal for fuel. The first exports, other than

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to China, were made in the Seventeenth Century, when the Dutch, who had a monopoly of Japanese foreign trade, exported seven hundred to twelve hundred tons of copper yearly for many years. In 1799 Japanese mines made about 2,800 long tons of fine copper, and in 1899 produced 27,560 tons, a tenfold increase, and the early years of the Twentieth Century have seen a steady gain in production. The modernization of mining and smelting methods was begun in the ninth decade of the last century, but beginning with the tenth decade progress was rapid, and all of the principal mines of the empire now have mining and smelting equipments of a most modern sort, and are managed with as great a degree of technical skill as can be found in any mining field of the world. Several of the largest copper mining companies of Japan have made a regular practice, for ten years or more, of sending their chiefs of departments around the world in search of information, and the benefits of such an unsually wide-awake policy are reflected in the increased outputs and greater profits of the best Japanese copper mines. Foreigners or foreign corporations cannot hold title to Japanese mines, but foreigners can become interested, as partners, with Japanese subjects, in mining properties. The mining industry, however, to all practical purposes, is exclusively in the hands of the Japanese, and likely to remain so.

Copper is much the most important metallic resource of Japan, and this country now holds fourth place among the copper producing countries of the world. The local consumption was about three thousand tons in 1899, and probably was about seven thousand long tons in 1906. Fully three-fourths of the copper produced is exported, this forming an important commercial resource of the empire.

Copper ores are widely spread, occurring on all of the principal islands, and showing nearly every variety of type. There are copper mines of importance in the provinces of Awa, Bingo, Bitchu, Bizen, Hida, Higo, Hyuga, Iwami, Iyo, Izumo, Kaga, Mimasaka, Mino, Nagato Rikuchu, Shimotsuke, Tosa, Ugo and Uzen. There are nearly two hundred copper mines, or mines in which copper is a factor of importance, of which about forty are mines making annual products of one hundred thousand to fifteen million pounds each, fifteen of the number exceeding an average annual production of one million pounds each, three of these making about half of the copper production of the empire. Ores are almost exclusively sulphides, though limited quantities of oxidized ores are noted, with occasional native copper.

The Ashio mine, in the province of Shimotsuke, is the largest copper mine of Japan. The veins are of wonderful profusion, being hundreds in number, of which about thirty are worked, these veins occurring as synclines, being opposed, in pairs, the seven main veins averaging 6 to 7 feet in width. A little melaconite and bornite are carried in the upper levels, but the principal values are in chalcopyrite, associated with galena, sphalerite, arsenopyrite and pyrite, with clay gouge and quartz gangue.

The Kosaka mine, in the province of Rikuchu, is in the extreme northern end of the main island of Japan. This was an old silver mine, supposedly exhausted, but now is the second largest copper mine of Japan, with prospects of becoming first. The ore is chalcopyrite, associated with sphalerite and pyrite, impregnating and cementing a volcanic tuff. The

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ore bodies, five in number are of enormous size, the largest being 100 to 600 feet in thickness, of one-half mile known length, and proven by drill-holes to a depth of 1,700 feet.

The Besshi is a famous mine in the province of Iyo, island of Shikoku. The ore body is a vein of 4 to 30 feet width, with an average of 20 feet, developed for a length of about 6,000 feet, and occurs in alternating layers of chloritic and graphitic schist, each enveloped by a quartz schist known locally as "habu," with interstratification of piedmontite schist. Step-faults run nearly parallel, from east to west, giving throws of 10 to 20 feet, with occasional throws up to 60 feet. The ore is chalcopyrite, disseminated in pyrite, averaging about 4.5 per cent. copper.

Further details of the geography and geology of Japanese ore deposits are given in the detailed descriptions of the various mines.

KOREA. Copper ores are noted at a number of points in the northern and southern parts of the Korean peninsula, but have been found only rarely in the central part. Copper had been mined by natives for some centuries, the product being utilized in the making of household utensils. By Korean law mineral deposits are the property of the crown, hence it is altogether probable that mines will be developed mainly by the Japanese. The production of copper in 1903 was estimated at 280 tons.

The Kap San mine, in the province of Hamgyeng, is the principal property, and is under development by the Japanese firm of Mitsui & Co. Another property of some promise is the Chhyang-Uŏn mine, about one ri north of Chhyang-Uŏn, which was opened about 1885 by the Korean throne, and was transferred to Japanese control in 1893, and worked until 1905, when the rich ores were exhausted and the mine closed down. There also are old mines, opened early in the Nineteenth Century, but worked until 1904, at Hu-Chhyang and Sin-Tyŏn.

PERSIA. The empire of Persia is known to be rich in copper, and there are small mines, many of them very old, from which copper ores are mined and smelted, in an exceedingly crude way, the small production being sufficient merely for the limited domestic demand. Until there are better transportation facilities, and foreign capital is enlisted, the copper mines of Persia are not likely to become producers of international importance.

There are primitive copper mines south of Kerman, but these lack facilities for economical transport. At Seman the deposits consist of disseminations and veinlets of oxidized ore in clay-slate, with an estimated average tenor of about 3 per cent. copper. There also are small copper mines at Sabzwar and in the Turbat district, worked on primitive lines.

SIAM. Copper ores were worked at several points by natives until the early years of the reign of the predecessor of King Chulalongkorn, but there is no present production, though copper deposits of more or less promise are found at a number of points, notably in the mountain ranges along the valley of the Menam river. Outcrops of copper ore are noted frequently along the railroad line leading to Korat, with rather extensive remains of ancient workings, where a little prospecting was done, and some ore found, by a Danish syndicate, circa 1901.

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SIBERIA. The extent of Siberia is so great, the lack of transportation facilities so utter, except in a narrow stretch along the Trans-Siberian railroad, and the country is so thinly populated and so new, with the attendant lack of capital, found in all new countries, that it is scarcely to be wondered at that only a beginning has been made in the development of the undeniably extensive and valuable copper measures. The principal copper mines are found in the governments of Semipalatinsk and Akmolinsk. There are two small producers in the Russian Altai, and other small producers nearer the city of Semipalatinsk, the largest making about two million pounds of copper yearly. The output of the Altai mines, in 1903, was only 228 long tons of fine copper.

In the government of Akmolinsk, in the Kirghiz Steppe, there is one highly promising mine, known as the Spassky or Yuspenssky, where considerable production has been secured in the past, along very crude and wasteful lines. This property is now in the hands of an Anglo-French company, but is hampered by lack of rail transport. There are other properties of promise in the government of Akmolinsk.

In the government of Krasnojarsk, in central Siberia, next east of Semipalatinsk, there are copper deposits, apparently large and promising, extending from near the line of the Trans-Siberian railroad to the Altai Mountains.

There are copper deposits of uncertain size and tenor in the vicinity of the city of Tomsk, in the province of that name, lying next north of Semipalatinsk, and to the northward of the Trans-Siberian railroad.

In the Trans-Baikal province, east of Lake Baikal, there are several copper deposits said to be of considerable promise. One of these is in the basin of the Chida river, where native copper occurs in masses ranging up to several pounds in weight, in amygdaloidal melaphyrs, under conditions somewhat similar to the occurrence of native copper in the Lake Superior district.

There are copper deposits, considered promising, in the northern province of Yeniseisk, and it is probable that copper ores exist also in the province of Irkutsk, and very likely in practically all of the other Siberian provinces.

THIBET. Copper is mined and worked in a small way and a primitive manner in southeastern Thibet, but the extent and promise of the copper measures are undetermined.

TONQUIN. Copper mines are found in the provinces of Son-Tay, Lang-Son and Lao-Kay, near the frontier of the Chinese province of Yun-Nan, and, like the mines of Yun-Nan, these have been worked in a primitive way for centuries, but never have become as important as those across the Chinese border. Various concessions have been granted for the exploration of copper deposits in Tonquin, but no producing mines have resulted therefrom as yet.

TURKESTAN. There are a number of small copper mines in Turkestan, the largest being the Karankuski, near Tashkent, and since the occupation of Turkestan by Russia there has been renewed interest in mining operations. A small smelter was built in 1903, on the shore of the Syr Daria river, at the foot of the Supetau Mountains, and new copper mines

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are being opened along the Syr Daria river in the Namangan and Khokand districts. There also are ores in the Ferghanah district, occurring as impregnations in sandstone to the extent of 1 to 5 per cent. copper, with occasional local enrichments up to 10 per cent. and as high as 40 per cent. in copper tenor.

TURKEY. The principal copper mines and the most promising copper deposits of the Turkish empire occur in Asia. The best known mines are those of Arghana-Maaden, located between Diarbekir and Kharput, in the Armenian Tauros of Asia Minor. At the beginning of the century these mines were producing about 1,500 tons of fine copper yearly, exported mainly to England via Alexandria. The ore is of high grade, though mining and smelting methods are by no means modern. Copper ores occur also in several of the cazas in the Vilayet of Cosova. There are mines of importance in the vicinity of Bakir-Maaden, near Diarbekir, and formerly there were mines in operation near Tokat. Copper has been produced to greater or less extent by the mines of Kalabak, near Mount Ida, from time immemorial, these having been old mines in the time of Strabo, who described them. The ore of the Mount Ida mines is chalcopyrite, occurring in Tertiary slates and limestones. There also are small old mines near Dendengatsch.

In the Vilayet of Trebizond, between Kerassund and the Russian frontier, along the Black Sea, there is a copper district of some promise, with a number of small producers, and copper mines are said to have been worked in this district as early as the beginning of the Thirteenth Century.

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CHAPTER XXII.

Copper Deposits of Australia.

The copper deposits of the Commonwealth of Australia, which includes the island of Tasmania, are treated in alphabetical order, by states, in this chapter, and those of New Zealand follow. Copper production dates from 1843, when the first shipment was made from the Kapunda mine, opened in the previous year. Production in 1906, by states, was by Tasmania, South Australia, Queensland, New South Wales and Western Australia, in the order given, Victoria not being a producer. Development has been hampered, except along the coast and in specially favored interior districts, by lack of transportation facilities, lack of water and lack of the large capital necessary to make successes of mines of low and medium grade copper tenor.

NEW SOUTH WALES. Copper was the first metallic product of this state, the first mining attempts having been made in 1845, but the Great Cobar mine, opened in 1869, was the first important producer and remains much the largest mine of the state.

There are nearly 300 localities in the state where copper has been found, and in most of these mines have been opened or attempts made at mining. There are three principal copper districts, known as the Cobar, Coast and Central fields. Copper is found mainly in the counties of Bathurst, Blaxland, Canbelego, Cunningham, Mouramba, Murray and Robinson. The principal cupriferous field is in Robinson and adjoining counties, in the western districts, where copper deposits of more or less promise are shown over an area of about 400 square miles. This field includes the Cobar, Girilambone, Nymagee, Melrose, Mount Hope and smaller cupriferous districts. The formation over this entire territory is mainly Silurian slates, with few occurrences of eruptive rocks, ore bodies occurring as bedded veins in Silurian schists. The district is a desert plateau, with occasional hills and short mountain ranges. There is a cupriferous district in the central part of the state where eruptive rocks predominate, and there are a number of scattered mines along the coast. The Budgery district is one of the newest fields of promise.

QUEENSLAND. The copper deposits of Queensland probably are the most promising found in any of the Australian states, but the industry suffers, not only from the aridity of many of the principal districts, and lack of railroads in certain of the fields, but also from untoward political conditions, there being universal suffrage, with the labor element in the saddle and inclined to captious and arbitrary methods. The state was a regular though small producer of copper until the collapse of the Secretan Syndicate in 1889, after which the industry was greatly depressed until about 1898, since which year there has been marked and fairly steady progress. The older copper fields were at Peak Downs, Mount Perry and Cloncurry, native copper being mined in the last named district from amygdaloidal traps, under conditions greatly resembling those found in the Lake

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Superior district. Work at this point was suspended because of lack of rail transport. There are copper mines in the counties of Beaconsfield, Bowen, Cardwell, Clermont, Cook, Gilbert, Lynd, Merivale and Palmerston, and occurrences of copper minerals at other points.

The Herberton district is the third largest producer of the state and includes the Chillagoe sub-district. This is a field of considerable promise, and was the largest copper producer of the state previous to the development of the copper measures of the Mount Morgan field. The Chillagoe district covers about ninety square miles, with smaller subsidiary districts adjoining. Copper and lead occur in conjunction with garnet and wollastonite, usually at or near the point of contact of Carboniferous limestone with granite-porphyry, the latter being much decomposed. The ore bodies vary greatly as to size and dip, ore occurring mainly as irregular segregations and being very bunchy. The existence of ore deposits without regular walls is a feature typical of this field. The surface ores as a rule are decidedly rich.

The Mount Perry district, in Bowen county, near the coast of southern Queensland, is a field of considerable importance. The predominant rock form is granite, and the fissure veins therein are mineralized only for portions of their width, the rich paystreaks averaging under one foot as a rule. Ore values have disappeared with depth in some cases, but in others have held to at least 800 feet. The ores are highly silicious and the gossans are both auriferous and argentiferous as a rule.

The change at depth of the Mount Morgan mine, in the Mount Morgan field, from a big gold mine to a big copper mine, is referred to in detail in the description of that mine.

The Stanthorpe field is an old district of considerable promise, but is now a small producer only.

The Tenningering district is fourth in the state in point of production, and has several properties of promise.

The Glassford Creek district is a new and promising field, with active development work under way at several properties.

The Cloncurry field, in northern Queensland, shows copper deposits at various points over a district about 75 miles from east to west and about 150 miles from north to south, the center of this district lying about 150 miles south of the Gulf of Carpentaria. The climate is hot and wood supply inadequate, with shortage of water at some points. Ore bodies are numerous and rich, but narrow, though showing good outcrops, and are said by Thos. Gibb to present the appearance of bedded deposits rather than of fissure veins. There also are occasional veins of greater width, but not outcropping so prominently, these carrying a gangue of kaolin, and the slate walls are impregnated with pyritic ore. Indications point to deposits of low grade sulphides at depth, and some of the oxidized ores are considered amenable to cheap leaching processes. Mining and smelting have been hampered by lack of cheap transportation, but a railroad to connect Cloncurry with the port of Townsville, to be in operation about 1908, should greatly stimulate mining and smelting developments.

SOUTH AUSTRALIA. The Kapunda mine was found in 1842, a decade before the discovery of gold, and in 1845 the Burra Burra mine begun production, since which time South Australia has been a regular

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producer of copper to some extent. The first smelter was built in 1851 at Port Adelaide, and the second at Wallaroo in 1861. There are about 500 mines, or attempts at mines, in South Australia, of which about 25 have been developed to an important extent. The principal mines are in the counties of Adelaide, Burra and Daly, with other mines of less importance in the counties of Flinders, Light and Robe, and in the Northern Territories.

The Wallaroo and Moonta mines, in Daly county, on the Yorke Peninsula, much the most important producers of the state, are old mines, dating from 1863. The country rock is porphyritic and ores are mainly sulphide, though the usual oxidized ores, including a considerable percentage of atacamite, occur in the upper workings, with a barren zone of 50 to 125 feet between the oxidized ores and chalcopyrite.

In the Kapunda district, about 50 miles north of Adelaide, where the first copper discoveries were made, the ores are mainly oxides and carbonates, with an appreciable amount of native copper. In the Burra Burra district, about 125 miles northeast of Adelaide, the predominant rocks are limestone and shale, carrying very irregular deposits of secondary ore, with increased regularity in vein formation noted at considerable depth. The promise offered by various cupriferous fields of this state would seem to justify a much larger copper production than has been secured as yet.

TASMANIA. Copper production on an important scale dates from the opening of the Mount Lyell mine, in 1896, and this remains the only important producer of the state. All of the copper fields under exploration or now producing are in the northwestern corner of the island, in the counties of Montagu, Russell and Wellington.

The Mount Lyell district, in Montagu county, is the only developed field of the state. Rainfall is heavy and the topography of the district is rugged. The principal ore bodies now exploited occur as mammoth lenses of pyritic ore, mainly chalcopyrite, with occasional bornite, disseminated through pyrite, occurring in conglomerate and quartzite, associated with mica schist. A limited amount of chalcocite, and a little native copper, are shown at some properties, but the production is almost exclusively from low-grade disseminated sulphide ores, though one mine is working on native copper.

Considerable prospecting has been done on Mount Darwin and Mount Jukes, adjoining peaks known as the Darwin and Jukes field. In the North Dundas field some prospecting has been done, and considerable ore shown; this being mainly of low grade.

VICTORIA. The principal copper field of this state, so far as can be judged from the very limited amount of work done, is the Beechworth district, where outcrops of ore have been noted at a number of points in an area of about 50 square miles. Total production of copper ore from all the mines of Victoria, to the end of 1905, was only 17,470 long tons, valued at £206,895. Prospecting was resumed, on a small scale, in 1907.

WESTERN AUSTRALIA. Copper ore was discovered in the Northampton district as early as 1842, and the first production was secured in 1855, but no large copper industry has been built up, though a number of small mines, near the coast, were worked in the eighth and ninth decades of the Nineteenth Century. Production has been secured mainly from selected ores, gained by hand-dressing, shipped to distant smelters for

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reduction, and, of course, only high grade ores can afford a profit under such circumstances. Production in 1906 was 7,430 long tons of ore, valued at £50,337, and 296 men were employed in the industry that year. A copper smelter erected by the state has been sold to a private company, with the proviso that custom smelting be done for all comers at reasonable rates, and it is possible that the building of this smelter may mark the beginning of a substantial industry, as Western Australia is by no means devoid of copper deposits of promise. The principal copper fields of the state are in the districts of Ashburton, Champion Bay, Mount Margaret, Mount Morgans, Murchison, Northampton, Phillips River and Pilbarra.

The Mount Margaret goldfield of the Mount Morgans district is much the largest producer, having mined 4,361 long tons of ore, valued at £21,934, in 1906, and the smelter now in operation in this district should stimulate development and production.

The Murchison goldfield has several properties of promise, but the production of 1906 was only 133 long tons of ore.

The Phillips River goldfield, in the extreme southern part of the state, was the only copper producer in 1905, and in 1906 shipped 2,885 long tons of selected ore. The principal ores of this district, as mined, are malachite and chalcocite, giving average assays of 31.48 per cent. copper, 2.16 oz. silver and 0.15 oz. gold per long ton.

The Pilbarra goldfield has copper ore deposits of promise, but these have been idle for several years. In the West Pilbarra district the ore occurs in bodies of considerable size, as oxides and carbonates of high grade, in schistose slate adjoining an igneous intrusive.

NEW ZEALAND. Copper was discovered in 1842 on Kawau Island, and copper mines were opened and worked on Kawau and Great Barrier Islands, circa 1865. A copper property at Nelson, opened about 1880, had a smelter, but none of these mines were successful. Ore has been found at Omaunu, in Whangaroa county. The production of copper ore from 1853 to 1904, inclusive, was valued at £18,211. One copper property was under development at last accounts.

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CHAPTER XXIII.

Copper Deposits of Oceanica.

The copper deposits of this grand division are treated under the names of the various islands in which they occur, in alphabetical order, no atempt being made to group the holdings of the various great powers.

BORNEO. Copper ores and other minerals are noted at several points in the northern part of the island, but these remain undeveloped.

CELEBES. A Dutch company has done some development work in the Pagoeat district, south of Palehleh, in the northern part of the island, where the ore occurs as sulphide impregnations in slate. In the same general district, about ten miles west of Somalata, on Demerki Bay, a brecciated vein carries about 20 per cent. of slightly auriferous and argentiferous sulphides in the form of chalcopyrite, sphalerite, galena and pyrite.

JAVA. Pospecting work during 1903, in the Poelonz district, near Soerabaia, exposed a large mineral body carrying fair values in auriferous and argentiferous chalcopyrite, sphalerite and galena. The vein is about two meters in average width, opened by several shallow shafts and 223 meters of tunnels, the ores shown assaying from 0.9 to 5.25 per cent. in copper tenor.

In the Gunong Kendeng district there are springs carrying copper iodides in solution, and from these thermal waters crude iodide of copper is secured by evaporation, the production amounting to 2,346 kilograms in 1899.

NEW CALEDONIA. More or less copper production was secured from the mines of New Caledonia during the last quarter of the Nineteenth Century, but the mines have been practically idle since 1902, when the output was 3,721 metric tons of copper ore, the greatest production having been 6,349 metric tons, valued at f492,310, in 1899.

There are copper mines in the districts of Bonde, Diahot and Noumea, in the northern part of the island, ore occurrences being noted in the valleys of Diahot, Nehoue and Koumac. The ore occurs as lenses in talcose and chloritic schists, and as stockwerks, the oxidized ores near surface carrying 2 to 4 grams gold per metric ton, while the sulphide ores, mainly chalcopyrite at depth, give considerable silver, this ranging up to 200 to 400 grams per ton from selected ores.

NEW GUINEA. Copper deposits are being exploited in the Astrolabe Mountain range, on the Laloki River, about 15 miles from Port Moresby, in the British portion of New Guinea. The stratified beds are mainly limestone, with occasional sandstone and shale and a few conglomerate tuffs, with diabase intrusions, the district somewhat resembling the Mount Lyell field of Tasmania. A shipment of 17 tons of selected ore, in 1906, gave returns of 26.8 to 32 per cent. copper, with traces of gold.

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PHILIPPINES. Copper ores occur in the islands of Luzon, Mindanao, Mindoro, Masbate and Panay, and their occurrence is reported, though not verified, from the island of Balabac, in the Paragua group. Native copper is said to occur in stream-copper gravels, in addition to lode deposits. Apparently the Philippines contain considerable copper deposits, and are likely to become a producing field of some importance, eventually.

In the island of Luzon there are occurrences of copper ore in the provinces of Batangas, Benguet, Camarines Norte, Lepanto and Tayabas. Much the most important copper measures of the island occur in the province of Lepanto, where natives were mining and smelting copper ores before the Philippines were discovered by Magellan. The Mancayan mines were worked by Igorrotes before the Spanish conquest, and their metallurgy was suprisingly good. The processes of reduction consisted of alternate roasting and matting, with eventual production of ingots of good quality, and the methods presumably were derived from Japanese or Chinese sources. In addition to supplying their own needs, the Igorrotes exported about twenty tons of manufactured copper yearly, leading to an invasion by the Spanish, ending in the organization of the Cantabro-Filipino mining company, by which the Spanish and natives joined forces, and two mines were worked extensively from 1864 to 1874, with an average yearly production stated to have been about 1,100 tons, work ending with the death of Don José María Santos, an exceptionally able man, who had been in charge of the work. Since 1874 the small production has been secured by natives only, along crude lines, but important development work is under way by several companies, notably one composed of American and English capitalists, who plan building a railroad from Mancayan to a seaport on the western side of the island. The Mancayan and Suyoc districts, in the southern part of Lepanto, are but a few miles apart. The Mancayan ores are said to average about 16 per cent. copper, and in the Suyoc district there are several deposits of auriferous tetrahedrite, tennantite and enargite, assaying 9.7 to 32.9 per cent. copper and 85 cents to $4.75 gold, per short ton. Chalcopyrite is known to exist in the Bontoc district. In the province of Batangas copper ores occur in the Loboo Mountains, in veins of 6 inches to 2 feet width, carrying oxidized ores, secondary sulphides and chalcopyrite, all auriferous and argentiferous, with quartz gangue. In the province of Benguet, Luzon, promising copper ores are noted on the Buld River. In the province of Camarines Norte, in the southern part of Luzon, there are occurrences of copper ore apparently worthy of investigation. In the Pangasinan district, at Salasa, 10 miles west of Dagupan, auriferous copper deposits are worked to a very slight extent. Copper ore is reported also from the province of Tayabas, in the island of Luzon.

Samples of native copper have come from the island of Masbate, but attempts at mining seem to have proven unsuccessful.

In the island of Mindanao copper ores are noted in the province of Surigao, and mines have been worked by Moros and Chinese, in a crude way. A German company did some mining, going to the point of building a small smelter, but did not meet with success.

In the island of Mindoro occurrences of copper ore, apparently all chalcopyrite, are reported from various points.

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Carbonate ores of good tenor have been secured in the province of Antigue, in the island of Panay.

SOLOMON ISLANDS. In this British protectorate copper is believed to exist on several islands, and some prospecting was done in 1901, and a little ore was found on the island of Rendova, but nothing came of the discovery.

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CHAPTER XXIV.

COPPER MINES OF THE WORLD.

As in the four preceding annual editions of this work, the detailed descriptions of copper mines and companies given in this chapter are printed in alphabetical order, regardless of location. This plan, though having some obvious disadvantages, is found, upon the whole, the best of any tried or suggested, as it renders the work fully self-indexing. In actual practice the plan is not always easy to carry out, owing to the large number of duplicate names, and for various other reasons as well. The definite article has been omitted from all titles in English and German, but could not well be omitted from Spanish and French titles. In cases where the Spanish or French articles are used, the descriptions have been filed upon the name of the mine, rather than the article, except that in the case of American or English companies having Spanish titles, the filing has been done upon the article, whether La, Las, Los or El. This plan of indexing may seem somewhat awkward, but the difficulties encountered in dealing with titles in many different languages, each with its own individual idioms, are by no means inconsiderable.

There are nearly 7,000 titles given in the present chapter, as compared with 256 mine titles in Volume I. and 4,626 titles in Volume VII.

AAMDAL COPPER MINES SYNDICATE, LTD. **NORWAY.**

Dead. Property sold and company wound up, circa 1903. Formerly was at Mo, Telemarken, Christiansand, Norway.

AAMDALS KOBBERVAERK. **NORWAY.**

Mine office: Aamdals Vaerk, Telemarken, Christiansand, Norway. Charles McCully, manager. Was opened circa A. D. 1600 and was a considerable producer for nearly three centuries, making 240 tons fine copper in 1895. Was reopened 1906. Veins formerly worked were narrow, but rich, and considerable low grade ore was developed circa 1903, when under option to the Tharsis Sulphur and Copper Co., Ltd. Diamond drill borings, 1907, gave good cores at depth of 1,400′. Employs circa 300 men.

ABBEY MINING CO. **NEW MEXICO.**

Office: 1007 Bessemer Bldg., Pittsburg, Pa. Mine office: Socorro, Socorro Co., N. M. Nelson Weddle, Jr., president; Earl A. Wheeler, vice-president; H. A. Spangler, treasurer; J. F. Hinckley, secretary; Nathan Hall, general manager. Organized December, 1901, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Lands, 19 claims, area 380 acres. The Abbey group, 22 miles north of Magdalena, shows 2 parallel veins with about 600′ of workings, carrying ore assaying up to 40% copper and 80 oz. silver per ton. The Washington group, circa 10 miles west of Upham, has a 165′ shaft. Idle several years.

ABBOT CREEK GOLD & COPPER MINING CO. **NORTH CAROLINA.**

Office: care of W. J. Brent, Portsmouth, Va. Lands are in Lexington county, North Carolina. Main shaft, 80′, is in a vein giving average assay

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values of $15 per ton, in copper and gold. Has a concentrator and mill with Tremain stamps and crusher. Presumably idle.

ABERDEEN COPPER CO. **NEW MEXICO.**

Dead. Formerly at Lordsburg, Grant Co., N. M. Fully described Vol. V.

ABERFOYLE COPPER MINING CO., LTD. **AUSTRALIA.**

Mine office: Armidale, N. S. W., Australia. Organized 1907, under laws of New South Wales, with capitalization £15,000, shares £1 par. Lands, 160 acres, 35 miles from Armidale, on the Aberfoyle river, in the New England district, showing a 4′ vein carrying sulphide ore of about 17% average copper tenor.

ACARI COPPER MINING SYYNDICATE, LTD. **PERU.**

Main office: Acari, Camaná, Arequipa, Perú. Mines idle at last accounts.

ACCIDENTAL MINING & MILLING CO. **COLORADO.**

Mine office: Granite, Chaffee Co., Colo. Ores carry gold, silver, lead and copper. Presumably idle.

ACHAICHES MINE. **ALGERIA.**

Mine office: Collo, Algeria. Lands, 36 kilometers from Collo, show chalcopyrite and cupriferous pyrites in schist. In June, 1907, a 50-ton water-jacket blast furnace was being installed to matte the ore.

ACME CONSOLIDATED GOLD & COPPER MINING CO. **WYOMING.**

Office: 7 Congress St., Boston, Mass. Mine office: Laramie, Albany Co., Wyo. Otto Gramm, president; Geo. M. Colby, vice-president; Arthur S. Howe, secretary and treasurer. Organized May 16, 1905, under laws of Maine, with capitalization $1,000,000, shares $1 par. Is a securities-holding corporation, controlling, through stock ownership, the Acme Gold & Copper Mining Co., and owns a large amount of standing timber, sawmill, planing-mill and a lumber yard at Centennial, Wyoming, an office building at Laramie, town lots at Laramie and Centennial, the Centennial Post newspaper and the Centennial Trust Co.

ACME GOLD & COPPER MINING CO. **WYOMING.**

Office: 7 Congress St., Boston, Mass. Letter returned unclaimed from former mine office, Laramie, Albany Co., Wyo. L. W. Thompson, president; Fred A. Miller, vice-president; Arthur S. Howe, secretary and treasurer. Capitalization $400,000, shares $4 par. Is controlled, through stock ownership, by Acme Consolidated Gold & Copper Mining Co. Lands, 20 claims, 12 patented, area reported by company as 514 acres, also a 60-acre mill site. Property, known as the Gold Hill group, has 2,454′ of workings. Improvements include necessary mine buildings, sawmill and stamp-mill. Presumably idle.

ACME MINING & MILLING CO. **COLORADO.**

Mine office: Cotapaxi, Frémont Co., Colo. Has a 50′ shaft, planned to be sunk 800′.

ACME MINING & REDUCTION CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. H. H. Pilling, president; Adolph Bail, vice-president; Chas. F. Slack, treasurer; Chas. W. Lewis, secretary; Lyman Bridges, manager; L. W. Waer, mine superintendent. Capitalization, $1,000,000. Lands, 24 claims, unpatented, known as the Acme group, in the Amole district, 12 miles from Tucson. Ores carry copper, gold, silver and lead.

ADA COPPER MINING CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. H. L. Frank, president; Jas. B. White, manager. Organized 1904, under laws of Montana. Property is the Ada mine and adjoining claims, carrying gold, silver and copper. Idle.

ADAKAI MINE. **JAPAN.**

Mine office: Adakai-mura, Yatsuka-gori, Izumo, Japan. County rocks

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are Tertiary shale and sandstone, alternating. Principal vein strikes NNE. Ores are bornite, chalcopyrite and pyrrhotite, accompanied by native copper and sphalerite, with clay gouge. Idle.

ADAMS COPPER CO. **WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. Idle.

ADAMS COPPER MINING & REFINING CO. **COLORADO.**

Office: 513 Cooper Bldg., Denver, Colo. Operating office: 317 McCornick Bldg., Salt Lake City, Utah. Mine office: Steamboat Springs, Routt Co., Colo. Boyd R. Adams, president; B. F. Barnett, vice-president; W. F. McQuarrie, treasurer. Lands, 7 claims, having a 200′ shaft carrying ore averaging about 4% copper. Has steam power. Presumably idle.

ADDIE COPPER MINING CO.

Letter returned unclaimed from former office, Denver, Colo.

ADELAIDE STAR MINES, LTD. **NEVADA.**

Office: 33 Renfield St., Glasgow, Scotland. Mine office: Golconda, Humboldt Co., Nev. P. Coats, chairman; D. M. Boyd, secretary; Glasgow & Western Exploration Co., Ltd., general managers; Otto Stahlman, manager; C. G. Smith, general superintendent; Joseph Farren, mine superintendent. Organized Apr. 21, 1897, under laws of Great Britain, with capitalization £350,000, shares £1 par. No financial statement issued since 1903. Lands, 486 acres, including the Adelaide group of 13 claims, area 238 acres, 10 miles south of Golconda, and the Star group, 4 claims, area 78 acres, at Cherry Creek, White Pine Co., Nevada, also a 170-acre mill site. The Star mine is but slightly developed. The Adelaide mine has a 300′ shaft and in the upper levels carried native silver, the 200′ level showing a good body of medium grade auriferous and argentiferous copper ore, a carload mill test returning $9.40 per ton. A 12-mile narrow gauge private railroad connects the mine with the mill at Golconda. Mine equipment includes a 200-h. p. steam plant, with hoist and 2 air-compressors.

The 100-ton reduction works include a 30-ton sampler and treat custom ores as well as company's own production. The mill uses the Macqueston flotation process of concentration, by which ore is first put through crushers, then through steel rolls, going to Huntington mills and then to the Macqueston plant, which has 100 concentrator tubes, each 18″ in diameter and 6′ in length, arranged side by side in 4 tiers. More than one-half of the tubes are immersed in water, and ore is carried through by endless screws, going out of the tubes at surface into settling tanks below. Concentrates not caught in the first tier of tubes pass into the next set, and so on, the process being completed in the third set. It is claimed that this process gives extraction of better than 99.75% of assay values, which claim seems too good to be entirely true. Work was resumed, 1907, at the Adelaide mine, which was producing circa 70 tons daily in August, 1908.

ADELINE MINES, LTD. **AUSTRALIA.**

Office: 50 Lime St., London, E. C., Eng. Mine office: Drake, N. S. W., Australia. G. Martin Inglis, chairman; W. N. Redman, secretary. Organized Sept. 5, 1902, under laws of Great Britain, with capitalization £100,000, shares £1 par; £30,577 issued, fully paid. Idle.

ADIRONDACK MINE. **MONTANA.**

Owned by North Butte Mining Co.

ADMIRAL GOLD & COPPER MINING CO. **NEW MEXICO.**

Office: Sterling, Kansas. Letter returned unclaimed from former mine office, Tusas, Rio Arriba Co., N. M. C. A. Cooper, president; W. M. Bisbee, secretary. Organized 1900, under laws of New Mexico, with capitalization $500,000, shares $1 par. Lands, 5 claims, area 120 acres, in the Bromide dis-

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trict, showing 3 fissure veins of 10′ average width, carrying sulphide ores, opened by 3 shafts, deepest 130′. Idle for some time.

ADMIRAL TOGO-ELY COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. A. R. Worth, president; C. R. Faulstich, secretary. Organized under laws of Arizona, with capitalization $3,500,000, shares $1 par. Lands are 2 claims about 5 miles north of Ely; one claim 24 miles north of Barstow, California and 2 placer claims in the Coolgardie district of San Bernardino county, California. Apparently a stock-jobbing enterprise.

ADVANCE DEVELOPMENT & MINING CO. **ARIZONA.**

Office and mine: care of Parker L. Woodman, president, Bisbee, Cochise Co., Ariz. Alex. Erickson, superintendent. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $2.50 par. Lands, sundry claims 3 miles from Bisbee, opened by a 30′ shaft, showing ore assaying well in gold and copper. Idle.

ADVENTURE CONSOLIDATED COPPER CO. **MICHIGAN.**

Office: 32 Broadway, New York, N. Y. Mine office: Greenland, Ontonagon Co., Mich. Jas. L. Bishop, president; Chester L. Dane, vice-president; W. R. Todd, secretary and treasurer; preceding officers, Chas. J. Devereaux, James S. Dunstan, Stephen R. Dow and Chas. D. Hanchette, directors; W. A. O. Paul, assistant secretary and treasurer; Chas. L. Lawton, general superintendent; A. H. Sawyer, engineer; S. A. Prince, clerk.

Organized Oct. 17, 1898, under laws of Michigan, with capitalization $2,500,000, shares $25 par; paid in, $20.50. American Loan & Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent.

Lands include the old Adventure and Hilton tracts, in one body to the eastward, and the Knowlton tract, one mile southwest, with total area of 1,696.22 acres on the mineral belt, also a millsite on Lake Superior. The mineral lands are located in Sections 35 and 36, Town 51 North, Range 38 West, and in Sections 1 and 2, Town 50 North, Range 39 West. The Toltec and part of the Belt lie on the north, Aztec on the east, Toltec and Mass on the south, and the Mass on the west of the main tract. The Knowlton tract has the Mass to the north and east, Flint Steel to the south and Michigan to the west, the Ridge mine of the Mass lying between the two Adventure tracts. The village of Greeland lies on the northwestern corner of the Adventure's principal tract, and the village of Maple Grove, controlled by the company, is near the mine.

The old Adventure mine was opened in 1850, along a line of ancient pits showing prehistoric mining. The largest annual production was 116 tons, 1,941 lbs. fine copper, in 1857. After closed by the owners, the old openings were worked for years by tributors, proving notably rich in silver.

The Hilton, or Ohio mine, opened 1863, on the Mass lode, never was worked vigorously. The Knowlton was opened in 1853. These three old mines made 974 tons, 1,173 lbs. fine copper, previous to their merging as the Adventure Consolidated, which started work Nov. 1, 1898.

The Adventure has a series of 7 parallel copper-bearing beds in a cross-section of about 1,200′ and these, coupled with the existence of Adventure Bluff, a 300′ hill, have caused the opening of the mine by adits as well as by shafts. The "South Range," or "Evergreen Belt" of Ontonagon county, comprises a belt of bedded traps, amygdaloids and conglomerates, 7 of these amygdaloids carrying copper on the Adventure tract. These beds were fully described in Vols. I to VII, inclusive.

The cupriferous lodes of the Evergreen belt are notoriously bunchy, being rich in spots and worthless at other points. The strike of the parallel lodes of the Adventure is N. 73° E. on the main tract, where operations were con-

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ducted, shafts being sunk at an angle of 45°. There are 4 tunnels and 4 shafts, latter, except No. 1, in the Merchant lode, being sunk on the Knowlton bed, at 45°, and numbered from west to east.

The mine equipment includes a 38x59′ steel boiler-house with three 500-h. p. Burt boilers; a 59x59′ steel engine-house having an Allis-Chalmers duplex double-cone direct-acting hoist with 42x60″ cylinders, capable of raising a 12-ton load from a depth of 5,000′ on an incline of 45° at a speed of 2,000′ per minute, and a 38x65′ steel compressor-house having a 60-drill Rand-Corliss air-compressor. There is a complete electric light and power plant and protection from fire is furnished by water-mains. The principal mine buildings are sheathed with steel and painted, and the property is served by a spur of the Copper Range railroad.

The stampmill, at Edgemere, on Lake Superior, went into commission Sept. 22, 1902. The mill, built and equipped by the Allis-Chalmers Co., which has been sued for defective construction, is 135x217′, of steel on stone foundations, with a 69x72′ boiler-house and 32x72′ pump-house. Equipment includes 3 Allis-Chalmers heads, fitted with Parnall-Krause mortars having 11-16″ openings in discharge screens, with two horizontal revolving screens having 5-16″ openings for each head. The stamp pistons are automatically rotated, equalizing wear on the shoes. From the revolving screens of the heads the crushed rock goes to the separator jigs, 24 for each head, or 72 for the mill, thence to 36 finisher jigs. There are round slime-tables, 3 Overstrom and 3 Wilfley concentrators, and Huntington mills for the raggings. The rock-bins have a storage capacity of 4,500 tons. Coal is delivered from trestles to boiler-rooms by gravity, through chutes. The pump is a 16,000,000 gallon Riedler, drawing its supply from Lake Superior through a tunnel extending 1,200′ under the lake. Miscellaneous improvements at the mill site include an office, smithy, machine-shop, dwellings, etc. There is 8′ to 12′ of clear water offshore, permitting the landing of cargoes from scows, in good weather.

The operation of the Adventure mine proper proved disappointing, every year showing a loss. The average contents of all rock stamped was only 12.29 lbs. fine copper per ton, and during the last half of 1907 fell to 8.7 lbs. per ton, an absolutely hopeless figure, hence mining was entirely suspended early in 1908. Production, 1907, was 1,244,874 lbs. fine copper.

By reason of the highly promising copper discoveries made by the Lake Copper Co., diamond drill boring was begun in the spring of 1908, with 2 drills, and 3 rich cores have been secured, 2 having been cut July, 1908, from a single hole, about 750′ apart, the second being supposed to have been taken from the Lake bed, though this is not certain, and having about 10′ only of solid core, balance being sludge assaying 4.5% copper. The cores were taken from beds of 26′ and 30′ estimated width, the wider bed not carrying copper for the entire width. The overburden is very heavy, holes being drilled from swampy ground. The future of the Adventure evidently lies in the new beds, though possibly, if a big and successful mine is opened thereon, the old workings can be operated to advantage at some future time. The horizon of the 2 rich beds must be opened by an entirely new line of shafts. The company's deficit for 1907 was about $86,000, and quick assets May 31, 1908, were $51,475.

AEOLIAN CONSOLIDATED COPPER MINING CO., LTD. IDAHO.

Mine office: Mullan, Shoshone Co., Idaho. Alfred Andrieux, president; Geo. E. Phipps, vice-president; Marguerite Andrieux, treasurer; Clara Phipps, secretary; preceding officers, Louis L. Durand, Alexis Daneau and Henry P. Knight, directors. Lands, 9 claims, area circa 140 acres, near the head of Deadman's Gulch, 3 miles from Mullan. Property, fairly timbered, shows 2 well defined veins in quartzite, circa 400′ apart, the south vein being 10′ to 40′ and the north vein 4′ to 10′ wide, opened by a 310′ tunnel on the south

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vein and a crosscut tunnel on the north vein, showing ore assaying well in copper, gold and silver.

AETNA COPPER CO. **MICHIGAN.**

Dead. Sold lands, 1905, to Keweenaw Copper Co. Formerly in Keweenaw county, Michigan.

AETNA GOLD & COPPER MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah.

AETNA MINING CO. **WYOMING.**

Office: Merrill, Wis. Mine office: Riverside, Carbon Co., Wyo. Julius Thielman, president; E. F. Hanf, secretary. Organized under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 7 claims, area 140 acres, in the vicinity of Beaver Creek, circa 12 miles south of Encampment, showing 4 veins of 3′ to 6′ width, as fissures and as contact veins between granite and quartzite, carrying chalcopyrite, bornite and chalcocite, estimated to average 25% copper, and developed by a shaft of 200′ and tunnels of 125′ and 380′. Has a 40-h. p. steam plant.

AFORTUNADA COPPER MINES, LTD. **SPAIN.**

Dead. Title changed, 1903, to Rio Rimal Copper Co., Ltd. Formerly at Figueras, Gerona, Spain.

AFRICAN & AUSTRALIAN CO., LTD. **AUSTRALIA.**

Office: Broad Street House, London, E. C., Eng. J. B. Palmer, chairman; H. J. Dixon, secretary. Organized Apr. 7, 1902, under laws of Great Britain as a third reconstruction of the West Australian Mining Co. and Victoria Copper Co., with capitalization £120,000, shares 2s. par. Holds stock interests in the Copper Selection Syndicate, Ltd., and various other enterprises.

AFRICAN COPPER DEVELOPMENT CO. **TRANSVAAL.**

Mine office: Middelburg, Transvaal. J. F. Davies, consulting engineer. Lands, in the Middelburg and Pretoria districts, are being developed by shafts.

AFRICAN COPPERS, LTD. **TRANSVAAL.**

Office: Exploration Bldg., Johannesburg, Transvaal. Mine office: Middelburg, Transvaal. Jerry F. Davies, manager. Organized under laws of Transvaal with capitalization £15,000. Lands are 1,025 claims on the farm Rietkloof, having 3 shafts, known as No. 1, New and Marnitz, latter, 160′ deep, showing malachite and bornite. Begun shipping ore to Middelburg by wagon, September, 1907.

AFRICAN NOBLE DUKE GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly infested Bisbee, Cochise Co., Arizona.

AFRO-AMERICAN MINING & MILLING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Chas. F. Jones, president; Anna Lee, secretary; Andrew G. Hansen, treasurer. Organized 1905, by negro residents of New York and Montana, with capitalization $500,000. Lands, 18 claims, including 5 claims in the northwestern part of Butte district, 5 claims in Madison county and 5 claims in Lewis & Clark county, Montana, latter having a 100′ shaft showing ore giving fair assay values in copper, silver and gold.

AFTERTHOUGHT MINING CO. **CALIFORNIA.**

Dead. Lands sold to Great Western Gold Co. Formerly at Redding, Shasta Co., Cal.

AFTON MINING & SMELTING CO. **MONTANA.**

Dead. Formerly at Helena, Lewis & Clark Co., Mont. Described Vol. V.

AGASSIZ MINING CO. **ARIZONA.**

Dead. Formerly at Ray, Pinal Co., Ariz. Described Vol. VI.

AGATE HARBOR MINE. **MICHIGAN.**

Office: care of Mrs. Anna Scott Block, owner, 100 Washington St., Chi-

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cago, Ills. Mine office: Eagle River, Keweenaw Co., Mich. Lands were slightly prospected, many years ago, but property never was a producer.

AGGER CONSOLIDATED MINES, LTD. **GERMANY.**

Letter returned unclaimed from former office, Finsbury Pavement House, London, E. C., Eng. Mine office: Siegen, Prussia, Germany. F. Lewis, secretary; Heinrich Noelling, mine manager. Organized Feb. 15, 1906, under laws of Guernsey, with capitalization £150,000, shares £1 par. Property is the Aggerburg group of copper, zinc and lead mines, area 2,880 acres, in the Bensburg district of western Prussia.

MINA AGUA BLANCA. **MEXICO.**

A property at Autlán, Jalisco, Mexico, controlled by the Mexican Investment & Development Co.

AGUASCALIENTES METAL CO. **MEXICO.**

Office and mine: Asientos, Ocampo, Aguascalientes, Mex. Dr. Chas. L. Bennett, president; Chas. P. Doerr, vice-president; Victor Hunton, secretary and treasurer; Albert Doerr, general manager; Geo. A. Crowder, mine superintendent; Robt. N. Woodworth, engineer. Organized Dec. 31, 1900, under laws of Mexico, with capitalization 35,000 pesos, shares 500 pesos par.

Lands, 82 hectares, in the Asientos and Tepezalá districts, including the Merced and San Simon mines at Asientos, and a group 3 miles from Tepezalá. Properties show 5 lenticular ore bodies, between limestone and calcareous slate and porphyry, with silicious limestone gangue, of which 4, under development, average about 5′ in width, carrying ore averaging about 3% copper, 10 oz. silver and $2 gold per metric ton. The Merced-Orito, 8 kilometers west of Cobre station, on the Mexican Union Railway, has 2 veins of 3 to 5 meters average width, carrying lenticular ore chutes, opened by shafts of 300′ and 400′, with about 2 miles of workings. Mine is very dry and is lighted by incandescent lamps. The San Simon y Anexas group has tunnels of 100 and 125 meters, and a 200′ shaft and the San Nicolás has a 150′ shaft.

Equipment is excellent, including a 100-h. p. De Laval steam turbine dynamo and Cameron electric triplex pump, with 20-h. p. and 50-h. p. electric hoists, good respectively for 1,000′ and 3,000′. Buildings include a 15x30′ stone machine shop, 20x40′ stone and adobe carpenter shop, 20x30′ smithy, power-house, hospital, office building, etc. Fuel is West Virginia coal, costing 16 pesos per metric ton. Average cost of mining is 10 pesos per metric ton, and of smelting 12 pesos. Production, 1906, was circa 1,000,000 lbs. fine copper, and for 1907 was circa 600,000 lbs. fine copper. Mine employs about 200 men. Company, which is a close corporation, controlled by one family, is wisely managed, and has accumulated a considerable surplus, instead of beginning dividends immediately, as is too commonly the case.

AGUILA AMALGAMATED MINING CO. **MEXICO.**

Office: care of J. Burpee Neily, 183 Summer St., Boston, Mass. Mine office: Hostotipaquillo, Ahualulco, Jalisco, Mex. Jos. P. Burlingame, vice-president; Eugene N. Estis, secretary; Jas. A. Floyd, treasurer. Organized with capitalization $6,000,000, practically as a reconstruction of the Mazeppa Consolidated Mining Co.

AGUASCALIENTES SMELTER. **MEXICO.**

Owned by American Smelting & Refining Co.

AHMEEK MINING CO. **MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office. Kearsarge, Keweenaw Co., Mich. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; W. J. Ladd, secretary and treasurer; preceding officers, Clarence H. Bissell, Thos. L. Chadbourne, Edward S. Grew and Walter A. S. Chrimes, directors; Wm. J. Uren, superintendent; Frank H. Haller, assistant superintendent; Russell Smith,

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surface superintendent; Thomas Rapson, chief mining captain; Chas. D. Hohl, engineer; John T. Reeder, chief clerk and purchasing agent; Wm. Veale, clerk; H. B. Clausen, superintendent motive power. Organized 1880, under laws of Michigan, with capitalization $1,250,000, shares $25 par; $17 paid in. Last call on capital stock was $5, Feb. 5, 1904. Annual meeting, first Friday in July.

Lands, 920 acres, lying west and south of the Mohawk, set off, 1880, by the Seneca Mining Co., to work the Kearsarge, or Houghton, conglomerate. Under the management of Capt. John Daniell 2 shafts were sunk on this bed, which averages about 70′ width, with 3 paystreaks, of 2′ to 3′ width each, aggregating 7′ width, each carrying copper in good quantities, but not payable, owing to great width of partially or wholly barren rock. Resumed work Dec. 2, 1902, and exchanged 11.188 acres with the Allouez, in July, 1903, for an equal area, this giving each property a better arrangement of lands for development. The Kearsarge lode was located by diamond drill in the spring of 1903, and was immediately opened.

The mine is opened by two 3-compartment shafts, 1,445′ apart, sunk at 42°, No. 1 being 1,204′ deep at the 9th level, and No. 2 being 1,334′ deep at the 10th level. Drift-stopes were carried in the early stages of production, providing considerable stamp-rock while permitting rapid increase of reserves. No. 1 shaft, which will be cut off by the side lines of the Allouez at a depth of about 3,000′, apparently is the richer of the two. Reinforced concrete has been substituted for wooden sleepers in the shafts, ties being moulded in place upon the natural anchorage of rough rock, cores being left for rods to bolt the rails to the stringers. Concrete stringers are cheaper than wood, and presumably of longer life, though harder upon rails and rolling stock. Each shaft has 2 skips in operation. No. 2 shaft has a rock chute 625′ long, reaching from the 4th to the 9th levels in the hanging, inclining toward the shaft which connects at the 9th level, from which point all hoisting is done. The end of the chute has an apron of one skip-load capacity, loading 7-ton skips in 20 seconds, one man looking after the dumping and filling of both skips, this system effecting a great saving.

There is room for 2 new shafts between the present workings and the Mohawk boundary and sand-pipes have been sunk for opening 2 shafts, which will be started from surface at an angle of 80°, in the form of an inverted "V," with a single shafthouse and rockhouse for both, somewhat similar to the plan used at the Allouez.

Each shaft has a shafthouse connecting with a centrally located rockhouse of brick with a cylindrical steel rock-bin 32′ in diameter and 45′ high, set on a concrete foundation with a tunnel and railroad track beneath, permitting filling of cars by gravity, one man loading a 40-ton car in 15 seconds. The bins have 1,600 tons capacity with an electric shaker and endless conveyor running from crushers to bins.

The power plant, about midway between shafts Nos. 1 and 2, is in 3 sections, the boiler-house being flanked on either side by engine-houses Nos. 1 and 2 for the respective shafts. The boiler house, having 5 boilers, with room for 8, is of structural steel, and the power-houses are of concrete and brick. No. 1 power-house has a 45-drill Nordberg air-compressor and electric light and power plant, liberal use being made of electric power throughout the plant. No. 2 power house has a 60-drill 2-stage Nordberg air compressor. The hoists are duplicate, capable of raising 10-ton loads from a depth of 1 mile, having double conical drums with maximum diameter of 18′ 6″, hoisting 10-ton skips in counterbalance. Buildings include a new machine-shop, 36x160′ warehouse of structural steel frame, connecting with the railroad tracks, and a 44x46′ office

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building. The townsite contains about 70 dwellings, with waterworks having upwards of 1 mile of 6" mains, with 10 hydrants.

The Ahmeek has no mill of its own, about 75% of the rock production being milled by the Osceola, and 25% by the Tamarack.

Production to end of 1907 was 10,518,136 lbs. fine copper, of which 5,510,985 lbs. were made in 1907, the 1907 production being secured from 302,733 tons of rock, and the average for 3 years being 18.5 lbs. fine copper per ton, which probably will be exceeded in the future, only 8% of the rock broken underground having been discarded. The mineral returns about 75% copper. The cost of copper for 1907 was about 12 cents per pound, and probably will prove about 10 cents per pound in 1908, and should be reduced in the future. In July, 1908, the mine was producing about 1,000 tons of rock daily, but is in a position to furnish 1,500 tons. It is planned to make, eventually, 20,000,000 lbs. fine copper yearly, and the property is capable of doing it, with further development. The company begun 1908 with a balance of quick assets of $385,571, and further assessments are entirely improbable, though it is likely that earnings will be drawn upon to provide a mill. The Ahmeek is a magnificent property, with a great future, being perhaps the most promising mine yet opened on the Kearsarge lode, and has been developed and managed with great skill and signal success.

COMPAGNIE DES MINES D'AÏN-BARBAR. **ALGERIA.**

Office: 39 Rue Dulong, Paris, France. Mine office: Bône, Constantine, Algeria. Lands, 22 kilometers northwest of Bône, show several veins carrying complex sulphide ores, mainly chalcopyrite, associated with sphalerite and galena. Has a magnetic concentration plant and is experimenting with the Korda process of copper reduction by leaching and electrolysis. Production, 1906, was 7,545 metric tons of washed copper ore, and 1,800 tons of washed mixed ore, ore being calcined and giving, after magnetic separation, 710 tons of copper ore and 649 tons of sphalerite, former estimated to contain 225,000 lbs. fine copper. For 1906 made a net profit of $31,807, paying a 7% dividend.

AJAX MINE. **MONTANA.**

Mine office. Fox, Beaverhead Co., Mont. Noyes & Morse, owners. Ores carry gold, silver, lead and copper. Has a 5-stamp mill.

AJAX MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Robinson, Juab Co., Utah. Thos. Weir, president and general manager; Jno. M. Burt, secretary. Capitalization $300,000, shares $10 par. Has liquidated a considerable former indebtedness, ending the fiscal year Oct. 1, 1907, with a $20,000 surplus. Mine has a 1,000' main shaft, and produces ore averaging circa 3.75% copper, 9 oz. silver and $7 gold per ton. Production, 1907, was 123 carloads of ore, carrying circa 150,000 lbs. fine copper.

AJO COPPER MOUNTAIN MINES CO. **ARIZONA.**

Dead. Property sold, January, 1907, to Rendall Ore Reduction Co. Formerly at Gila Bend, Maricopa Co., Ariz. Fully described Vol. VI.

AK-SAR-BEN COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

ALABAMA GOLD & COPPER CO. **NEW MEXICO.**

Letter returned unclaimed from former mine office, Orogrande, Otero Co., N. M. Property shows large outcrops of iron ore, also veins carrying copper and gold values, with more or less turquoise.

ALADDIN MINING CO. **MONTANA.**

Mine office: Clinton, Missoula Co., Mont. Idle for some years.

ALAKNUNDA COPPER SYNDICATE, LTD. **INDIA.**

Office: 20 Bucklersbury, London, E. C., Eng. Mine office: Devanghur, Garhwal, Oudh, India. Organized Sept. 25, 1907, under laws of Great Britain,

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with capitalization £6,750, in 600 A shares and 6,000 ordinary shares of £1 par each, and 3,000 deferred shares of 1s. par. Lands are leasehold.

ALAMEDA MINING CO. **WYOMING.**

Office: care of P. J. Winters, manager, Encampment, Wyo. Mine office: Saratoga, Carbon Co., Wyo. Lands, 3 claims, near the Charter Oak property, opened by shallow shafts, deepest 30′, and a 100′ tunnel, said to show encouraging ore. Idle.

ALAMOS MINING CO. **MEXICO.**

Office: care of L. C. Hanks, secretary and treasurer, Douglas, Ariz. Letter returned unclaimed from former mine office, Alamos, Sonora, Mex. Harry F. Smith, president. Organized February, 1906. Lands, sundry claims below Guaymas, in the Alamos district of Sonora, Mexico, slightly developed, said to show argentiferous copper ores. Presumably idle.

ALAMOS SILVER & COPPER CO. **MEXICO.**

Office: care of J. S. Obermiller, general manager, Philadelphia, Pa. Mine office: Alamos, Sonora, Mex. Lands, circa 200 acres of mineral property and about 300 acres of millsites and water rights, including the Promontorios mine, opened A. D. 1720, having a 600′ shaft showing a 48′ ore body. Has a 50-ton smelter.

ALASKA AMALGAMATED COPPER CO. **ALASKA.**

Office: Seattle, Wash. Mine office: McCarthy's Creek, Copper River district, Alaska. W. A. Mears, president; L. C. Dillman, vice-president and general manager; E. V. Dillman, secretary; H. H. Greer, superintendent. Organized December, 1905, under laws of Washington, with capitalization $1,250,000.

Lands are 113 claims, area circa 2,260 acres of copper claims, stretching along about 60 miles, also 168 gold placer claims, 1,200 acres of coal lands and 3 water powers, one of latter having a 500′ vertical fall, available for power purposes about 6 months yearly. Of the copper claims the Walters, Statesman, Ramshead and Dillman groups give the best surface showings.

The Statesman group, 10 claims, shows native metal, occuring as fine shot and flake copper, in slightly amygdaloidal trap, with greenstone walls, the trap bed, said to be 350′ wide, mineralized for entire width and traced 2,400′, carrying occasional copper masses, said to range in weight from a few pounds to 10 tons each.

The Walters group, 7 claims in length, shows a vein of 8′ to 10′ average width for 1,000′, reported then to swell to 200′ width for 3,000′, then narrowing to 8′ to 10′ only, being traceable about 6,000′ in all. Ores are massive bornite and chalcopyrite.

The Ramshead group, exposed to depth of 100′ by erosion, shows a vein of 12′ to 16′ width, claimed to carry 8′ to 10′ of massive chalcocite and a 12′ streak of quartzose material, balance of ore being a good grade of disseminated bornite and chalcopyrite, with spar gangue.

The Dillman group, exposed for a depth of about 300′ by erosion, has a vein of 4′ to 22′ width, traceable by outcrop 6,000′ on company's lands, carrying an average of about 6′ of massive chalcocite, considerably weathered at surface, showing green carbonate stains.

ALASKA-CALUMET COPPER CO. **ALASKA.**

Office: 645 New York Blk., Seattle, Wash. Mine office: Valdez, Alaska. H. M. Herrin, president; F. Freeman Evans, secretary; Walter Bowen, treasurer; Fred Elkins, agent. Organized Jan. 13, 1906, under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, 17 claims, in 2 groups, in the Copper River district, adjoining the Hubbard-Elliott, showing bornite and chalcocite assaying up to 56% copper and $169 combined gold and silver values per ton.

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ALASKA CONSOLIDATED COPPER CO. **ALASKA.**

Office: 512-60 Wall St., New York, N. Y. Hon. W. F. Bay Stewart, president; Ambler J. Stewart, vice-president; Peter Stederoth, secretary; preceding officers, John R. Miller, Chas. J. Hutchins, W. B. Bousman, C. B. Watt, Frank P. Lauer, Herman Barring and Robert Gwynne, Jr., directors. Capitalization $5,000,000, shares $5 par. Company has no connection with any corporation of somewhat similar title. Lands, 34 claims, mainly on Nugget Creek, in the Chitina Basin of the Copper River district, Alaska, said to have a 26′ fissure vein traceable 1,000′, carrying ore of 10% average copper tenor.

ALASKA CONSOLIDATED MINING & SMELTING CO. **ALASKA.**

Dead. An abortive reorganization, 1907, of the Alaska Copper Co.

ALASKA COPPER ASSOCIATION. **ALASKA.**

Letter returned unclaimed from former office, Valdez, Alaska. Organized 1907, with capitalization $25,000.

ALASKA COPPER CO. **ALASKA.**

Office: 316 Globe Bldg., Seattle, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. H. B. Bryson, president; A. P. Burchfield, vice-president; Frank C. Lane, treasurer; Henry W. Armstrong, secretary; H. T. Granger, receiver. Organized Feb. 28, 1903, under laws of Washington, with capitalization $5,000,000, shares $25 par. Lands, 18 claims, patented, area 360 acres, also 8 patented millsites, area 80 acres, on Copper Harbor, a land-locked haven with deep water. Lands, well timbered, on Copper Mountain, rising to a height of 3,600′, have a partially developed water power, with a 22″ steel pipe-line of 1,000′ length, from Reynolds Creek to the power plant, where there are 2 water wheels of 300 aggregate horse power.

The Brooklyn vein, 10′ to 30′ wide, carries chalcopyrite assaying 3 to 34% copper. The New York vein, a contact between porphyry and limestone, 10′ to 60′ wide, has given smelter returns of 16.9% to 29.06% copper. Principal vein is the Indiana, in limestone, near porphyry, giving average assays of 6% copper and $6 gold per ton. Mine has 6 shafts, 2 deepest, 230′. Principal development is by tunnels, 8 in number, of 7,209′ aggregate length. Ores at surface are oxidized, with occasional native copper, with sulphides at depth. Mine has a 1,400′ ground-tram, connecting with an aerial tram leading to the smelter, which has a 350-ton Allis-Chalmers blast-furnace. Buildings include a 30x60′ frame machine-shop, 20x70′ frame carpenter shop, 24x36′ smithy, and various other structures, with a total of 16 buildings. Property includes a 15,000′ sawmill and gasoline launch. Property produced some matte, latter half of 1906, but since idle. Is said to have an indebtedness of circa $175,000, and to have sold its lands. Bankruptcy apparently is inevitable.

ALASKA COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Lands are in litigation with Nevada Consolidated Copper Co.

ALASKA COPPER & COAL CO. **ALASKA.**

Office: 146-45 Broadway, New York, N. Y. Ernest Trusiow, secretary and treasurer. Organized under laws of West Virginia, with capitalization $3,500,000, shares $10 par, as Alaska Copper Co., and name changed to present title. Lands, circa 3,000 acres, patented, 180 miles northeast of Valdez, are known as the Kennicott group. The Bonanza mine, 6 miles above the foot of Kennicott glacier, has a 2′ to 7′ fissure, cutting both bedded rock and limestone, apparently at right angles to contact, and is exposed to height of 150′ on a slope in the greenstone, immediately above the contact. Ores at surface are massive chalcocite and bornite, mainly the former, giving average assays of about 70% copper and 18 oz. silver per ton. A 40′ shaft apparently has penetrated the ore body, which seems merely a surface enrichment. Property formerly was controlled by the Havemeyers, but apparently now is controlled

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by the Guggenheim interests, through the organization of the Kennicott Mines Co.

ALASKA-GALENA MINING CO. **ALASKA.**

Offices: care of W. W. Catlin, Seattle, Wash. Mine office: Ketchikan, Alaska. Property is a short distance from tidewater, and the installation of an aerial tram is planned.

ALASKA GOLD & COPPER CO. **ALASKA.**

Dead. Title changed to Central Alaska Gold & Copper Co. Formerly at McCarthy's Creek, Copper River district, Alaska.

ALASKA IMPERIAL MINING CO. **ALASKA.**

Dead. Formerly at Ketchikan, Alaska. Described Vol. VI.

ALASKA INDUSTRIAL CO. **ALASKA.**

Office: 11 Broadway, New York, N. Y. Mine office: Sulzer, Prince of Wales Island, Alaska. Chas. A. Sulzer, president and general manager; S. I. Frankenstein, vice-president; Col. A. M. Lowry, treasurer; Louis Sarecky, secretary; Evan Jones, mine foreman. Organized Oct. 30, 1899, under laws of New Jersey, with capitalization $1,000,000, shares $1 par. Annual meeting, second Monday in November.

Lands, 60 patented claims, area 1,200 acres, also 60 acres in millsites, 80 acres in homestead, and various patented properties. Lands show 7 contact deposits, between limestone and granite, giving average assays of 6% copper, 3 oz. silver and $3 gold per ton. Ore beds are irregular, lying in metamorphic contact veins between igneous rocks and limestone, carrying mainly chalcopyrite, with some malachite, azurite, bornite and a little tetrahedrite, with magnetite and quartz gangue. Mine has 4 shallow shafts, but development is mainly by tunnel, with numerous opencuts, having a large amount of ore blocked out for stoping.

The property carries an available water power, rated at 5,000 h. p., and this has been partially developed by a 36″ Pelton wheel, taking water from Beaver Creek and actuating a 6-kw. generator, and a 16″ Pelton wheel taking water from Jumbo Creek, through a 10″ pipe-line of 3,000′ length, this actuating a 55-kw. 3-phase 2,300-volt 60-cycle generator, current being stepped down to 220 volts for lighting and power. Mine is equipped with electric fans, blowers and Temple-Ingersoll electric drills.

Mine has a 9,000′ Riblet aerial tram, carrying 22 buckets of 1,000 lbs. capacity each, operated by gravity, with a 600′ auxiliary tram, both loading and discharging automatically, requiring only one brakeman for operation. The main tram has small bins at the mine, and 4,000-ton storage bins at tidewater, where there is a 200′ wharf, company having a 47′ gasoline launch. Equipment and buildings are of an extensive nature, including a 35x40′ warehouse, 35x30′ power plant, smithies, store, office, dwellings, bunk-houses and numerous smaller buildings.

Production, 1907, was 1,545,941 lbs. fine copper, 13,699 oz. silver and 1,065 oz. gold. Ore went to Ladysmith smelter, 1907, and to the Tacoma smelter 1908. Company weathered the financial storm of 1907 in excellent shape, without reducing forces, and has no liabilities other than current accounts. Property considered valuable and management good.

ALASKA METALS CO. **ALASKA.**

Mine office: Bruce, Prince of Wales Island, Alaska. Harry Corbin, superintendent. Property, on the west coast of Prince of Wales Island, formerly known as the Corbin mine, is under development, and a little ore has been shipped.

ALASKA MINING CO. **UTAH.**

Office: 230 Atlas Blk., Salt Lake City, Utah. Letter returned unclaimed

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from former mine office, Silver City, Juab Co., Utah. J. W. Neill, secretary, at last accounts. Capitalization $400,000. Idle.

ALASKA MINES SECURITIES CO. ALASKA.

Office: 25 Broad St., New York, N. Y. Samuel L. Silverman, president and general manager; Samuel W. Erich, treasurer; preceding officers, Lester Turner, Maurice McMicken and B. E. Barinds, trustees. Organized under laws of Washington, with capitalization $2,500,000, shares $5 par. Controls, through stock ownership, the Hadley Consolidated Copper Co., Uncle Sam Copper Co., and Big Tiger Gold Mining Co. of Nevada. Is said to have paid, 1906, a dividend of 15 cents per share.

ALASKA-NORTHWEST COPPER CO. ALASKA & BRITISH COLUMBIA.

Office: Alaska Bldg., Seattle Wash. J. L. Hutton, president; Hon. Edgar Dewdney, vice-president; Porteus B. Weare, first vice-president; Nathan W. Hendricks, secretary; John W. Black, treasurer; Pierre Duryee, assistant treasurer. Organized under laws of Washington, with capitalization $5,000,000, shares $1 par. Lands are in 2 groups, one, of about 50 claims, being near the property of the Valdez-Boston Copper Co., 160 miles by rail from Valdez, at the head of the Lakina river, which empties into the Chitina river, an affluent of the Copper river, carrying native copper in amygdaloidal diabase. The Indian Chief group, on Vancouver Island, British Columbia, which has the principal development, carries mainly bornite and chalcopyrite, said to give average assays of 7% copper and $2.50 gold per ton, opened by 3 tunnels and various opencast workings. Mine has 4,000′ aerial tram to tidewater, where 300-ton bunkers are planned.

ALASKA SMELTING & REFINING CO. ALASKA.

Office: 82 Beaver St., New York, N. Y. Mine office: Coppermount, Prince of Wales Island, Alaska. Works office: Hadley, Prince of Wales Island, Alaska. Geo. D. Mumford, president; W. J. Steadman, Jr., secretary; Henry Harris, superintendent; Gordon Knox Bell, assignee. Organized July, 1905, under laws of New Jersey, with capitalization $1,000,000. Is closely connected, in ownership and management, with the Brown-Alaska Copper Co.

The smelter, rated at 350 tons daily capacity, has steel buildings, and is connected by an aerial tram and rail with the Brown-Alaska mines. The smelter, blown in Sept. 20, 1904, has a 44x160″ furnace, treating ores from the Brown-Alaska and Hadley Consolidated, and obtaining silicious ores for fluxing from the Britannia, making 50% matte, which is sent to the Crofton smelter for refining. Was said, early 1908, to plan a smelter, to be completed 1909, on Resurrection Bay. Employs, normally, circa 150 men. In hands of assignee since Oct. 1, 1907.

ALASKA UNITED COPPER EXPLORATION CO. ALASKA.

Office: 551 Coleman Bldg., Seattle, Wash. L. C. Dillman, president and general manager; I. B. Hammond, vice-president; E. V. Dillman, secretary; W. A. Mears, treasurer; preceding officers, W. W. Phillips, Jas. A. Mundy, R. LaBar Goodwin and P. S. Clarkson, directors; Geo. Davidson, superintendent. Organized Nov. 14, 1906, under laws of Washington, with capitalization $12,500,000, shares $1 par. Lands, 137 claims, area circa 2,750 acres, in 12 groups, also 80 acres in smelter-sites and 900 acres miscellaneous lands, on the Chitna and Nizina rivers, in the Copper River district of Alaska. Only exploratory work has been done, property having 4 small tunnels and numerous trenches showing copper ore.

COMPAÑIA MINERA DE ALBAYALDE. MEXICO.

Mine office: Gomez del Palacio, Mapimí, Durango, Mex. C. E. Wilbert, manager. Has silver and copper ores.

ALBERNI GOLD & COPPER CO., LTD. BRITISH COLUMBIA.

Dead. Formerly at Alberni, Vancouver Island, B. C.

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ALBION COPPER MINING CO. **MONTANA.**

Mine office: Sunday, Granite Co., Mont. Christian Reichert, president; James M. Hinkle, secretary. Lands, opened by tunnels, show 3 veins, carrying concentrating ore with values in copper, lead, silver and gold. Idle.

ALBION MINING CO. **UTAH.**

Office: care of Hatfield & Sons, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Wm. Hatfield, general manager. Property is the Albion group, said to have yielded about $1,000,000 worth of ore under former ownership. A tunnel of 2,800′, being driven to drain old workings and open new ground, shows a fissure vein assaying up to 15% copper, with silver values. Has water power and plans a concentrator.

ALDA COPPER MINES, LTD. **SPAIN.**

Dead. Liquidated May, 1906. Formerly at Cabrales, Asturias, Spain.

ALDA MINING & SMELTING CO., LTD. **SPAIN.**

Dead. Reorganized, 1900, as Alda Copper Mines, Ltd. Formerly at Cabrales, Asturias, Spain.

SOCIÉTÉ MINIERE D'ALDEIRE. **SPAIN.**

Dead. Formerly at Aldeire, Guadix, Granada, Spain.

COMPANHIA MINEIRA ALEMTEJANA. **PORTUGAL.**

Office: 4 Praca d s Remolares, Lisbon, Portugal. Mine office: Beja, Alemtejo, Portugal. Waldemar d'Orey, superintendent. Property is a group of old mines in the San Domingos district, carrying two ore bodies in schists, the carbonate and sulphide ores giving a selected product of about 25% copper tenor. Mines were worked by the Romans.

ALESSANDRO COPPER MINING CO. **NEW MEXICO.**

Dead. Lands sold, 1908, to Copper Gulf Mining Co. Formerly at Silver City, Grant Co., N. M. Fully described Vol. VI.

ALEXANDER y CIA. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Firm is a very small producer of native copper.

ALEXANDRIA GOLD & COPPER MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Randsburg, Inyo Co., Cal. Organized under laws of Nevada, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, unpatented, area 160 acres, in the Argus Mountains, circa 40 miles from Randsburg. Mine was worked formerly in a small way, with a 5-stamp mill, destroyed by waterspout. Has about one-half mile of workings, showing mainly gold and silver values, expected to turn into copper at depth.

COMPAGNIE INDUSTRIELLE ET MINIÈRE DES CUIVRES D'ALGERIE. **ALGERIA.**

Letter returned unclaimed from former mine office, Oran, Algeria. Lands, 3,800 hectares, circa 14 kilometers west of Oran, showing cupriferous sandstone beds of several hundred feet thickness, said to assay 2 to 2.5% copper. Beds are too low in copper tenor to mine profitably, and company is searching for local enrichments of sufficiently high grade to prove workable.

ALGOA COPPER CO., LTD. **TRANSVAAL.**

Mine office: Zoutpansberg, Transvaal. C. A. Rickard, chairman. Organized circa 1906, under laws of Transvaal, with capitalization £4,000. Lands are mining claims, well watered and timbered, on the farm Rotterdam, lying on the west side of the Sand river. In liquidation June, 1908.

ALGOL MINE. **CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Opened circa 1865; reopened 1899. Has a 50′ vein, with 2″ to 10″ paystreak, developed by two 120′ shafts.

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Ores are cuprite, malachite and azurite, also native copper and a little gold, giving average smelter returns of 20% copper. Has steam power. Idle.

ALGOMA & CALUMET DEVELOPMENT CO. **ONTARIO.**

Dead. Lands transferred, June, 1903, to Hermina Mining Co., Ltd. Formerly at Massey Station, Algoma, Ont.

ALGOMA COMMERCIAL CO., LTD. **ONTARIO.**

Office: Sault Ste. Marie, Ont. Mine office: Sudbury, Algoma, Ont. C. M. Boss, superintendent. Property includes the Elsie, Wilmott and other mines, 4 miles from Sudbury, Algoma, Ont.

ALGOMA COPPER & SMELTING CO. **ONTARIO.**

Office: care of Eugene Warner, vice-president, Prudential Bldg., Buffalo, N. Y. Mine office: Bruce Mine, Algoma, Ont. Mark B. Schwab, president; Ben. Newman, secretary; Bernard J. Hillman, treasurer. Organized, circa 1905, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Lands, 1,550 acres, about 9 miles from Bruce Mine, opened by a 425′ shaft and a 175′ tunnel. Has a 300-ton concentrator. No recent developments and company apparently inactive. Property fully described under title Rock Lake Mining Co., Ltd., in Vol. III.

ALGOMA CUSTOM SMELTING & REFINING CO., LTD. **ONTARIO.**

Office: Hermann Blk., Fifth St., Calumet, Mich. Works office: Thessalon, Algoma, Ont. Jos. Hermann, president; F. H. Pollock, vice-president; W. B. Anderson, treasurer; H. Appleton, secretary; Merchants & Miners' Bank, Calumet, registrar. Capitalization $250,000, shares $5 par. Is closely connected, in ownership and management, with the Hermina, and has begun construction of a custom smelter to contain reverberatory furnaces of the Kirby type, with estimated daily capacity of 500 tons.

ALGONQUIN COPPER CO. **WYOMING.**

Dead. Formerly in Wyoming.

MINA EL ALICANTE. **MEXICO.**

Mine office: Mazapil, Zacatecas, Mex. M. Dolores Aguirre y Ca., owners; Vicente Banavides, superintendent. Ores carry gold, silver, lead and copper.

ALICE CONSOLIDATED MINING CO. **UTAH.**

Office: care of C. C. Dailey, secretary and treasurer, Salt Lake City, Utah. Mine office: Callao, Juab Co., Utah. W. R. Hutchinson, president; W. F. Calloway, vice-president. Capitalization $1,000,000, shares $1 par. Lands, 6 claims, in the Dugway division of the Deep Creek district, near the St. George Copper Mining Co.

ALICE GOLD MINING CO. **WASHINGTON.**

Dead. Formerly at Chewelah, Stevens Co., Wash. Described Vol. VI.

ALICE GOLD & SILVER MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. John D. Ryan, general manager. Has 400,000 shares, and is controlled, through stock ownership, by Butte Coalition Mining Co. Has a 1,500′ shaft. In 1906 extracted 3,170 tons of ore giving gross returns of $7.70 per ton and costing, to mine, mill and smelt, $9.30 per ton.

MINA DE ALJUSTREL. **PORTUGAL.**

Mine office: Aljustrel, Alemtejo, Portugal. Is said to be owned by a Belgian company. Ore is chalcopyrite, associated with iron pyrites, carrying 1 to 7% copper. Mine is a small but fairly regular producer.

ALLEGHENY MINING CO. **NEW JERSEY.**

Dead. Property was the Pahaquarry mine, opened by the Dutch, circa 1660. Mine was reopened, 1860, by the first Allegheny Mining Co., now dead, and reopened 1901, by the second Allegheny Mining Co., also dead. Formerly at Belvidere, Warren Co., N. J.

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ALLEN MINE. **OREGON.**

Owned by Oregon Homestead Mining & Reduction Co.

ALLGEMEINE ELEKTRO-METALLURGISCHE GESELLSCHAFT. **GERMANY.**

Works office: Papenburg a/d Ems, Germany. Has a small electrolytic plant with capacity of about 500 pounds of cathodes daily, treating nickel-copper anodes.

ALLIANCE COPPER CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Augustus T. Morgan, president. Organized May 19, 1906, under laws of Montana, with capitalization $400,000, shares $2 par. Property is very small acreage in the northeastern portion of the Butte district, with surface rights to sundry town lots. Development is by a shaft, sunk jointly by the Alliance and Farrell companies, and a little ore of good grade was shipped, 1907, from the 200′ level. Presumably idle.

ALLIANCE COPPER-GOLD CO. **BRITISH COLUMBIA.**

Mine office: Greenwood, Boundary district, B. C. H. H. Shallenberger, superintendent, at last accounts. Lands include the Moreen claim, in the Deadwood camp, developed by open cuts and a tunnel, showing veins of 4 to 20′ width carrying low grade auriferous copper ores.

ALLIANCE COPPER MINING CO. **WASHINGTON.**

Dead. Absorbed, 1902, by Iconoclast Consolidated Mines Co. Formerly at Keller, Ferry Co., Wash.

ALLIGATOR & TIGER LEASING CO. **COLORADO.**

Mine office: Red Cliff, Eagle Co., Colo. A. S. Little, manager. Lands, 2 claims, showing massive bornite and chalcopyrite, in fissure veins, traversing granite, ores assaying up to 15% copper, 5% lead, 50 oz. silver and $10 gold per ton.

ALLOUEZ MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Allouez, Keweenaw Co., Mich. Harry F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. MacNaughton, general manager; preceding officers, Alexander Agassiz, F. L. Higginson, F. W. Hunnewell, Quincy A. Shaw, Jr., R. L. Agassiz and W. L. Frost, directors; A. Warne, mining captain. Organized September, 1859, under laws of Michigan, with capitalization $500,000, shares $25 par; reorganized and reincorporated, 1889, under laws of Michigan, with capitalization $2,500,000, shares $25 par; $22.25 paid in. Last assessment, $3 per share, was levied 1904. Old Colony Trust Co., Boston, registrar. Annual meeting, second Tuesday in March.

Control was secured, 1907, by the Calumet & Hecla Mining Co., through purchase of a large stock ownership. For 1907 the company showed a mining profit of $106,374, and net earnings of $21,528, but the purchase of a half interest in the Centennial mill used up the cash balance, and necessitated the borrowing of $185,000 from the Calumet & Hecla. The year's construction account, including the mill purchase, amounted to $423,000, so that the company began 1908 with a deficit of $38,557.

The old mine, opened 1859, is on the Allouez conglomerate, a bed underlying the greenstone. The conglomerate, 30′ wide in many places, with strike of N. 39° E., and dip of 39°, averages 0.7 to 1% copper, and is very refractory under the stamps. There are 3 shafts, deepest about 3,700′. Mining was begun actively in 1869, and stopped in 1877, with an exhausted treasury. The mine was then leased to Watson & Walls, who made money from it, after paying a royalty of one-eighth on gross production. In 1880 the company resumed control, to quit once more, financially exhausted, in 1885. Watson & Walls took the mine again, and once more did well; the company resumed

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work on its own account for the third time, and again lost money, stopping all work in 1892. The old mine has been idle for some years, except for exploratory and development work in 1898-1900, when a shaft was sunk 1,200′ on the Osceola lode, and nearly 4,000′ of openings secured thereon, with indifferent results. The shafthouse at the Osceola shaft has been demolished. The stamp-mill, on Hills Creek, has three old-fashioned heads and cannot be used for the new mine. The old Allouez made 13,025 tons, 1,528 lbs. fine copper, 1869-1892.

Lands are circa 3,400 acres, including the main tract of 640 acres on which the mine is opened. In 1903 an exchange of 11.188 acres was made with the Ahmeek. The new Allouez mine is opened on the Kearsarge amygdaloid, which does not outcrop on Allouez lands, hence was opened on the underlay, the bed lying under the entire 640-acre tract. There are 2 shafts, No. 1, with 3 compartments, on the extreme southeastern corner of the tract cutting the lode at 1,480′ depth, with first level opened at depth of 1,264′, the shaft being circa 2,500′ deep. No. 1 shaft leaves surface at an angle of 75°, but at slight depth takes an angle of 80°, continuing thereon to about 1,435′ depth, when a curve of 60′ brings the shaft to the angle of the dip of the bed, at 38° 30′. Owing to the steep pitch of the shaft, back-rails of 6x10″ timber are set so close to the wheels of the skips that their flanges cannot leave the steel rails, the wooden timbers serving as guides. At the change of angle from 80° to 38° 30′, on reaching the lode, a single idler with a very wide flange cares for the cables passing at either end. In order to save pumping charges on surface water, a gutter has been cut entirely around the shaft, this leading to an incline 36′ long, used as a sump, from which the water is forked. The bottom levels of No. 1 shaft are not showing as well as before. No. 1 has a 42x62′ steel shaft-rockhouse, with two 18x34″ crushers.

No. 2 shaft is circa 1,500′ northeast of No. 1, and must go to a depth of about 2,400′ before cutting the Kearsarge lode, but the bed will be reached by crosscuts eastward before intercepted by the shaft. This shaft was forced to start further in the hanging wall than No. 1, on account of the proximity of a lake, and was 1,800′ deep in August, 1908. No. 2 was sunk 120′ in the month of February, 1908, which is a record for the Lake Superior district. The collar of No. 2 shaft is of concrete, Washington fir and 16x24″ steel "I" beams, with 14x14″ square-timber wall plates and 4″ plank sheathing. The interior, from collar to solid rock ledge, is lined with 22″ of concrete, dividers having their ends bedded in concrete, this giving an impregnable shaft through the treacherous sand overburden. Each shaft can be sunk about 9,500′ before reaching the western boundary of the property.

Machinery equipment includes a Nordberg hoist with 32x72″ duplex cylinders and 18′ double-conical drum. No. 2 has the temporary hoist with which No. 1 was sunk. The engine-house is of mine rock with redstone trimmings. A stone boiler-house has five 125-h. p. boilers and a 120′ self-supporting steel smokestack. No. 1 engine-house has 12-drill and 18-drill air compressors, and No. 2 has a 60-drill Laidlaw-Dunn-Gordan air compressor. Miscellaneous buildings include a redstone machine shop and smithy, and a large warehouse. The mine is reached by a spur of the Mineral Range railroad.

Production was begun Aug. 1, 1905, at the Centennial mill, and for 1905 averaged 28.4 lbs. copper per ton. For 1906 production was 3,486,900 lbs. fine copper, and in 1907 was only 2,934,116 lbs., secured from 214,720 tons of rock stamped, which yielded an average of only 13.66 lbs. fine copper per ton, or less than half the returns of 1905. For the first half of 1908 rock tonnage and copper percentage were at about the same rates as in the preceding year. The bed averages about 16′ in width, and for 1907 only 5.6% of the rock hoisted was discarded, the mineral returning 63.56% fine copper. About 400 men are employed. The Allouez has proven very much lower in grade than

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was anticipated at the time it was first opened, but an improvement may be looked for with reasonable confidence, and the property, being in strong and experienced hands, should make a fine mine in time.

ALLPORT MINING CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Capitalization $500,000, shares $1 par.

ALMA COPPER MINING CO. **MEXICO.**

Office: Des Moines, Ia. Mine office: Carbó, Ures, Sonora, Mex. Abner Graves, general manager; Nelson D. Graves, superintendent. Lands, 747 acres, in the Ures district, showing auriferous, argentiferous and somewhat bismuthiferous cuprite, melaconite, azurite, malachite and chrysocolla, assaying up to 37% copper and $13 gold per ton. Has gasoline power. Idle since circa 1905.

ALMA GOLD MINING CO. **COLORADO.**

Office: Idaho Springs, Clear Creek Co., Colo. Theo. Mixsell, manager. Ores carry gold, silver and copper. Has steam power.

ALMA MAY COPPER CO. **WYOMING.**

Office: care of Silas H. Jenkins, general manager, Chicago, Ills. Claude M. Smith, second vice-president; LeRoy Pierce, secretary; preceding officers, Louis Auerbach, John C. Eads and Jos. L. Ebner, directors. Organized Apr. 19, 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 4 claims, area circa 60 acres, in the Medicine Bow Mountains, Albany county, Wyoming, showing a good gossan capping, opened by a 50′ shaft.

ALMA MINING & MILLING CO. **MEXICO.**

Office: care of P. B. McCabe, Los Angeles, Cal. Letter returned unclaimed from former mine office, Canitas, Zacatecas, Mex. C. A. Heberlein, general manager. Organized 1903. Lands include the San Antonio, San Luis, Torrington and Rosario mines, showing ores carrying 15 to 150 oz. silver per ton, with appreciable copper values.

ALMADO & TERITO CONSOLIDATED MINING CO. **MEXICO.**

Succeeded by Negociacion Minera de Clemente Ybarra.

SOCIEDAD MINERA DE ALMANZORA. **SPAIN.**

Office and mine: care of Don Camilo Bilarge, agent, Javier Sanz, 4, Almería, Spain. Property is sundry idle copper mines in Almería.

ALMEDA CONSOLIDATED MINES CO. **OREGON.**

Office: 207 Board of Trade, Portland, Ore. Mine office: Galice, Josephine Co., Ore. O. M. Crouch, president; L. B. Simons, vice-president; R. C. Kinney, secretary and treasurer; John F. Wickham, general manager; P. B. Wickham, mine superintendent. Organized July 18, 1905, under laws of Oregon, with capitalization $15,000,000, shares $5 par, as successor of Almeda Mining Co. Annual meeting, second Tuesday in December. Lands, 40 claims, area 800 acres, well timbered, on the Rogue river, showing 3 large and well defined contact deposits between altered diorite and slate, estimated by company to average 200′ width and said to be traceable 2,300′, showing mainly chalcopyrite, giving average assays of 3.5% copper, 3 oz. silver and $3.50 gold per ton. Development is by tunnels of 250′, 160′, 280′, 450′, 150′ and 45′, with 2,800′ of workings, estimated to show 800,000 tons of ore. Property was worked to slight depth for free gold, circa 1860-1870. Equipment includes 6 mine buildings and a 15,000′ sawmill. A smelter, building 1908, by the Willamette Iron & Steel Co., will have a 100-ton water-jacket blast-furnace. Property is considered promising.

ALMEDA MINING CO. **OREGON.**

Dead. Succeeded July 18, 1905, by Almeda Consolidated Mines Co. Formerly at Galice, Josephine Co., Ore.

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SOCIEDAD MINERA EL ALMENDRAL. **CHILE.**

Office: Valparaiso, Chile. Mine office: Coquimbo, Chile. Organized Jan. 5, 1906, under laws of Chile, with capitalization 1,000,000 pesos, shares 50 pesos par.

ALMERIA QUICKSILVER & COPPER CO., LTD. **SPAIN.**

Dead. Liquidated, voluntarily, 1906. Formerly at Berja, Almería, Spain.

COMPAÑIA MINAS DE ALMOLOYA, S. A. **MEXICO.**

Is the Mexican incorporation of the Almoloya Mining Co.

ALMOLOYA MINING CO. **MEXICO.**

Office: 60 Wall St., New York, N. Y. Mine office: Baca, Ramal de Parral, Chihuahua, Mex. Nils O. Bagge, president, I. B. Newton, secretary; W. C. Paterson, treasurer; D. W. Shanks, general manager; D. C. Joslyn, mine superintendent. Los Angeles Trust Co. and New York Trust Co., registrars. Organized 1903, under laws of Arizona, with capitalization $2,000,000, shares $1 par, in $800,000 preferred stock, at 10%, non-cumulative, and $1,200,000 common stock. Lands, 270 pertenencias, area 730 acres, also a 100-acre mill-site, with total holdings of circa 1,000 acres, in the Allende district, about 4 miles from the railroad station at Baca. The Sierra de Almoloya is an isolated mountain range, about nine miles long, formation being limestone of Cretaceous age, with two eruptive intrusions. Property adjoins the well-known Cigarrero mine, which shows four ore bodies of good width. Development is by shafts of 68′, 140′, 270′, 350′, and 700′, and by tunnels of 180′, 360′, 1,320′ and 1,600′, with a total of about 6,400′ of openings. Property has gasoline, electric, and pneumatic power, with a 60-h. p. producer gas-plant for drills. Employs circa 90 men.

ALPHA COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized 1907, with capitalization £1,000, shares £1 par.

ALPHA MINING CO. **ALASKA.**

Office: Grand Rapids, Mich. Mine office: Dolomi, Prince of Wales Island, Alaska. F. L. Loomis, superintendent. Lands, 3 claims, showing a 5′ ore body traceable circa 2,500′, giving assays of 2.5 to 7% copper and $3 to $20 gold per ton.

ALSACIA DEVELOPMENT CO. **MEXICO.**

Dead. Reorganized, 1905, as Alsacia Mining Co. Formerly at Fronteras, Arizpe, Sonora, Mex.

ALSACIA MINING CO. **MEXICO.**

Office: care of Chas. F. Wrenn, secretary and general manager, Bisbee, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mex. R. L. Whaley, president; John Hermann, engineer. Lands, 23 miles east of La Cananea, in the Ajo Mountains, are opened by a 400′ shaft. The 350′ level shows argentiferous copper ores giving average assay values of about $25 per ton. Machinery includes a hoist good for 1,000′. Idle.

ALTA CENTRAL COPPER CO. **ARIZONA.**

Office: 506 Citizens National Bank Bldg., Los Angeles, Cal. Mine office: Florence, Pinal Co., Ariz. Julian P. Jones, president; A. R. Hueth, vice-president and secretary; Citizens National Bank of Los Angeles, treasurer; Col. G. W. Griffey, mine superintendent. Organized Apr. 3, 1907, under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 7 claims, area circa 125 acres, carrying about one-half mile of the strike of a system of 5 fissure veins, having a north and south trend, in a width of about one mile, passing through Mineral Hill. The Alta Mining & Smelting Co. lies to the north, and the Oklahoma to the south. Country rock is Pinal schist, intruded by porphyry dikes, the 5 fissure veins cutting the schist unconformably with strike or dip, sometimes cutting the porphyry dikes and occasionally running

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beside them. The veins outcrop 20′ to 50′ in width. Several prospect tunnels and shafts show 1′ to 6′ of ore carrying copper carbonates, oxides, and chalcocite, with gangue of quartz and manganiferous iron ore, carrying combined gold and silver values of $1 to $14 per ton. Geological conditions are markedly similar to those at the Gibson and Live Oak mines, distant about 20 miles to the northeast. Company plans developing through a drift, to be run from the 400′ level of the main shaft of the Alta Mining & Smelting Co.

ALTA COALITION COPPER CO. **UTAH.**

Office: care of N. Y. Stringham, secretary, Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. F. R. Snow, president; B. F. Grant, vice-president. Organized, early 1907, to develop a group of claims in the Big Cottonwood district.

ALTA COPPER CO. **MONTANA.**

Mine office: Jefferson, Corbin Co., Mont. Was promoted by Marcus L. Hewett, with capitalization $10,000,000, shares, $10 par. Lands include the Alta mine, supposed to carry the continuation of the ore body in the Bertha claim of the Boston & Corbin, also 700 acres of placer ground and sundry water rights. The old Alta mine has a 1,600′ incline shaft, and a new shaft is planned. Has a concentrator.

ALTA COPPER MINING CO. **IDAHO.**

Mine office: Ketchum, Blaine Co., Idaho. Lands, 5 quartz claims and 8 placer claims, in Cain Cañon, near the base of Mount Hindman, 18 miles from Ketchum, opened on the American claim by a 150′ tunnel cutting a 7′ vein.

ALTA CROWN COPPER CO. **CALIFORNIA.**

Office: 10 Howard St., Spokane, Wash. Jas. F. Marrs, president; Frank Liddell, vice-president; G. Major Taber, secretary and treasurer. Organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 10 claims, area 200 acres, in the Bullion district of Inyo county, California. According to prospectus of this company, the predominant rock form is a white crystalline limestone-granite, with intrusive dikes of porphyry with greenstone carrying "amygogules" of copper pyrite, which certainly is a most unusual and decidedly interesting formation. Has shafts of 40′ and 110′, with several short tunnels, showing azurite, malachite, chalcocite, bornite and chalcopyrite, assaying 12 to 32% copper, from 4 to 15 oz. silver and from a trace to $8.20 gold per ton. Smelter returns have given 18 to 20.5% copper, 9 to 10 oz. silver and 92 cents to $11.66 gold per ton.

ALTA & HECLA MINING & MILLING CO. **UTAH.**

Office: 210 Brooks Arcade Bldg., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs 14 men. H. Bamberger, president; S. Golden, vice-president; Geo. H. Watson, secretary, treasurer and general manager; preceding officers, C. H. Gabrielson and A. J. Byron, directors; A. C. Newell, superintendent. Organized May 22, 1906, under laws of Utah, with capitalization $150,000, shares 25 cents par. Lands, 14 claims, area 250 acres, partly patented, also a 10-acre millsite, in the Little Cottonwood district, showing 6 fissure veins and contact deposits, of which 3 have been opened, by the 900′ Scott tunnel, 160′ Never Sweat tunnel, and an 80′ crosscut tunnel, mine having 1,620′ of workings, estimated to show 10,000 tons of ore, veins averaging 7′ width, and said by company to average 3% copper, 26% lead, 6% zinc, 22 oz. silver and $2.40 gold per ton. Has several mine buildings and plans continuing development.

ALTA-IDAHO GOLD & COPPER MINING CO. **IDAHO.**

Office: care of John M. Nuss, secretary, Nescopek, Pa. Mine office: Pardee, Idaho Co., Idaho. J. B. Nuss, president; Geo. M. Snyder, vice-president and general manager. Organized December, 1902, under laws of Delaware, with capitalization $1,000,000, shares $1 par. Lands, 11 claims, area 209 acres,

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also a 5-acre smelter-site, in the Lolo district. Development is by sundry test-pits, deepest 35′, and three tunnels, longest 1,500′, showing stringers of melaconite, azurite, chalcocite, bornite and chalcopyrite.

ALTA MINING & MILLING CO. **WYOMING.**

Office: 490 Quincy Bldg., Chicago, Ills. Mine office: Lusk, Converse Co., Wyo. P. C. Conley, secretary and treasurer. Property is the Rawhide Butte group. Idle.

ALTA MINING & SMELTING CO. **ARIZONA.**

Office: 514 Delta Bldg., Los Angeles, Cal. Mine office: Florence, Pinal Co., Ariz. L. H. Sherman, president; Col. G. W. Griffey, vice-president and general manager; J. C. Ferrall, secretary and treasurer. Organized Sept. 8, 1905, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Annual meeting, first Tuesday in September. Lands, 25 claims, area 470 acres, also a 200-acre ranch, in the Mineral Hill district, near the Lake Superior & Arizona, circa 16 miles east of Florence. Lands show veins in schist and contact deposits between schist and porphyritic rock, ranging 5′ to 50′ in width, opened by shafts of 96′, 127′ and 150′, with about 3,000′ of workings, showing ore assaying 2 to 57% copper, with gold and silver values, also a lead vein showing ore assaying 2 to 57% lead, 4 to 15 oz. silver and 80 cents to $14 gold per ton. Has steam power, with hoist good for 1,000′, a 4-drill Leyner air-compressor and 9 mine buildings. Company plans continuous development along sensible lines.

MINA ALTAMIRA. **CHILE.**

Mine office: San Lorenzo, Combarbalá, Coquimbo, Chile. Jerónimo Tapia, owner and manager. Property is 18 leagues from a railroad station, with 20 pesos freight charges per metric ton. Mine shows a vein of about one meter average width, developed to depth of 260 meters. In 1903 production was 122 metric tons of 22.5% copper ore, made by 27 men.

ALTAMIRA MINING CO. **MEXICO.**

Office: care of W. W. Mathews, president, Etztlán, Jalisco, Mex. Mine office: Ahualulco, Jalisco, Mex. R. R. Landrum, superintendent. Property is said to be controlled, through stock ownership, by the Jalisco Mining Development Co.

ALTA MIZPAH COPPER & GOLD MINING CO. **UTAH.**

Letter returned unclaimed from firm office, care of C. J. Jenkins, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Organized 1907, to develop property near Alta, which is said to show considerable ore of milling grade.

ALTAMONT MILLING CO. **NEW MEXICO.**

Office: Altamont, Ills. Mine office: Jarilla, Otero Co., N. M. Capt. L. H. Williams, president. Lands include the Cuprite mine, having a 140′ shaft, said to show 12′ of medium grade chalcopyrite, with limestone gangue. A small smelter shipment from the 80′ level gave net returns of $8 per ton.

ALTA-PERUVIAN MINING & MILLING CO. **UTAH.**

Office: Springville, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. F. J. McAuliffe, president; T. R. Kelley, secretary and treasurer. Organized 1904 with capitalization $200,000, shares $1 par. Lands, 4 claims, in the Little Cottonwood district. Idle.

ALTA-QUINCY MINE. **UTAH.**

Dead. Merged, 1906, in South Columbus Mining Co. Formerly at Alta, Salt Lake Co., Utah. Described Vol. VI.

ALTA-ST. LOUIS MINE. **UTAH.**

Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. W. M. J. Craig, manager, at last accounts. Mine has a vein between

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limestone and shale carrying a 12" to 18" paystreak assaying 15 to 25% copper and 15 to 240 oz. silver per ton, with small gold values.

ALTA-SUPERIOR MINING CO. **UTAH.**

Mine office: Alta; Salt Lake Co., Utah. Has a 300' tunnel, and at last accounts was in litigation with the South Columbus and Columbus Consolidated over the projected 4,000' drainage tunnel started on the Snow Bird claim of the Alta-Superior.

ALTATA MINING CO. **ARIZONA.**

Office: 145 La Salle St., Chicago, Ills. Mine office: Chloride, Mohave Co., Ariz. J. F. McBride, president and general manager; L. L. Funk, vice-president; W. A. Barr, secretary and treasurer; C. H. Dryden, superintendent. Bonds, $25,000 authorized; $12,000 issued. Mine has a 200' shaft, showing silver-lead and auriferous copper ore. Has steam power.

ALTA-ZOANNI MINING CO. **NEVADA.**

Mine office: Hamilton, White Pine Co., Nev. Roy W. Schenk, president and general manager; M. T. Collins, vice-president; G. A. McElery, secretary and treasurer. Lands are near the peak of White Pine Mountain.

KÖNIGLICHES HÜTTENAMT ALTENAU. **GERMANY.**

Office and works: Altenau im Harz, Germany. Is a custom smelting plant, treating ores of copper and other metals from the mines of the Hartz. Has an electrolytic refinery, with daily capacity of 1,600 to 2,000 lbs. of cathodes.

ALTENS KOBBERGRUBER. **NORWAY.**

Office: care of Sulitelma Aktiebolag, Helsingborg, Sweden. Mine office: Kåfjord, Finmarken, Norway. Lord-Lieutenant G. Tornerhjelm, chairman; Consul N. Persson, vice-chairman; C. Ingelsson, secretary; A. Quale, general manager; B. G. G. Tiberg, mine superintendent; Ch. Rosenquist, smelter superintendent; Sverre Falch, mill superintendent and chemist. Lands, 339 claims, also a 60-acre millsite and circa 2,000 acres miscellaneous lands. This is the northernmost copper mine in the world, lying near North Cape, in 70° north latitude. Post-silurian schists and slates have been penetrated by dioritic greenstone, showing about 75 ore bodies in diorite and also as impregnations in dolomitic strata. The veins have a generally NNW. strike, fissures in diorite dipping at about 30° and dolomitic layers at about 60°. About 20 strong veins and many small ones are under development, former ranging 1 to 3 metres in average width, and traceable 50 to 2,000 metres. The various veins average about 1.25% copper, the metal occurring as chalcocite, bornite and chalcopyrite disseminated in pyrite.

Development is by numerous tunnels, of which the Sture is 650 metres and the Jernmalm 415 metres in length, and by 6 shafts, deepest 100 metres. The mine has several miles of workings, exposing fully 600,000 tons of ore, with circa 100,000 tons blocked out for stoping. Mine, opened 1825 and closed 1878, was reopened, 1895, by present owner.

Equipment includes 120 hydraulic h.p., 100 electric h.p., 25 steam h.p. and 15 gasoline h.p. There are 4 small hoists, 2 Sullivan diamond drills and an electric light plant. Buildings include a machine shop of 220 square metres area, a 40-metre carpenter shop and 170 buildings of all classes, including dwellings.

The 100-ton concentrator, of 1,716 square metres area, has 2 Blake crushers, 4 Humboldt centrifugal crushers, 2 rolls, 11 jigs, 16 Lüborg vanners and 4 large and 8 small spitzkasten. The smelter has a 20-ton water-jacket blast furnace, smelting to a 20% matte, which by a second fusion is brought up to 60% copper tenor and shipped to Helsingborg for refining.

The mine is 300 miles from a railroad, but only 300 feet from the sea. The company owns a steamer and a gasoline launch. A school is maintained. Production, 1907, was 25,000 metric tons of ore yielding 1,050 tons of matte

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and 600 tons of 48% sulphur ore, producing circa 625,000 lbs. fine copper. The property has a strong and progressive management.

GEWERKSCHAFT ALTFALTER. **GERMANY.**

Mine office: Altwalnau, Hirschberg-Grosselmerode, Hessen-Nassau, Germany. Has copper-lead ores, with one shaft, employing circa 25 men.

ALTO COPPER CO. **ARIZONA.**

Office: 43 Exchange Pl., New York. Mine office: Patagonia, Santa Cruz Co., Arizona. Geo. A. Beaton, president; Geo. O. Earhart, secretary; Geo. J. Lockley, treasurer; J. N. Curtis, general manager. Organized Apr. 4, 1905, under laws of Maine, with capitalization $3,000,000, shares $100 par. Bonds, $750,000, at 7%. Annual meeting, first Tuesday in April. Lands, 21 claims, area 420 acres, 8 miles from Patagonia, in the Santa Rita Mountains, near the Mexican border, developed by tunnels of 187′ and 400′ and by about 50 antigua shafts, of 30′ to 70′, and by 3 new shafts of 73′, 100′, and 150′, with circa 3,000′ of underground openings, estimated by the company to show 500,000 tons of ore blocked out for stoping, which is much too high. Ore is mainly chalcopyrite, associated with galena and sphalerite, giving assays of 8 to 12% copper, 10 to 20% lead, 10 to 30 oz. silver and $3 to $20 gold per ton. Has steam power with 3 hoists, good for 600′ each, and an 8-drill Sullivan air-compressor. Has a 20x40′ machine shop, smithy, and about 25 miscellaneous buildings, including dwellings. The ore, from its complicated nature, will prove refractory in reduction. Presumably idle.

ALTO MINING CO. **ARIZONA.**

Dead. Lands sold, January, 1908, to Leontine Consolidated Mining Co. Formerly at Poland, Yavapai Co., Ariz.

ALVERDSKI MINE. **RUSSIA.**

Owned by Compagnie Française des Mines de Cuivre d'Akhtala.

ALYCE MINERAL CO. **GEORGIA.**

Office: care of E. C. Gothard, secretary and treasurer, Knoxville, Tenn. J. G. Sterchi, president; Joe P. Davis, vice-president; preceding officers, W. D. Haun, Gus N. Miller and N. S. King, directors. Lands are several thousand acres in Murray county, Georgia, about 30 miles east of the Ducktown mines of Tennessee, showing ores giving assay values in lead, copper, silver and gold.

AMADOR CONSOLIDATED MINING & DEVELOPMENT CO. **MONTANA.**

Office: 507-172 Washington St., Chicago, Ills. Mine office: Iron Mountain, Missoula Co., Mont. William Surman, president; Geo. Lill, vice-president; D. E. McKinnon, secretary and general manager; P. F. Smith, receiver. Organized March 16, 1903, under laws of Arizona, with capitalization $10,000,000, shares $5 par. Property is the entire stock issue of the Amador Copper & Gold Mining & Milling Co.

Mine is described under title of owner, the Amador Copper & Gold Mining & Milling Co., and smelter under name of owner, the Amador Smelting Co., the two latter named corporations being the underlying companies, while the Amador Consolidated was the stock jobbing corporation. McKinnon, who was practically the entire company, and has been accused of crookedness in other deals, is said to have sold about $350,000 of stock of this company. Mrs. L. M. McKinnon, wife of the promoter, is endeavoring to secure $25,000 from the wreck, on two promissory notes, which seems adding insult to injury. Principal production of the mine apparently was distributed as samples, some of which reached the Copper Handbook, but did not secure for the company the favorable rating that it implored and demanded, by turns. Property considered worthless, and present equipment valuable only for scrap.

AMADOR COPPER & GOLD MINING & MILLING CO. **MONTANA.**

Office: 507-172 Washington St., Chicago, Ills. Mine office: Iron Mountain, Missoula Co., Mont. D. E. McKinnon, secretary and general manager. Organ-

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ized under laws of Arizona, with capitalization $2,000,000, shares $1 par. Entire stock issue is held by Amador Consolidated Mining & Development Co., which is hopelessly bankrupt. Lands, 18 claims, area 355 acres, also 2 groups of patented placer gold claims, area 180 acres, and 450 acres miscellaneous lands, claimed to show 5 fissure veins in slate and quartzite. The alleged mine was described at length in Vol. VI, under title Amador Consolidated Mining & Development Co., with explanation that information as to large ore bodies rested solely on the statements of the company. Mine has a 600′ vertical shaft, with about one mile of workings, and was claimed by McKinnon to have $10,000,000 worth of ore blocked out, which was a lie. As a matter of fact, the mine shows a small chute of fair grade ore on the 200′ level, ore occurring in small bunches, very irregularly, with calcite gangue, in black slate. Mine has a 2-mile flume and pipe-line, delivering water under a 310′ head. Has steam power, with air-compressor, two hoists, sawmill, about 15 mine buildings and a 10-mile railroad, built at a cost of circa $160,000. Production was five carloads of ore, which did not pay for treating charges.

AMADOR SMELTING CO. **MONTANA.**

Office: 507-172 Washington St., Chicago, Ills. Mine office: Amador, Missoula Co., Mont. D. E. McKinnon, general manager. Is controlled, through stock ownership, by Amador Consolidated Mining & Development Co., which is bankrupt. Property is a 60-ton pyritic smelter, which treated, from the Amador mine, five carloads of ore that did not pay treatment charges. Smelter considered valuable mainly for junk.

AMALGAMATED COPPER CO. **MONTANA.**

Office: 42 Broadway, New York. Henry H. Rogers, president; Benj. B. Thayer, assistant to the president; F. P. Addicks, vice-president; John D. Ryan, managing director; preceding officers, Albert C. Burrage, W. M. Rockefeller, H. H. Rogers, Jr., Fred P. Olcott, Anson R. Flower, John Bushnell and Geo. H. Church, directors; A. H. Melin, secretary and treasurer; John Gillie, general superintendent. Organized Apr. 27, 1899, under laws of New Jersey, with capitalization $75,000,000, increased, 1901, to $155,000,000, shares $100 par. Central Trust Company of New York and National Shawmut Bank of Boston, registrars. National City Bank of New York, and Kidder, Peabody & Co., of Boston, transfer agents. Annual meeting, first Monday in June.

The Amalgamated is a securities holding corporation, not a mining company, with assets consisting mainly of share interests in sundry subsidiary companies. Stock of the following named corporations is entirely owned by the Amalgamated, with the exception of the few founders' shares, required to be in the names of directors: Washoe Copper Co., capitalization $5,000,000; Colorado Smelting & Mining Co., capitalization $2,500,000; Diamond Coal & Coke Co., capitalization $1,500,000; Big Blackfoot Milling Co., capitalization $700,000. In the following named corporations the Amalgamated holds from practically the entire issue, as in the case of the Boston & Montana, to a majority interest only, as in the Anaconda: Boston & Montana Consolidated Copper & Silver Mining Co., capitalization $3,750,000; Parrot Silver & Copper Co., capitalization $3,000,000; Butte & Boston Consolidated Mining Co., capitalization $2,000,000; Anaconda Copper Mining Co., capitalization $30,000,000. The Amalgamated also is credited with owning a controlling interest in the United Metals Selling Co., but in all likelihood the control is held by Amalgamated officers, rather than by the company. Miscellaneous holdings of the Amalgamated include 27,000 acres of timber lands; a large stock interest in the Butte, Anaconda & Pacific R. R. Co.; the Republic Sampling Works, at Butte; a sawmill at Ravalli, Hamilton county, Montana; hotels at Anaconda and Hamilton; business blocks in Butte and Anaconda, and several daily newspapers. The company has about 21,000 shareholders.

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Of the total capitalization of $155,000,000, the amount issued is $153,887,900. Net income for fiscal year ending Apr. 30, 1907, was $14,154,400, or 9.19% on the stock, and for year ending Apr. 30, 1908, was $6,680,557, or 4.3%, at which time the surplus was $12,008,823. The available resources of the company, however, are larger than shown by these figures, for the reason that the subsidiary corporations are exceptionally well fortified, both with cash reserves and quick assets. Among the assets of the company is a loan of $7,200,000 made to the Washoe Copper Co., for building a smelter. Dividends have been as follows: 2% in 1899; 8% in 1900; 7½% in 1901; 2½% in 1902; 2% in 1903; 2% in 1904; 4½% in 1905; 6¾% in 1906; 7% in 1907; 2% in 1908, a total of 44½% for 10 years, an average of slightly under 4½% per annum.

The subsidiary mines and other enterprises of the Amalgamated employ about 13,000 men, mainly at Butte, Anaconda and Great Falls, Montana, with an annual payroll of approximately $15,000,000. A 5-year contract with employes was made, early 1907, under which wages were automatically reduced at the time of the depression in the copper trade, but will be automatically raised when copper again reaches a high price. Labor conditions are harmonious and satisfactory to both employer and employes.

The Amalgamated was organized in 1899 with the intention of controlling the copper industry of the world, but the debacle of 1901 proved that the Amalgamated was a long ways from being in control of the copper industry of the world, or even of the United States, though much the largest single factor in that industry. The material progress made by the Amalgamated has been especially notable since 1904, when John D. Ryan became managing director. The production of copper by companies owned or controlled by the Amalgamated was about 252,000,000 lbs. in 1904; 268,000,000 lbs. in 1905, and circa 275,000,000 lbs. in 1906, the direct share of the Amalgamated in the production of 1906 being about 225,000,000 lbs., while for 1907 the Amalgamated share of copper output by companies owned or controlled was about 175,000,000 lbs., out of a total of about 215,000,000 lbs. produced. This copper was secured at an average cost of probably about 10.5 cents per pound, but somewhat cheaper copper should be made in the future, by reason of numerous economies and greatly improved conditions. The subsidiary corporations are in good condition financially, and their mines, with few exceptions, are in fine shape physically, the Anaconda and Boston & Montana being especially notable in the latter regard. The long and disastrous litigation with F. Augustus Heinze was settled in 1906, through the interposition of Mr. Ryan, by the formation of the Butte Coalition Mining Co., the organization of which brought relief from the intolerable conditions that had prevailed for years. The litigation in which the company was concerned has been cleared off the dockets of the courts, and the Amalgamated, instead of being engaged in more lawsuits than any other great company, now has fewer suits in the courts than almost any other large corporation of the United States. Mr. Ryan has proven himself an organizer and harmonizer of the highest ability, and in the course of a few years has secured the hearty good-will of almost everyone connected with the copper industry of Montana, either as an employe or competitor of the Amalgamated. The company again followed, in 1907, its mistaken policy of "holding the umbrella" over the copper market for the benefit of its competitors, thereby repeating, though on a less serious scale, the mistake of 1901. The financial position of the company is strong, the general management has learned a great deal about the copper industry in a decade, and the local management in Butte is as effective and as good as that enjoyed by any copper property of the world.

AMALGAMATED COPPER MINING CO. **UTAH.**

Office: care of Dr. C. E. Watkins, Boston, Mass. Letter returned unclaimed from former mine office, Tremonton, Box Elder Co., Utah.

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AMALGAMATED COPPER MINING & EXTRACTION CO. **WYOMING.**

Office: 1515 Larimer St., Denver, Colo. Mine office: Hecla, Laramie Co., Wyo. Louis Williams, president; Alonzo Hastings, vice-president; Henry Schwartz, secretary and treasurer. Organized under laws of Wyoming, with capitalization $1,000,000, shares 50 cents par. Lands, 11 claims, area 220 acres, in the Silver Crown district, 2 miles from the Union Pacific railway and 23 miles from Cheyenne, having about 700′ of workings, showing ore giving fair assays in copper. Company is in debt and property idle.

AMALGAMATED GOLD & COPPER CO. **ARIZONA.**

Dead. A swindle, promoted by Douglas, Lacey & Co., of 66 Broadway, New York, N. Y. See Douglas, Lacey & Co. Formerly at Huron, Yavapai Co., Ariz. Fully described Vol. VI.

AMALGAMATED GREENWATER COPPER CO. **CALIFORNIA.**

Office: 501-1524 Chestnut St., Philadelphia, Pa. Letter returned unclaimed from former mine office, Greenwater, Inyo Co., Cal. Was promoted, April, 1907, by Edward H. Worne & Co., who were organizing a syndicate, with intention of incorporating later, on 4 claims, said to be in the Greenwater district. Apparently somewhat diaphanous.

AMALGAMATED METAL & EXPLORATION CO. **ARIZONA.**

Letter returned unclaimed from mine office, Jerome, Yavapai Co., Ariz. J. M. Layman, secretary and general manager; Rudolph Rothermel, superintendent. Lands are said to include coal and oil areas in Utah, metalliferous claims in northern California and Oregon, and the Hogback group of 8 claims, adjoining the Verde Queen on the southwest and touching the Florencia claim of the United Verde. The Hogback has a 300′ tunnel and a 105′ shaft, said to show a little high grade ore. Company said to plan sinking a two-compartment shaft.

AMALGAMATED NEVADA MINES & POWER CO. **NEVADA.**

Office: 1131-52 Broadway, New York, N. Y. Operating office: Salt Lake City, Utah. Mine office: Black Horse, White Pine Co., Ely, Nev. Wm. Johnson, president; John I. Mathias, vice-president; Merrill A. Smith, secretary; Chas. N. Prouty, treasurer; Grant Snyder, general manager. Capitalization $10,000,000, shares $5 par. International Trust Co., Boston, transfer agent. Lands, 56 claims, also 1,000 acres of placer ground, 5,000 acres of ranch lands and water rights for the district, circa 35 miles east of Ely. Assays show values mainly in gold and silver. Is said to plan a 20-stamp custom mill.

GEWERKSCHAFT VEREIN AMALIA- UND KNOTTENBERG. **GERMANY.**

Letter returned unclaimed from former mine office, Mornshausen an der Dautphe, Hessen-Nassau, Germany. Adolph Freund, president. Capitalization, 1,400,000 marks. Has cupriferous silver-lead ores, opened by one shaft.

AMARILLO MINING CO. **NEW MEXICO.**

Office: care of Guy W. Holbrook, president, Lowell, Mass. Mine office: Jarilla, Otero Co., N. M. Dr. Warren W. C. Spencer, secretary. Lands, 13 claims, having about 5,000′ of openings.

AMATOLA COPPER CO. **TRANSVAAL.**

Mine office: Zoutpansberg, Transvaal. Has copper claims near the Messina Extension and Caledon mines, in the Zoutpansberg district.

AMAZON-BUTTE COPPER CO. **MONTANA.**

Office and mine: Forbis Blk., Butte, Silver Bow Co., Mont. A. H. Barrett, president; Jos. Lynch, vice-president; Chas. Mattison, secretary and treasurer; John Hewett, superintendent. Organized circa November, 1906, under laws of Montana, with capitalization $2,500,000, shares $5 par. Owners of lands took $1,500,000 in stock in full payment for property, giving them control of company. Stock was made assessable later, and a small assessment was levied October, 1907. Lands, 9 claims, 7 fractional, area 128 acres,

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patented, in 2 groups, lying circa 2 miles east of the center of Butte and separated by the Ida-Montana, Butte & Summit Valley and Calumet & Butte. Lands include the Amazon, Gaynor and West Altoona claims at the mouth of Horse Cañon, in the southeastern part of Butte, about a quarter mile south of the Bullwhacker and carrying more than 1,000′ of the north and south fault veins of the latter. Lands also carry about 1,600′ of the east and west vein of the Ida-Montana and 3 other veins, 2 veins being of fair promise, the Amazon and Altoona claims giving a good showing from slight development. Has a 436′ two-compartment shaft, with crosscuts and drifts on the 400′ level. In 1907 nine sets of leasers were working the Bullwhacker vein on the Amazon claim, and shipping about 50 tons of ore daily. Ore, as developed, is chalcopyrite, about 4′ giving average assays of 7% copper. Equipment includes several permanent mine buildings, two 100-h. p. and one 250-h. p. boilers, 4-drill air compressor and hoist. Production was begun circa November, 1906, and shipments to end of July, 1907, were 1,835 tons of ore, giving average returns of 2.72% copper and 0.01% silver, without gold values.

AMAZON COPPER MINING CO. **CALIFORNIA.**

Letters returned unclaimed from former office, 203 Fay Bldg., Los Angeles, Cal., and former mine office, Victorville, San Bernardino Co., Cal. C. H. Green, secretary. Capitalization, $1,000,000. Lands, 12 claims, area 240 acres, 5 miles from Victorville, in the Copper Mountain district, showing low grade ore giving assays of 4.5 to 21.5% copper, with small gold and silver values.

AMAZON GOLD CO. **MEXICO.**

Office: 107 Commercial Bldg., St. Louis, Mo. Mine office: Chacala, Tamazula, Durango, Mex. Jas. T. Dugan, president; Edward B. Sowers, manager; J. S. Wilkinson, superintendent. Mine, known as the Candelaria, has auriferous, argentiferous and bismuthiferous copper ores. Equipment includes a Bryan mill, 6-ton chlorination plant and 100-ton smelter. Employed circa 100 men, at last accounts.

AMAZON GOLD MINING CO. **MEXICO.**

Mine office: Culiacán, Sinaloa, Mex. Has gold, silver and copper ores, with steam power, employing circa 40 men, at last accounts.

AMERICA-BRITANNIA MINING CO. **WASHINGTON.**

Dead. Formerly at Baring, King Co., Wash.

AMERICAN & CANADIAN MINING CO. **BRITISH COLUMBIA.**

Office: care of M. G. Scribner, general manager, Oakland, Cal. Mine office: Tyee, Vancouver Island, B. C. Organized 1907.

AMERICAN CONSOLIDATED COPPER CO. **MONTANA.**

Office: 60 State St., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. Larkin T. Trull, president; Hiram M. Burton, vice-president; Timothy E. Hopkins, treasurer; David W. Snow, secretary; Jos. A. Coram, manager. Organized Jan. 12, 1906, under laws of Maine, with capitalization $65,000,000, later increased to $150,000,000, shares $100 par. Was organized to merge the copper lands of the Davis and Daly estates, later organized as the Davis-Daly Estates Copper Co., the Balaklala, and various other properties. Capitalization is ridiculously high and company apparently is abortive. Is regarded unfavorably.

AMERICAN CONSOLIDATED COPPER CO. **NEW MEXICO.**

Dead. Formerly at Santa Fé, Santa Fé Co., N. M. Fully described Vol. V.

AMERICAN CONSOLIDATED COPPER CO. **UTAH.**

Offices: First National Bank Bldg., Chicago, Ills., and McCornick Bank Bldg., Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. John C. Barnard, president; E. J. Darst, vice-president; Wm. Darst, secretary and treasurer; preceding officers, John Branborg and Jas. W. Sibley, directors.

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Organized 1907, under laws of Utah, with capitalization $500,000, shares $1 par, to develop property in the Big Cottonwood district.

AMERICAN CONSOLIDATED MINES CO. **NEW MEXICO.**

Office: 23 Postoffice Bldg., Colorado Springs, Colo. Mine office: Twining, Taos Co., N. M. J. Shumaker, president; C. D. Weimer, secretary and treasurer; O. H. Stanley, general manager; E. H. Souther, superintendent. Organized November, 1901, under laws of New Mexico, with capitalization $3,000,000, shares $1 par. Lands, 19 claims, area 380 acres, also a 5-acre mill-site and a half interest in 380 acres of timber lands, in the Rio Hondo and Lake Fork districts. Has secured assays of 3% copper and $16 gold per ton, from ores cut in 3 tunnels, longest 510'. Apparently has large ore bodies of low grade. Presumably idle.

AMERICAN CONSOLIDATED MINING CO.

Dead. A swindling concern of this title operated in 1906, from Chicago, giving no street number. Ostensible sponsors were A. Batchelder and Dr. S. Blott. Company offered a guaranteed 10% investment and now is unfindable.

AMERICAN COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Samuel L. Gibson, president; J. F. Coughlin, vice-president; John L. Alexander, secretary; Wm. Ryan, treasurer. Organized 1905. Lands, circa 3 miles from the Gibson, have 2 shafts, deepest 165', showing chalcocite and argentiferous tetrahedrite, latter assaying up to 70 oz. silver per ton.

AMERICAN COPPER CO. **ARIZONA.**

Dead. Succeeded, 1905, by American Copper & Gold Co. Formerly at Humboldt, Yavapai Co., Ariz. Fully described Vol. VI.

AMERICAN COPPER CO. **WYOMING.**

Office: 327 Pine St., Williamsport, Pa. Mine office: Holmes, Albany Co., Wyo. Thos. M. B. Hicks, president and treasurer; Otto C. Clinger, secretary; LeRoy Scholl, consulting engineer; P. F. Kelly, superintendent. Organized Aug. 23, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 40 claims, area 800 acres, in the Douglas Creek division of the Encampment district, showing a fissure vein in granite, 20' wide at depth, and composed of three distinct layers, first being porphyritic, with width of 6' to 7' and carrying about 1.5% copper and $7 gold per ton, with some covellite assaying 60% copper and $20 gold per ton; second layer, of 6' to 7', is of jaspelite and diorite, carrying decomposed iron ore assaying $20 to $150 gold per ton; third layer, brecciated, carries oxide, carbonate and sulphide ores of copper, with quartz gangue. Has a 350' three-compartment main shaft, also shafts of 50', 60' and 160', with a total of about 1,800' of mine openings. Has a 100-h. p. steam plant with Norwalk air-compressor. Has about 15 mine buildings.

AMERICAN COPPER & GOLD CO. **ARIZONA.**

Office: 73-99 Warren St., New York, N. Y. Mine office: Blanchard, Yavapai Co., Ariz. A. J. Runyan, president; N. C. Tabor, secretary and treasurer; J. J. Murray, manager. Is a reorganization of the American Copper Co. Lands, 20 claims, area 400 acres, including the Iron King mine, in the Big Bug district, having 7 shafts, 4 deepest 400', 410', 350' and 385', with about 1 mile of workings, claimed by old management to have blocked out for stoping 350,000 tons of $10 ore, which estimate was excessive. Principal values are in gold and silver, with copper and lead as by-products. Has steam and electric power, a 12-stamp mill and 50-ton cyanide plant, with necessary mine buildings, dwellings, store and combination church and schoolhouse.

AMERICAN COPPER MINING CO. **NEW JERSEY.**

Office: 20 Broad St., New York. Mine office: Somerville, Somerset Co., N. J. Col. Josiah C. Reiff, president; W. S. Chapman, secretary; Josiah Bond,

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general manager. Organized 1885, under laws of New York, with capitalization $500,000, shares $1 par. Lands are mining rights to about 1,000 acres, and a 50-acre millsite owned in fee, on Watchung Mountain, circa 2½ miles from Somerville. Ore occurs as blanket veins between trap and shale, these having an average thickness of 2′ and being traceable nearly 4 miles, carrying an estimated average of 2.3% copper, with small gold and silver values. The oxidized zone shows crysocalla nearest surface, succeeded by oxides and carbonates, with chalcocite at greater depth, succeeded at circa 700′ depth by native copper that is both auriferous and argentiferous. The largest mass of native copper secured weighed about 100 lbs. Mine is opened by 3 inclines, of 155′, 450′, and 1,300′, and by a 500′ crosscut drainage tunnel. Has steam power, with 30-h. p. hoist, 5-drill Rand air-compressor and drills, tramway and necessary mine buildings. The 50-ton concentrator, of wood and stone, has 2 rolls, screens, crushers and 2 Wilfley tables. Product, when mine is operated, is turned out as concentrates, shipped to smelters on New York harbor. Idle for some years.

AMERICAN COPPER MINING CO.

Dead. John Baker, former president and general manager, reports company dead. Location of property never learned.

AMERICAN COPPER MINING CO.

Dead. A stock-jobbing outfit, formerly at 40 Wall street, New York. Promoted, on wind, by Ralph M. Jacoby, and others of his ilk.

AMERICAN COPPER & MINING CO. **NEW MEXICO.**

Office: St. Joseph, Mo. Mine office: Brice, Otero Co., N. M. Jas. C. Sager, president; J. J. Metcalf, secretary. Capitalization $1,000,000, shares $1 par. Lands, 5 claims, area 100 acres, known as the Badger group, on Granite Mountain, 4 miles from Orogrande smelter, showing a 20′ ore body and 4 smaller veins, opened by 5 shafts, deepest 140′. Has secured assays up to 12% copper and $7.20 gold per ton.

AMERICAN COPPER MINING & EXTRACTION CO. **COLORADO.**

Letter returned unclaimed from former office, 623 St. James Bldg., New York, N. Y. Property was the Gardiner leaching process. Presumably dead.

AMERICAN COPPER MINING & MILLING CO. **UTAH.**

Dead. Formerly at Simpson Springs, Utah.

AMERICAN COPPER MINING & SMELTING CO. **NEW MEXICO.**

Dead. Was a swindle, promoted by J. R. Kerr & Co., formerly at 555-11 Broadway, New York.

AMERICAN COPPER & SILVER CO.

Office: 15 Exchange Place, Jersey City, N. J. Organized February, 1907, under laws of New Jersey, by Geo. Melville Boynton, John R. Turner and B. S. Mantz, with capitalization $100,000. Location of lands, if any, unknown.

AMERICAN DEVELOPMENT CO. **ARIZONA.**

Dead. Merged, March, 1906, in American-Saginaw Development Co. Formerly at Bisbee, Cochise Co., Ariz.

AMERICAN EAGLE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

AMERICAN EAGLE MINING CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. H. H. Ahrens, superintendent. Lands are on Whipple Mountain, 10 miles west of the Colorado River and circa 40 miles south of Needles. Presumably idle.

AMERICAN FLAG MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Geo. H. Rotham, president; E. B. Palmer, secretary; John G. Rhodin, superintendent. Is said to plan a bond issue, not to exceed $150,000, to raise funds for a mill. Mine is developed principally on the 400′ to 1,100′ levels, work

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on the bottom levels, hampered by water, showing a considerable tonnage of $15 to $16 milling ore. Ores are said to carry an average of about 2% copper, 5% lead and up to 60 oz. silver and $7.50 gold per ton. Has steam power. Unwatered mine, April, 1908.

AMERICAN GOLD & COPPER CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. O. W. Thompson, director. Organized June 20, 1907, under laws of Arizona, with capitalization $500,000, shares $1 par.

AMERICAN GOLD & COPPER CO. **ARIZONA.**

Dead. Was merged, 1904, in the Poland-American Gold Mining & Milling Co. Formerly at Morristown, Maricopa Co., Ariz. Described Vol. VI.

AMERICAN GOLD & COPPER CO.

Office: 951 Tremont Bldg., Boston, Mass. Location of lands, if any, unknown.

AMERICAN GOLD & COPPER CONSOLIDATED MINING CO. **ARIZONA.**

A tentative reorganization, circa 1905, of the American Copper Co., of Yavapai county, Arizona. Apparently abortive.

AMERICAN GOLD & COPPER MINING CO. **WYOMING.**

Dead. Formerly at Jelm, Albany Co., Wyo. Described Vol. VI.

AMERICAN GOLD MINING CO. **COLORADO.**

Office: 304-411 Olive St., St. Louis, Mo. Mine office: Ouray, Ouray Co., Colo. Fully described Vol. VI.

AMERICAN GOLD MINING COMPANY OF NEW MEXICO. **NEW MEXICO.**

Letter returned unclaimed from former office, 312 Tacoma Bldg., Chicago, Ills. Mine office: Nogal, Lincoln Co., N. M. A. T. Anderson, president; John Monk, secretary; J. M. Rice, manager; M. D. Gaylord, superintendent. Lands include the American, Helen and Old Abe mines, carrying ores of copper, gold, silver and lead. Has steam and electric power, 50-stamp mill and 50-ton cyanide plant. In litigation several years. Planned resumption early 1908, but apparently remains idle.

AMERICAN GULCH MINING CO. **UTAH.**

Office: 53 Tremont St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized, 1906, by interests closely connected with the Utah-Apex, to build a 200-ton mill at Bingham. Control is owned jointly by the Utah-Apex Mining Co. and Utah Development Co., latter to furnish site and former the cash. Cannot be learned that any work has been done.

AMERICAN METAL CO., LTD. **U. S. A. & MEXICO.**

Office: 52 Broadway, New York, N. Y. Mexican office: 3 Calle de San Augustin, Mexico, D. F. Also has branch offices in Denver and St. Louis. Company is American agent for Henry R. Merton & Co., Ltd., of London; Metallegesellschaft und Metallurgische Gesellschaft, of Frankfurt am Main; Societe le Nickel, of Paris, and Balbach Smelting & Refining Co., of Newark, N. J. Controls the Compañía de Minerales y Metales, of Mexico. Is an extensive dealer in metals, largely copper.

AMERICAN METALS CO. **NEW MEXICO.**

Letter returned unclaimed from former office, Las Cruces, N. M. Mine office: Organ, Donna Ana Co., N. M. Emil A. Franke, superintendent. Organized 1905, under laws of New Mexico, with capitalization $1,000,000. Property is the Modoc mine, having a mill with 3 Wilfley tables and 2 vanners.

AMERICAN-MEXICO MINING & DEVELOPING CO. **MEXICO.**

Office: Watertown, S. D. Mine office: Velardeña, Cuencamé, Durango, Mex. W. A. Merrifield, president; A. L. Selenberger, vice-president; John W. Martin, secretary; F. O. Smolt, general manager. Organized 1902, under laws of South

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Dakota, with capitalization $3,000,000, shares $1 par. Company, in 1906, reported $1,267,544 stock issued, and in 1908 reports $857,550 stock issued. Has authorized $50,000 bonds at 6%. Dividends paid, though unearned, circa $387,500. Lands, 21 claims, area 110 hectares, with 49 hectares in millsites, and 300 hectares miscellaneous lands, including La Roca Negra, Tecolotes and Los Libres mines. La Roca Negra mine has a 400′ shaft; Los Libres mine a 134′ shaft and 34′ tunnel, and the Tecolotes mine has a 160′ shaft and 350′ tunnel. La Roca Negra mine, sometimes called La Victoria, area 10 hectares, bought for $60,000, is a good small mine, having 3 veins averaging 5″ to 9″ width only, and not 3 metres, as claimed by company. Equipment includes a 180-h. p. steam plant, with 3 hoists.

Smelter, at San Lorenzo, 4 to 8 miles from the mines, has 2 blast-furnaces, with 80 to 150 tons daily capacity. The company's claim of a production of 261,531 lbs. fine copper in 1904 was questioned by the Copper Handbook. The suspicions plainly stated in past editions have been verified by disclosures in 1908, leading to indictments against the former officers, including Dr. W. S. Phillips, who seems to have been the chief scoundrel. Property, under former management, was a deliberate swindle, but La Roca Negra mine, though small, has good ore, and possibly, under honest management, the shareholders may recover something from the wreck.

AMERICAN MINES DEVELOPING ASSOCIATION. CALIFORNIA.

Office: 610 South Spring St., Los Angeles, Cal. Letter returned unclaimed from former mine office, Needles, San Bernardino Co., Cal.

AMERICAN MINES DEVELOPMENT CO., LTD. ARIZONA.

Office: 506 Oneida Bldg., Minneapolis, Minn. P. R. Bailey, president; Jas. T. Manning, secretary and treasurer. Capitalization $10,000,000, shares $1 par. Lands are claimed to be zinc property in Searcy county, Arkansas; 14 copper claims 16 miles west of Globe, Gila county, Arizona; 2 miles of placer claims on the Snake River, Idaho; 2 gold quartz claims in eastern Oregon; 2 gold claims in the Cripple Creek district of Colorado and 5 sections of oil lands in California. Capitalization is excessive, plan of operations nonsensical, and company apparently was promoted to sell stock.

AMERICAN MINES & EXPLORATION CO. ARIZONA.

Mine office: Hillside, Yavapai Co., Ariz.

AMERICAN MINING CO. ARIZONA.

Mine office: Globe, Gila Co., Ariz. Mine, near the Gibson, has a 300′ shaft. Lands said to have been leased, 1903, to Amos Green and John Ryson.

AMERICAN MINING CO. IDAHO.

Office: Helena, Mont. Letter returned unclaimed from former mine office, Weiser, Washington Co., Idaho. Property was the Peacock mine, in the Seven Devils district.

AMERICAN MINING CO. MEXICO.

Dead. Lands sold, 1906, to Cananea Central Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex. Described Vol. VI.

AMERICAN MINING CO. MICHIGAN.

Office: care of John W. Kingston, receiver, Calumet, Mich. To Dec. 31, 1871, company had levied assessments of $21,000. Company was formed originally by setting off 1,100 acres from the Cliff mine. Present lands are circa 500 acres, in Keweenaw county, Michigan. Company is being liquidated.

AMERICAN MINING & DEVELOPMENT CO. CALIFORNIA.

Letter returned unclaimed from former office, Omaha, Neb. Mine offices: French Corral, Nevada Co., Cal.; Kennett, Shasta Co., Cal., and Marysville, Yuba Co., Cal. T. F. Warden, general superintendent. Is supposed to be controlled by the American Smelting & Refining Co. The Red Ledge mine, in Nevada county, carries copper ore and has steam and water power. The

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property in Yuba county, at Sweetland, 20 miles east of Marysville, shows a considerable body of auriferous copper ore.

AMERICAN MINING & DEVELOPMENT CO. **MEXICO.**

Office: Bisbee, Ariz. Mine office: Naco, Arizpe, Sonora, Mex. Lands are a few miles south of Naco. Owing to quarrels among shareholders, attended by litigation, company is practically moribund.

AMERICAN MINING, MILLING & SMELTING CO.

Dead. Was a brazen swindle, owning no property whatever, with office at 10 Coleman St., London, E. C., England, and was fully exposed in Volumes V. and VI. As a result of the efforts of the Copper Handbook this gang of swindlers was brought to book in 1906, and, as surmised, company was found to possess no lands, no officers and no organization, hence it is unnecessary to repeat the names of the alleged officers in quotation marks, as was done in the last two editions of this work. It was stated in Vol. VI. of the Copper Handbook that every man connected with this company was either a fool or a rascal, and this statement was verified at the trial, when Henry Jonas, the fool, was given 18 months in prison, and Mark Anthony Youngs, the rascal, was given 10 years penal servitude.

Sir Harry Marks, owner of the London Financial News, who had puffed this rotten swindle extensively, was sufficiently alarmed, when requested by the Copper Handbook to explain his action in the premises, to engage the services, as solicitor, of Sir George Lewis, a lawyer noted in England for his ability to keep clients out of jail, and for his profound and intricate knowledge of the swindles and scandals of the past forty years. Sir Harry and Sir George jointly repelled, "with scorn," the idea that there was anything to explain in connection with the puffery by the Financial News of this deliberate swindle, and a satisfactory explanation of the attitude of the Financial News remains to be made—if such an explanation is possible.

Another party, the editor of a financial weekly in London, who had viciously attacked the Copper Handbook as a blackmailing enterprise, because of its exposure of the American Mining, Milling & Smelting Co., and who had strongly endorsed the latter, became so alarmed over the pointed questions of the Copper Handbook, after the conviction of Messrs. Jonas and Youngs, that he took refuge in nervous prostration and sold his newspaper, inducing the new proprietor to beg him off, thus saving his precious bacon. Readers of the London Financial News and other publications of like ilk should bear in mind that the reports on companies, printed in their columns, almost invariably are furnished by the companies themselves, or that the report is submitted to the companies before printed, for "editing," and that, in practically every case, the reports of company meetings and other matters of similar nature, are paid for, in hard cash, at tremendously high advertising rates. The true value of this sort of "news" is too obvious to require comment.

AMERICAN PROSPECTING & DEVELOPMENT CO. **ARIZONA.**

Office: Bisbee, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Lands are sundry claims adjoining the Equator mine, having a 43' shaft, with a 112' drift in ore. Presumably idle.

AMERICAN-SAGINAW DEVELOPMENT CO. **ARIZONA.**

Office: 510 Lyceum Bldg., Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Thos. H. Collins, president; Chas. d'Autremont, Jr., vice-president; Frederick R. Kennedy, secretary; Wm. G. Haggart, treasurer; preceding officers, Henry B. Hovland, Wm. B. Mershon and Watts S. Humphrey, directors; L. W. Powell, general manager. Organized March 7, 1906, with capitalization $1,000,000, shares $10 par, $6 paid in, as a merger of the American Development Co. and Saginaw Development Co. Lands are 26 claims, owned outright,

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being the American group of 9 claims, lying next east of the Junction, the Saginaw group of 17 claims, area 297 acres, also favorably located, and the Muheim and World's Fair groups. Mine has an old 384' shaft, sunk at an angle of 70° with the horizon, showing 35' of leached ore on the 300' level, and a new 1,100' three-compartment shaft connected with the Denn-Arizona, which cut a 35' body of low-grade ore on the 350' level. A considerable body of leached ore was found on the 750' level of the Saginaw, with prospects of commercial ore at greater depth. The Saginaw shaft has a double-drum first-motion hoist, with capacity for raising 4-ton skips 1,400', and also has a good pumping equipment. Management is excellent and property is well located. Idle since September, 1907.

AMERICAN SMELTERS EXPLORATION CO. **U. S. A. & MEXICO.**

Dead. Organized 1905, title changed to American Smelters Securities Co.

AMERICAN SMELTERS SECURITIES CO. **U. S. A. & MEXICO.**

Office: 71 Broadway, New York. Daniel Guggenheim, president; Barton Sewell, Silas W. Eccles, G. F. Hilton, Eugene B. Borden and Edward Brush, vice-presidents; W. E. Merriss, secretary; Morris Guggenheim, treasurer; W. S. Morse, assistant manager; W. C. Potter, Mexican manager; William R. Rust, business manager; Alfred von der Ropp, metallurgical superintendent. Organized March 25, 1905, under laws of New Jersey, as American Smelters Exploration Co.; name changed to present title May, 1905. Capitalization $77,000,000, shares $100 par, divided into $17,000,000 Series A cumulative 6% preferred stock; $30,000,000 Series B cumulative preferred stock at 5%, and $30,000,000 common stock. Series A has preference as to dividends, and both preference series have equal rights as to assets, both having priority over common stock. The American Smelters Securities Co. is controlled by the American Smelting & Refining Co., through ownership of a majority of the issue of common stock, and the American Smelting & Refining Co. guarantees the Series B. preferred stock. First quarterly dividend was paid July, 1905, on Series A. Surplus, May 31, 1907, was $1,016,744. Morton Trust Co., registrar. Annual meeting, first Wednesday in September.

The American Smelters Securities Co. is merely a subsidiary corporation of the American Smelting & Refining Co., and, in turn, is merely a securities holding company, controlling, through ownership of shares, or otherwise, a number of smaller corporations. It also is closely affiliated with the Guggenheim Exploration Co. The various corporations and the principal mines controlled are as follows:

Balaklala Consolidated Copper Co., Coram, Cal.
Dairy Farm Mining Co., Van Trent, Cal.
Selby Smelting & Lead Co., Selby, Cal.
A. Y. & Minnie Mining & Milling Co., Leadville, Colo.
Silver Lake Mines, Silverton, Colo.
United States Zinc Co., Pueblo, Colo.
Western Mining Co., Leadville, Colo.
Federal Mining & Smelting Co., Wallace, Idaho.
Federal Lead Co., Federal, Ills.
Central Lead Co., Flat River, Mo.
Federal Lead Co., Flat River, Mo.
Cumberland-Ely Copper Co., Ely, Nev.
Nevada Consolidated Copper Co., Ely, Nev.
Steptoe Valley Mining & Smelting Co., Ely, Nev.
Garfield Smelting Co., Garfield, Utah.
Utah Copper Co., Bingham, Utah.
Puget Sound Reduction Works, Everett, Wash.
Tacoma Smelting Co., Tacoma, Wash.

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Monte Cristo Mining & Concentrating Co., Monte Cristo, Wash.
Bonanza Mines, Bonanza, Zacatecas, Mex.
Botello Mines, Parral, Chihuahua, Mex.
Dolores Mines, Matehuala, San Luis Potosí, Mex.
Jibosa Mines, Jiménez, Chihuahua, Mex.
Reforma Mines, Reforma, Coahuila, Mex.
Tecolotes Mines, Santa Barbara, Chihuahua, Mex.
Tepezalanes Mines, Tepezalá, Aguascalientes, Mex.
Velardeña Mining & Smelting Co., Velardeña, Durango, Mex.

AMERICAN SMELTING & REFINING CO. U. S. A. & MEXICO.

Office: 71 Broadway, New York, N. Y. Works offices: At numerous addresses, given hereinafter. Daniel Guggenheim, president; Barton Sewell, vice-president; Edw. Brush, vice-president and assistant to the president; Silas W. Eccles, vice-president in charge of mine and mills; W. E. Merriss, secretary; Isaac Guggenheim, treasurer; L. A. Chapin, assistant treasurer; F. W. Hills, comptroller; Judd Stewart, general auditor and general superintendent; J. K. MacGowan, purchasing agent; Wm. Sproule, traffic manager; Geo. C. Kaufman, manager mining department; Franklin Guiterman, general manager Colorado department; C. W. Whitley, general manager Utah department; W. C. Potter, general manager Mexican department; S. R. Guggenheim, chairman executive committee; Morris Guggenheim, chairman finance committee; Edw. Brush, Silas W. Eccles, Anton Eilers, Karl Eilers, Daniel Guggenheim, Isaac Guggenheim, Morris Guggenheim, M. R. Guggenheim, F. W. Hills, J. K. MacGowan, W. S. Morse, E. L. Newhouse, Grant B. Schley, Barton Sewell, Wm. Sproule, J. N. Steele, Judd Stewart, J. P. Grant, Franklin Guiterman, Dennis Sheehy, Jos. Clendenin, Solomon Guggenheim, W. S. McCornick and W. F. Thatcher, directors.

Organized Apr. 4, 1899, under laws of New Jersey, with capitalization $54,600,000, later increased to $100,000,000, shares $100 par, in $50,000,000 cumulative 7% preferred and $50,000,000 common stock. Annual meeting, first Wednesday in September. Chase National Bank, New York, registrar; Chas. E. Beach, treasurer for agent. Dividends on common stock have been as follows: 5% in 1904; 5½% in 1905; 7% in 1906; 7½% in 1907; 2% January and 1% April and July each, 1908. Net earnings have been as follows: $1,979,907.85 in 1900; $3,828,441.27 in 1901; $4,861,619.01 in 1902; $7,576,785.57 in 1903; $7,905,572.84 in 1904; $8,898,811.36 in 1905; $10,161,358.12 in 1906; $11,509,669.20 in 1907. Company controls the American Smelters Securities Co., which is a subsidiary corporation, through ownership of $17,751,000 of the common stock issue of $30,000,000, and owns 25,000 shares, par value $2,500,000, of Series B, preferred stock, of the same company, bought for $2,302,270, and has guaranteed 5% dividends on the entire stock issue of Series B, preferred stock. Company's surplus, at end of fiscal year, Apr. 30, 1907, was $13,397,028.12, not including $17,751,000 of common stock of the American Smelters Securities Co.

Following is the list of operating plants of the company:
Perth Amboy plant, Maurer, N. J., copper and lead and lead smelting.
National plant, South Chicago, Ills., lead refinery.
Omaha plant, Omaha, Neb., lead refinery, copper smelting and converting.
Globe plant, Denver, Colo., lead smelting.
Pueblo plant, Pueblo, Colo., lead smelting.
Eilers plant, Pueblo, Colo., lead smelting.
Durango plant, Durango, Colo., lead smelting.
Arkansas Valley plant, Leadville, Colo., lead smelting.
Murray plant, Murray, Utah, lead smelting.
Garfield plant, Garfield, Utah, copper smelting.

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Selby plant, Selby, Cal., lead smelting and lead refinery.
Tacoma plant, Tacoma, Wash., lead and copper smelting.
Everett plant, Everett, Wash., lead smelting and arsenic refinery.
Helena plant, East Helena, Mont., lead smelting.
El Paso plant, El Paso, Tex., lead and copper smelting.
Aguascalientes plant, Aguascalientes, Mex., lead and copper smelting.
Monterey plant, Monterey, Mex., lead smelting.
Velardeña plant, Velardeña, Mex., lead and copper smelting.
Chihuahua plant, Chihuahua, Mex., lead smelting.
Federal plant, Federal, Ills., lead smelting and refining.

In addition to the foregoing plants, the company has other extensive interests and is supposed to control the United States Zinc Co., of Pueblo, Colo., the Silver Lake Mines, Silverton & Western Mining Co., and Aspen Mining Co., of Silverton, Colo.; the Carbon Coal & Coke Co., of Trinidad, Colo.; the Cook's Peak Mines, of Cooks, N. M., and extensive mining interests in the leading mining states of Mexico. Unfortunately, the American Smelting & Refining Co., its subsidiary corporation, the American Smelters Securities Co., and its affiliated corporation, the Guggenheim Exploration Co., are so closely interlocked, and particulars furnished the public are so meagre, that it is almost impossible to state which properties are owned or controlled by any one of these three different dovetailing corporations.

In addition to the foregoing interests, the company owns the exclusive rights to the Huntington-Heberlein ore-roasting patents in the United States and Mexico, and maintains a profit-sharing fund for employes occupying positions of responsibility. The various smelting plants of the company and its affiliations have an annual capacity of probably about 6,000,000 tons of raw ore and concentrates. There also are various subsidiary corporations for ore purchasing and other purposes. Apparently the copper ores are handled mainly through the American Smelters Securities Co.

The Helena smelter, at East Helena, Mont., is of 600 tons daily capacity. Frank M. Smith, manager; C. C. Titus, assistant manager.

The Murray smelter, at Murray, Utah, is a very complete plant. A new feature at these works is a 100x216′ baghouse, which has 4,200 cotton bags, each 30′ long and 18″ in diameter, the cloth required being sufficient to cover 16 acres. There has been much trouble in the past from smelter fumes, but the baghouse, in addition to saving considerable values heretofore lost, has greatly reduced the volume of fumes.

The Arkansas Valley plant, at Leadville, Colo., handles mainly lead ores,

The old Grant smelter, at Denver, has been dismantled, and it is planned some years.

with a little copper. The other plants at Leadville have been dismantled for to sell the ground.

The El Paso smelter, at El Paso, Tex., F. C. Earle, manager, has 8 furnaces, with a daily capacity of circa 1,200 tons.

The Playa Blanca smelter, at Antofagasta, Chile, has been idle for some years, and the American Smelting & Refining Co. is no longer a factor in the South American metal industry.

The Aguascalientes smelter, at Aguascalientes, Mexico, Wm. J. Hamilton, superintendent, is a large plant of about 2,000 tons daily capacity, having 2 lead furnaces, 8 copper furnaces and 4 copper converters.

The Chihuahua smelter, at Chihuahua, Mexico, Geo. B. Squires, superintendent, is a new plant, rated at 625 tons daily capacity, having blast furnaces with buildings of steel and a 370′ brick stack, with inside diameter of 16′, 8 miles of railroad track, a hotel and 192 dwellings for workmen.

The Monterey smelter, at Monterey, Nuevo León, Mexico, Edward C.

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Knight, manager, is of 1,200 tons daily capacity, having 10 blast furnaces and 15 reverberatory furnaces.

The principal refinery is the Guggenheim Works, at Perth Amboy, Middlesex Co., N. J., built 1895, and since repeatedly enlarged. This plant, having the advantages of tidewater frontage and rail connections at the rear, has copper and lead furnaces and a large electrolytic plant, also a bluestone plant making large quantities of copper sulphate. The electrolytic lead and copper refineries are each of about 125 tons daily capacity.

The Keyser refinery, at Baltimore, Md., was bought in 1907.

Copper production is merely an incident with the American Smelting & Refining Co., which is much the largest general smelting and metallurgical enterprise of the world. Copper production, 1905, was 72,952,000 lbs. fine copper; in 1906 was 85,810,000 lbs. fine copper, and in 1907 was 94,600,000 lbs. fine copper. It seems probable that an annual output of at least 150,000,000 lbs. fine copper will be reached within a few years.

AMERICAN VENTURE CO. **MEXICO.**

Office: care of Harry M. McIntosh, general manager, 77 Jackson Blvd., Chicago, Ills. Mine office: Ayutla, Autlán, Jalisco, Mex. Capitalization $200,000. Lands, 18 hectares, in the Bautista district, also copper and silver claims in the Cuautla and Ayutla districts, and one property in the Mascota district.

SOCIEDAD MINERA LA AMISTAD. **SPAIN.**

Office: San Antonio, 44, Granada, Spain. Mine office: Albuñuelas, Granada, Spain. Don Joaquin Marin Robles, president. Property is the Santa Ines mine, carrying copper and cobalt ores.

AMYGDALOID MINE. **MICHIGAN.**

Owned by Calumet & Hecla Mining Co. Described Vol. II.

ANACONDA CONSOLIDATED COPPER COMPANY OF GREENWATER. **CALIFORNIA.**

Office: care of Geo. F. von Polenz, secretary, Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. W. R. Wheat, president; J. L. Kalfus, vice-president; preceding officers, H. T. Rudisell and W. D. Wilson, directors. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 7 claims, area 114 acres, circa 4 miles southwest of Greenwater, showing copper float. Idle.

ANACONDA CONSOLIDATED COPPER MINES & SMELTING WORKS. **AUSTRALIA.**

Dead. Property sold to Murrin Copper Mines, Ltd., and company liquidated.

ANACONDA COPPER MINING CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Works office: Anaconda, Deer Lodge Co., Mont. John D. Ryan, president; Henry H. Rogers, vice-president; preceding officers, Wm. Rockefeller, J. E. Judson, E. C. Bogert, Geo. H. Church and Urban H. Broughton, directors; F. P. Addicks, treasurer; C. F. Kelley, secretary; A. H. Melin, assistant secretary; John Gillie, general superintendent; E. P. Mathewson, mill and smelter superintendent; D. W. Brunton, consulting engineer; J. P. O'Neill and Jas. Higgins, mine superintendents.

Organized June 18, 1895, under laws of Montana, with capitalization $30,000,000, shares $25 par, as successor of Anaconda Mining Co. Is controlled, through ownership of about 75% of stock, by Amalgamated Copper Co. Annual meeting, in May. National City Bank, New York, transfer agent. Stock is listed on the New York, Boston and London stock exchanges, and on the New York Consolidated stock exchange. Dividend coupons are payable in England by the London Joint Stock Bank, Ltd., Princes St., E. C. Warrants

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to bearer are issued, in England, in denominations of 5, 20 and 50 shares. Dividends have been as follows: $4,800,000 in 1900; $3,900,000 in 1901; $1,200,000 in 1902; $1,200,000 in 1903; $1,200,000 in 1904; $2,400,000 in 1905; $5,850,000 in 1906; $7,800,000 in 1907, and for 1908, quarterly dividends of 2% were paid, dividends for the year aggregating $2,400,000. Net earnings for 1907 were $3,378,220.42, including $581,281.74 earned by various subsidiary corporations and departments outside of regular mining operations. Company's surplus, Dec. 31, 1907, was $6,261,462.30. Assets include investments of $534,113.32 in various subsidiary companies, and merchandise on hand, for sale, valued at $631,860.14.

Lands, 572 acres, constituting much the largest property in the Butte camp, and including the heart of Butte Hill. A detailed description of the geology will be found in the article on Montana, in the chapter on American copper deposits. Miscellaneous real estate holdings include extensive timber lands and coal mines. The Anaconda is the largest copper producer of the world and employs about 5,000 men, under normal conditions.

The Anaconda was opened, 1880, as a silver mine, but at about 150′ depth the silver values decreased, being succeeded, a little lower, by high-grade copper ores, mainly chalcocite and bornite, while at depth there is a large amount of enargite. Net earnings of the mine, during the 15 years, 1880-1894, are unknown, but may be estimated safely as not less than $50,000,000. At a depth of about 1,600′ the mines of the Anaconda showed impoverished values, there being considerable marcasite, but an improvement was noted at 1,800′ and 2,000′, and very rich ore has been found below 2,200′, while high-grade chalcocite is being mined at a depth of 2,800′ in the High Ore mine of the Anaconda, this being the deepest level now worked in the Butte camp. The various mines of the Anaconda have immense reserves of ore, of all grades from low to high, and a considerable number of stopes of high-grade ore remain untouched. The ores extracted from the various mines give an average return of about 65 lbs. of copper per short ton, or 3.25%, with about 2½ to 3 oz. silver and 35 cents gold per ton.

The Anaconda mine proper has a 3-compartment main shaft, 2,450′ deep, timbered with 10x10″ square sets, with about 30 exits, being connected underground with the Never Sweat, St. Lawrence, Bell, Wild Bill, East Grey Rock, Buffalo and Mountain Consolidated mines. Ventilation normally is good, but considerable trouble was had, 1908, with gases from the adjoining St. Lawrence mine, and it is probable that the fire has crept from the St. Lawrence into several of the upper levels of the Anaconda. The mine has electric lights and signals, and electric locomotives for tramming were installed, 1907, on several levels. Hoisting is by 8-ton skips, swung under double-deck cages and worked in counterbalance.

The Never Sweat mine has a 3-compartment 2,500′ main shaft, retimbered, 1905, with false sets, allowing an 18″ play for squeeze. Square-set timbering is used, with back filling, and tramming is done by horses. The mine has electric lights and bells, and is connected underground with the Parrot, Colusa-Parrot and Moonlight mines. The surface plant includes a 3,000-h. p. hoist with 30x72″ cylinders, raising 8-ton skips swung under double-deck cages. There are 5 Ingersoll-Sergeant air-compressors, 2 being electrically driven, with aggregate capacity of 32,000 cubic feet of free air per minute, capable of running 360 power drills.

The St. Lawrence mine has a 3-compartment 2,400′ main shaft, with 22 exits, being connected underground with the Anaconda, Never Sweat, Mountain View and Pennsylvania mines. The mine has electric lights and bells, and a chain system of endless-haulage on the 14th level. The St. Lawrence has been on fire since 1889, in an extensive area above the 1,100′ level.

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The fire has been fought constantly, and walled off by bulkheads wherever possible, but cannot be extinguished, and must be allowed to burn itself out, though it is possible to control its progress to a considerable extent. A complete fire-fighting brigade is kept constantly on duty, working 8-hour shifts. While the fire is troublesome, it does not result in the loss of copper, as the cintered ore remaining after the burning of the sulphur can be mined later, and the mine waters are strongly charged, carrying 9 to 13 lbs. copper per ton, much of which is recovered by underground precipitation in concrete sumps, the water leaving these sumps carrying only 2 to 4 lbs. of copper per ton, and again being leached on surface. The hoist has 32x72" cylinders, raising 9-ton skips swung under double-deck cages.

The High Ore mine is the deepest in Butte, having a 3-compartment shaft of 2,900' depth, with the lowest level at 2,800', producing high-grade chalcocite. Being the deepest mine of the group, the High Ore does the pumping for a number of connecting mines of the Anaconda and Amalgamated groups, handling all water from the Anaconda, Washoe and Parrot properties. The mine has 7 powerful pumps, including 3 Dixon pumps on the 2,200' level, 2 pumps on the 1,600' level and 3 on the 1,000' level. The mine has electric lights and bells, and tramming is done mainly by horses. Hoisting is done with two 3-deck cages.

The Diamond mine has a 3-compartment 2,200' shaft, from which hoisting is done by a 32x72" Risdon engine, operating double-deck cages with 8-ton skips. The Diamond has a large compressor plant with 4 electric air-compressors fitted with auxiliary steam cylinders, having an aggregate capacity of 16,000 cubic feet of free air per minute.

The Mountain Consolidated mine has a 3-compartment 2,400' shaft, with a 28x72" Union Iron Works hoist operating two 4-deck cages.

The Green Mountain mine has a 3-compartment 2,200' shaft.

The Modoc mine has a 1,000' shaft. The Modoc vein is the largest in Butte, averaging about 100' in width, but is low in grade to the depth opened, ore ranging in tenor from 1.5 to 2% copper only, but should improve with depth, and is a property of much promise. A new gallows-frame and a 1,000-h. p. electric hoist were installed, 1908, when the mine was reopened.

The Bell mine has a 3-compartment 1,600' shaft, connected underground with the Anaconda mine. Ore is trammed by mules and a 28x40" hoist raises double-deck cages.

The Bell No. 4 mine, having a 365' shaft, is idle.

The Belmont mine has a 1,000' shaft, which was cut down, 1907, to 3-compartment size.

The Wild Bill mine, having a 2-compartment 400' shaft, is idle. The surface plant has been dismantled, and ore probably will be extracted through the shafts of adjoining mines.

The Ramsdell-Parrot mine has an 800' shaft, connected underground on the 400' and 500' levels with the Colusa mine, and is operated through the Never Sweat shaft.

The Gallatin mine has a 250' shaft.

The Monitor mine is connected underground with the J. I. C. and Ground Squirrel mines.

In addition to the foregoing mines, there are several smaller properties, mainly idle, having more or less development, among the more important being the Sunnyside, J. I. C., Wake-Up-Jim and Buffalo.

The mine waters from the various shafts being highly charged with copper, an extensive leaching plant is operated in the gulch just above Meaderville, where a large amount of cement copper is secured by precipitation. Old scrap iron, tin cans and wire rope are used as the precipitating agent,

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these articles commanding a standard price of 1 cent per pound. The drop of the water in the precipitation tanks and launders is much more rapid than is the case in the large Spanish lixiviation plants.

Steam has been supplanted very largely by electric energy, which is brought from a generating plant at Canyon Ferry, 70 miles distant, and from adjoining hydro-electric installations in Broadwater county. The current is wired to the mine with a primary voltage of 50,000, reduced to 2,000 volts at a transformer station just outside of Butte, power being distributed to the various workings from a main station at the Never Sweat mine. A 3-phase dynamo furnishes motive power for a direct-current generator that replaced an extensive underground haulage system actuated by compressed air. Electric lights are used underground very extensively, being employed wherever possible, and a large number of minor motors at the various buildings of the surface plant are driven electrically by a 440-volt current. Electric power has been found considerably cheaper than steam, both at the mines and works.

The Washoe reduction works are described hereinafter, although standing in the name of the Washoe Copper Co., because treating mainly Anaconda ores, commonly known as the Anaconda smelter, and leased by the Anaconda Copper Mining Co. The site of about 240 acres, on Washoe Hill, is about 2 miles east of Anaconda and 28 miles by rail from Butte. The plant was designed by Frank Klepetko and built and equipped with the able assistance of Messrs. Mathewson, Repath and Gulberg, and the late R. C. Collins and Wm. F. Evans. Ground was broken May, 1900, and smelting was begun February, 1902, since which time numerous modifications and improvements have brought the works to a daily capacity of 11,000 tons of raw ore. In the construction of the plant there were required 20,000 tons of structural steel, 25,000,000′ of lumber, 1,000 carloads of brick, 50,000 cubic yards of masonry and 300,000 cubic yards of excavation. The cost of the plant has been about $9,500,000. The grounds are of exceptional neatness, and the plant, as a whole, is nearly ideal in design, construction and equipment. Being located upon the side of a hill, full advantage is taken of gravity in the handling of material.

The concentration plant, covering 7 acres, includes a number of buildings. The bins, of wood and steel, include 8 second-class ore storage bins of 1,250 tons capacity each, thirteen 200-ton sampling ore bins, and a 2,500-ton coal-storage bin.

The sampling mill, 40x60′ in size and 6 stories high, is in 2 sections, each of 1,800 tons daily capacity. Ore to be sampled is taken from sampling bins by an electric locomotive and dumped into the mill bins, whence delivered to crushers, crushed material being raised to the top of the building by bucket elevators. The descending stream of ore is cut four times by Brunton automatic samplers, each taking 20%, giving a final sample of 3.2 lbs. per short ton of ore. Discard from the sampling mill is elevated and dumped into the concentrator ore-bins, or, in the case of smelting ore, is sent to the blast-furnace storage bins. The final sample is quartered by a Brunton quartering shovel, the resulting sample dried on a steel dryer, ground on an Engelhart sampling grinder, bucked to pass through a 100-mesh sieve, and divided into 3 sample packages, one going to the laboratory for analysis and one to the owner of the ore, while the third is filed as a control, in case of dispute.

The power-house of the concentrator, 136x150′ in size, stands between and connects the two halves of the concentrator proper. The construction is of steel, with brick walls, and there are three 15-ton traveling cranes, of 44′ span. Equipment includes two 4-cylinder triple-expansion condensing engines of 3,300 indicated h. p. at 200 lbs. steam pressure, but run at 150 lbs. pressure, developing 1,750 h. p. each, with a 4-cylinder triple-expansion 1,150-h. p. engine held in reserve as an auxiliary. There also is a complete electric plant, taking power

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from an installation near Helena, and from Flint Creek Falls, 22 miles west of Anaconda, electric power being used in preference to steam, but with the steam plant remaining intact for emergencies. This plant operates the mill and furnishes power for lighting the works, lighting the city of Anaconda, operating the city street-car system, etc.

The concentrator boiler-house, of brick and steel, located behind the coal-bins, has ten 300-h. p. Stirling water-tube boilers, feed pumps, etc., with an independent steel stack, 160′ high, of 14′ diameter.

The concentrator plant proper consists of 2 steel and wood buildings, on stone foundations, each 255x350′, each containing 4 complete sections, or 8 in all. Each section contains a 12x24″ Blake crusher, two 7x10″ Blake crushers, 6 Harz jigs for coarse concentrates, 1 set of 15x42″ coarse rolls, 1 set of 15x42″ fine rolls, 36 Evans jigs for fines, 1 set of 15x42″ rolls for middlings, 18 Evans jigs for middlings, 3 six-foot Huntington mills, 18 Evans finishing jigs and 33 Wilfley tables, with a large number of classifiers, settling tanks, dewatering tanks, elevators and trommels. The first crusher reduces ore to 3″ size, which passes over 2 sets of trommels for sizing, oversize material going thence to 2 smaller crushers, which reduce it to 1½″ size. Two belt-elevators take this material to a series of trommels for coarse sizing, oversize going to coarse jigs which produce coarse concentrates for the blast-furnaces. The waste from the coarse jigs goes to 2 sets of 15x42″ rolls for crushing, and is thence elevated and rejigged. In the jigging department all undersize material from crushers is treated automatically. The jigging sections have Evans jigs in 3 double rows, with Evans hydraulic classifiers making 3 sizes of concentrates, which go to the storage bins, while middlings go to the middling department, where 2 sets of 15x42″ rolls crush the material to about 1¼″ size, this going by belt-elevators to 4 sets of trommels, from which the undersize goes automatically to 4 hydraulic classifiers, which feed 18 double Evans jigs, set in a triple row. Concentrates from the middlings department are mixed with concentrates from the jigging department, going thence to storage bins. Middlings are collected in launders, and taken by elevators to the regrinding department, where three 6′ Huntington mills are fed from V-shaped tanks, the ground material passing through 1¼″ screens to hydraulic classifiers, thence to the jigs, both concentrates and tailings being carried by water, in launders. The slimes department has 33 Wilfley tables, fed from the bottoms of V-shaped tanks, concentrates being washed in launders to the settling tanks, at the foot of the concentrator building.

The tankhouse, of wood, is 70x670′, containing 9 settling tanks for each section, each tank being 19x19x15′, with a capacity of 420 tons. Each section of 9 tanks is divided into 6 tanks for the first settlement of concentrates, and 3 for settling the overflow of the first settlement tanks, the overflow from the second settling tanks going to 3 large tanks, common to all 4 sections of that half of the mill, the overflow from the final settlement tanks going to a slum pond, together with slum-water from all the settling tanks and Wilfley tables. The product of the first settlement tanks is known as fine concentrates, that of the second tanks as second settlement concentrates, and that of the third series of tanks as tank-slum. The fine and second settlement concentrates are treated in the roaster building, and the tank-slum goes to the briquetting plant.

The slum-ponds, located in the valley below the works, are 6 in number, each of about 300x630′ average size. As soon as one pond is filled the slum-water from the works is diverted to an empty pond, and as much water as possible is drained from the filled pond, slums being excavated by one of 2 Lidgerwood traveling cableways operating 5-ton buckets, the slums being piled in heaps on the edges of the pond, and allowed to drain. Dried slums are

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removed by buckets, and loaded into hopper-cars, thence to railway cars conveying them to storage-bins feeding the briquetting plant. Slum-water containing the least values is used for condensing purposes and for sluicing slag at the reverberatory and blast-furnaces. Settling tanks containing fine and second settlement concentrates, after draining, are emptied from the bottom into cars and material taken to the charging floors of the calcining building, being weighed and sampled before dumping. Throughout the works material is weighed and sampled on entering and leaving each building, thus giving an accurate check on the work of each department.

The roaster building, 96x412′, of steel frame on stone foundations, contains 64 McDougal calcining furnaces of the Evans-Klepetko type. Each furnace is 16′ in diameter and 18′ high, with 6 hearths having revolving water-cooled shafts and arms driven by top-gearing, rabbling arms being so set as to move material from circumference to center, and vice versa, on alternate hearths, until the material drops from the lower hearth into 2 calcine hoppers under each furnace, beneath which run the railroad tracks, hopper cars transporting calcines to the reverbératory building. No carbonaceous fuel is required, except occasional fine coal for charging a cold calciner. Gases are drawn through brick flues into 40x40x300′ brick and steel dust-chambers having concrete inner walls, where much of the flue-dust settles. The bottom of the dust-chamber has a series of hoppers, underneath which are railroad tracks, flue-dust going direct to the reverberatory furnaces for smelting. The barrings adhering to the rabbling arms and shafts are removed and sent to the blast-furnaces. In charging the roasters, finely crushed limestone and screenings from first-class ore are admixed, in the feed-hoppers, for the purpose of producing a balanced charge for the reverberatories. The capacity of each calciner is 45 tons per day.

The reverberatory department consists of two 183x225′ steel buildings, each containing 4 coal-fired furnaces with hearths 19′ wide and from 102′ to 116′ in length, with grate area of 8x16′, having a smelting capacity of 300 tons daily, on natural draft. Fuel is Wyoming coal, dumped into hoppers having 4 discharges directly above the fire-box. The flames, after leaving the furnaces, pass through two 375-h. p. Stirling boilers, in tandem, reducing the temperature of the gases to about 600° Fahrenheit when reaching the main flue, and securing about 600 h. p. from the waste gases. Ashes and partly burned coal drop from the fire-boxes into launders carrying them over a grizzly, the larger pieces of ash going to the slag-sluice, while the smaller pieces, containing unburned coke and coal, are sluiced to the coal-washery. Slag is skimmed from the reverberatories, at 4-hour intervals, into a stream of slum-water, which granulates and sluices it, through a launder with cast-iron lining, to the slag-dump. By allowing slag to accumulate until 3″ or 4″ above the skimming-plate, it is possible to skim the furnace very rapidly, 60 tons of slag being skimmed in 20 minutes. Matte is kept some distance below the skimming-plate, rendering it impossible to pull out any of the matte, thus obviating explosions. Matte is tapped from the side of the furnace through copper tap-hole plates, and run through cast-iron launders, lined with silicious material, to 10-ton hot-metal ladles that go by tram to the converters. Fire-brick used in the reverberatories are made by the company's brick-plant, bricks being 3x6x15″ in size. Bridge-walls and sides are luted with clay every 30 days, when necessary. Bridge-wall plates are kept cool by the circulation of air through pipe connecting with the main flue. Fumes from the reverberatories are taken through underground flues, 1 for each row of furnaces, to the main flue. Flue-dust is not briquetted, but is treated in reverberatories with fines. The reverberatory department has given exceptionally satisfactory results, effecting an increase of about one-third of the normal smelting capacity,

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a reduction of about one-third in fuel charges, saving about 10% of unburned fuel in the coal washery, reducing labor costs and securing about 600 h. p. of energy from the waste gases.

The briquetting plant occupies a 55x192′ frame building containing 4 Chambers end-cut auger-type briquetting machines, each of about 700 tons daily capacity, 2 machines being sufficient, as a rule, to handle all material. Briquettes are made of fine concentrates, fine first-class ore and pond-slums, mixed with crushed coke and coal from the coal-washery. Materials are brought from storage-bins by belt conveyors to a pug-mill, whence they are discharged into the briquetting machines, where further mixed and forced through a former in a continuous bar, which is cut into 10-pound briquettes by a revolving cutter. Briquettes are taken by a series of belt-conveyors to storage hoppers, whence loaded into charging-cars for the blast-furnaces.

The blast-furnace building, of steel frame, 82x269′ in size, has 3 floors, the first carrying the railroad tracks, second being the main operating floor and third the charging floor. There formerly were numerous furnaces of 56x180″ section at the tuyeres, and 40′ high, of about 400 tons daily capacity each, but these have been made into 3 furnaces by building connections between, 2 of the 3 furnaces being 51′ in length, while the third is 87′ long, with a uniform width of 56″ at the tuyeres. The two 51′ furnaces have a maximum capacity of 1,800 tons each, and the 87′ furnace has smelted 3,100 tons in 24 hours. It is possible to repair one end of any of these furnaces while frozen, with full smelting in progress at the other end. The large blast-furnaces of the Anaconda mark perhaps the most important step taken in copper smelting since the invention of the bessemer process of copper conversion. The bottom of the centre of each furnace is of silica brick, laid on water-cooled cast-iron plates mounted on cast-iron columns, with a gradual slope to each discharge spout. The 87′ furnace has 3 discharge spouts and three 16′ settlers, with 150 four-inch tuyeres, the 51′ furnaces having 88 four-inch tuyeres and two 16′ settlers each. The credit for these gigantic furnaces is due to Mr. Mathewson. Among the advantages are increased hearth area, with but two ends to hold crusts, while crusts forming on the sides can be disposed of by permitting the furnace to run down, in which case the crust will drop, or, if necessary, can be barred. The large furnace has a smaller radiating surface for the same hearth area, requires less fuel, and may be repaired rapidly while in blast. Leaking water-jackets may be replaced in 6 to 8 hours. Each 51′ furnace has three 7′ 45° unlined steel flues, with 5 similar flues on the 87′ furnace. The charging floor has railroad tracks on either side of the furnaces, side-dumping hopper cars being handled by compressed-air locomotives. The charging-doors extend full length, and are opened and closed by compressed-air pistons, all charges being fed automatically. In front of each furnace is a 16′ settler, receiving a continuous flow of molten matte and slag, matte being drawn from the bottom into 10-ton hot-metal ladles, going thence to the converters, while the slag skims into sluices and is granulated and washed to the slag-dumps by running water. Overhead sheet-iron flues carry fumes and smoke into a dust-chamber exactly duplicating that in the calcining department, and which connects with the main flue. The product of the first fusion is a 44% matte, with slags averaging about 0.2% copper only. A charge-train consists of 18 cars, receiving material by weight from the storage bins adjacent to the blast-furnace building. These bins, of wood, are in 3 rows, each row being 28′ wide, 20′ deep and 786′ in length, divided into bins of various sizes, providing storage for first-class ore, coarse concentrates, limestone, coal, limestone, silica, etc. All bin gates are operated by compressed air. Two charge-cars carry a charge, this ranging from 8,400 to 11,000 lbs., according to composition.

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The converter building, 176x416′ in size, is of steel frame, except the crushing and mixing department of the lining plant, which is of wood. There are two 60-ton 60′ span electric traveling cranes for handling converters and ladles, with two 15-ton auxiliary electric traveling cranes in the casting department for general use, one of the larger cranes handling copper and slag from the converters, and one handling converters for relining. Matte from both blast and reverberatory furnaces is brought to the charging-floor of the converter building, which is 23′ above the operating floor, and is poured from ladles into a launder, the end section which is so pivoted that it can be turned out of the way when the converter shell is filled, the shell being filled while in a nearly vertical position, with air on. Charge per shell is 7 tons of matte, regardless of condition of lining, and charge is blown up to blister copper in the same converter. There are 11 stands, operated hydraulically, with shells of the horizontal barrel type, 8′ in diameter and 12′ 6″ long. Converters blow off into hoods with flues leading to a dust-chamber similar to that of the calcining department. The matte is blown to low grade blister copper and poured into a sheet-steel clay-lined ladle, which is taken by crane to a hydraulic cradle, from which it is poured into the casting furnace. There are two 95-ton and one 110-ton casting furnaces, 2 being in continuous use. Copper is poured in at the side, and when charged to 50 or 60 tons, oxidation is begun by a 90-lb. air pressure. When the furnace is full, slag is removed and oxidation is complete, the charge then being poled to the desired pitch, and cast in a machine with a platform conveyor having moulds attached, operated hydraulically. Molten copper is run into a suspended ladle, from which it is poured by hydraulic power into moulds. When the mould is filled, the ladle is dropped to a horizontal position, and the next mould is brought into position, and the process repeated. Capacity of the casting machine is 25 tons hourly. The cast copper is chilled by a spray, and dumped from the moulds upon a platform conveyor running through a tank of water, then trucked to the scales, weighed, marked and shipped. Anodes assay about 97% copper and 80 oz. silver per ton.

The lining department, in the converter building, includes also a 40x62′ building on the southwest corner of the converter building, where material is prepared. Lining material is highly silicious ore having gold and silver values, and slum is used for a binder. Material is reduced by a Blake crusher and fine rolls, and sized by trommels, which feed four 7′ Carlin grinding and mixing pans, where it is ground and mixed with pond-slum to the proper consistency. Lining material is then transported to the converter shell and tamped around a steel form by a special Ingersoll-Sergeant tamping machine, of 5″ diameter with a 20″ stroke, supported by a revolving jib-crane with vertical motion controlled hydraulically. After lining, the shell is removed by crane to a drying stand, where it is dried by a fire of coal and scrap wood secured from the concentrator and sampling mill.

Coal ashes from the reverberatory department are sluiced to the coal-washery, which has a complete jigging equipment that saves about 35 tons daily of coal and coke, which is ground and sent to the briquetting department, where it is mixed with other material and bricked.

The 85x526′ smelter power-house, of brick and steel, has a 15-ton electric traveling crane running the entire length of the building. There are 10 Connersville blowers, direct-connected to Corliss engines, each with a capacity of 300 cubic feet of free air per revolution, compressed to 40 oz.; six air-compressors with an aggregate capacity of about 2,500,000 cubic feet of free air per hour, compressed to 16 lbs. pressure; three 90-lb. air-compressors for general use, and four 900-lb. air-compressors furnishing air to the locomotives of the tram-line. Four hydraulic compressor pumps and accumulators raise

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water to 360 lbs. pressure per square inch, for use in the hydraulic apparatus at the converter plant, and for various other purposes. Steam is supplied from the waste-heat boilers at the reverberatory building, and from twelve 300-h. p. Stirling water-tube boilers in a boiler room at one end of the power-house. The principal work is done, however, by electric energy, the steam plant being held merely as an auxiliary under normal circumstances.

The system of flues is most excellently planned and highly efficient. There are 3 principal flue-lines, from the roasting department, blast-furnaces and reverberatory furnaces, each being 20′ wide and 15′ high, built of brick and steel. The converter department has two 7′x7′ flues. The blast, roaster and converter flues connect with their respective dust chambers, while the reverberatory flue leads direct from the furnaces. Lengths of the flues are as follows: blast flue, 1,653′; reverberatory flue, 842′; converter flue, 703′; roaster flue, 488′. These flues converge into one main flue, which, for the first 1,200′ of length, is 60′ wide, with side walls 20′ in height, the bottom being excavated at an angle of 30° from horizontal. The roof is of "I" beam and brick arch construction. For the balance of distance to the stack, 1,122′, the main flue is 120′ wide, having a roof of No. 9 sheet steel. The main flue leads to a brick stack 300′ high, with inside diameter of 33′ 4″ at the bottom, and 30′ at the top, with a thickness of 4′ 6″ at the bottom, requiring 3,000,000 brick in its construction, with the top of the stack 932′ above the valley. Underneath the main flue is a tunnel 7′ high and 55′ wide. Flue-dust is drawn off through hoppers, placed at intervals of 10′, into cars operated by gravity from a set of drums located at the stack. Loaded cars are taken from the end of the main flue and elevated to 2 sets of flue-dust bins adjacent, one set taking arsenical flue-dust while the other receives flue-dust that is to go direct to the reverberatories.

Much trouble was experienced in the past from damage suits arising from the fumes thrown off from the smelter, until the building of the new stack and the installation of an arsenic plant, which treats about 60 tons of dust daily. Arsenical flue-dust is taken from the bins by inclined revolving pipes, leading to the feed hoppers of 2 Brunton revolving-hearth roasting furnaces. Fumes from these are conducted through 240′ of zigzag flue having about 40 cells, the cooling of the fumes subliming the arsenic on the walls. At intervals roasting is suspended, and the sublimated arsenic is scraped from the walls of the cells and taken to a small reverberatory furnace, fired by coke, and resublimed in a similar zigzag flue. The first product is a 90% arsenic sesquioxide, and the final product a 99.8% arsenic sesquioxide, which is ground, barreled and shipped.

The local transportation system of the Washoe works includes 48 miles of standard-gauge railroad tracks, equipped with 17 Porter air-locomotives, of 12 to 22 tons weight each, and 240 cars. The air receivers of the locomotives are charged at 900 lbs. pressure, cut to 150 lbs. pressure at the cylinders by reducing valves. There are charging stations at frequent intervals, fed by an extensive system of high-pressure pipes. Locomotives are recharged about every 20 minutes, 2 minutes being required for the work. The tram system handles about 13,000 tons of material daily.

The electrolytic refinery of the Anaconda was closed August, 1903, blister copper being sent east for refining. The refinery is a portion of the old reduction plant, about 2 miles from the Washoe works and on the opposite side of the valley.

In addition to the various milling and smelting departments previously described, there are large and well equipped shops, including a smithy, boiler-shop, machine-shop, carpenter-shop and electric repair shop. There also is a large foundry and machine shop at Anaconda, about 2 miles from the smelter,

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doing new work and heavy repairing, in addition to a general custom business.

The laboratory sampling mill, of brick, 29x63′ in size, cares for all metallurgical samples taken throughout the works, there being about 9,000 samples of different kinds of material monthly.

The laboratory, of brick and stone, 2 stories high, is one of the most thoroughly equipped at any metallurgical plant. All samples taken in the works and at the sampling mill are sent to this department, and there analyzed, there being about 15,000 actual determinations monthly, for copper, gold, silver, iron, zinc, sulphur, alumina, silica, etc. There are testing and photographic departments in the basement of this building.

The general office building, of brick, contains offices for the manager, assistant superintendents, accounting department, engineering department, etc., also a large telephone exchange, there being a private system connecting all departments of the works, with long distance connections for Butte, Helena, Great Falls and other Montana points. There also are private telegraph wires connecting with the Western Union and Postal companies at Anaconda.

The amount of water required by the Washoe works, when in full operation, is about 35,000 gallons per minute. Water is stored in Storm Lake and Silver Lake, about 15 miles west of Anaconda, water from both creeks and lakes being gathered by a dam about 4 miles west of Anaconda, and diverted in a 5x7′ flume, 7 miles long, that brings the water to the works.

The Washoe works treat, in addition to Anaconda ores, the production of the Butte & Boston, Washoe, Trenton and Parrot companies of the Amalgamated Copper Co., and the ores of the North Butte Mining Co. as well, having a capacity of about 11,000 tons of raw ore daily, and of about 150,000,000 lbs. of fine copper yearly. The Anaconda concentrating ore carries an average of about 3 to 4% copper, 1 to 6 oz. silver, 0.01 to 0.02 oz. gold, 16% iron oxide, 17% sulphur and 55% silica. The tailings carry an average of about 0.7% copper and 90% silica.

In concluding a description of this wonderful metallurgical plant, which is the largest in the world, it is but simple justice to give credit to Mr. Mathewson and his corps of able assistants for the great technical skill and executive ability that are manifested in a remarkably high degree in every department. An inspection of the plant is a genuine pleasure. The Washoe works employ about 2,000 men directly and 500 men indirectly.

Miscellaneous enterprises of the Anaconda Copper Mining Co. include a brick plant at Anaconda, manufacturing mainly silica brick from local material, the refractory products of this plant ranking among the best. The company has sawmills at Hamilton, Montana, which in 1907 cut 24,275,111′ of lumber, board measure, of which the company used 5,463,000′, the balance being sold. The company's coal mines at Belt, Montana, in 1907 produced 233,298 tons of coal, of which 16,111 tons were used at the mines, 106,594 tons were shipped to other departments of the company, and the balance was sold.

The Anaconda owns a controlling interest in the Butte, Anaconda & Pacific Railway Co., which, in 1907, transported 4,258,370 tons of ore and freight and 205,862 passengers. Gross earnings were $1,434,767.32, with net earnings of $160,786.04, on which a 6% dividend of $60,000 was paid on the capitalization of $1,000,000.

Early in 1907 the Anaconda made a 5-year contract with its mine workmen, under which wages were reduced October, 1907, when the price of copper fell, the men submitting to the reduction, in accordance with their contract, without a murmur. The relations of the company with its employes are exceptionally harmonious and satisfactory.

For 1907 the production of ore was 1,110,203 tons, yielding 63,055,661 lbs. fine copper, 2,001,351 oz. fine silver and 8,290 oz. fine gold, the average extrac-

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tion being 2.85% copper, 1.73 oz. silver and 0.007 oz. gold per ton. For 1905 the copper production was 95,443,730 lbs., and for 1906 was 94,963,000 lbs., the falling off in 1907 being due to suspension of operations during the latter part of the year.

The Anaconda has immense ore reserves, and is capable of making considerably more copper than the average production of slightly under 100,000,000 lbs. yearly. The management throughout is of a high order of ability, and the property, which seemed, only a few years ago, to be on a downward grade, again ranks among the most vigorous, profitable and promising mines of the globe.

ANACONDA MINE. **NEW MEXICO.**

Mine office: San Pedro, Santa Fé Co., N. M. Carruthers & Field, owners and managers. Ores carry gold, silver, lead, copper and zinc. Has steam power and is said to have a small smelter. Idle.

ANACONDA MINE. **WESTERN AUSTRALIA.**

Mine office: Mount Morgans, Margaret Goldfield, Western Australia. Was a considerable producer of copper ore in 1906, the district shipping 4,316 long tons of copper ore, mainly from this property.

ANACONDA MINING CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Was the parent of the Anaconda Copper Mining Co., and still in existence at last accounts.

ANACONDA MIZPAH COPPER CO. **NEVADA.**

Dead. Was merged, circa June, 1907, in the Ely-National Copper Co. Formerly at Ely, White Pine Co., Nev.

ANACONDA PROPRIETARY COPPER, GOLD & SILVER MINE. **AUSTRALIA.**

Dead. Was liquidated and succeeded by Melrose Copper Mines.

ANACONDA-SONORA COPPER CO. **MEXICO.**

Office: 95 East Fifth St., St. Paul, Minn. Letter returned unclaimed from former mine office, Sahuaripa, Sonora, Mex. J. W. Shepard, president and treasurer; Herbert W. Merrill, vice-president; J. F. Hibscher, secretary. Organized March 17, 1906, under laws of South Dakota, with capitalization $3,000,000, shares $10 par. Annual meeting, first Tuesday in June. Is said to be free of debt. Lands, 400 hectares and a 40 hectare millsite, with 23,000 acres miscellaneous lands, fairly timbered, with water rights. Property carries about 3½ miles of the strike of a porphyry and limestone contact deposit of 10′ to 100′ width, showing oxidized and sulphide ores. Old management claimed ore averaged 17.5% copper, 19 oz. silver and $3.20 gold per ton, which was entirely too high, and apparently a deliberate misstatement. Mine has several tunnels, with about a quarter-mile of workings. The 120-ton smelter that the old management claimed to be building, 1906, seems to have become merely a smelter-site, on the Yaqui river, 9 miles west of the mine. Apparently present management is not responsible for the lies and stock-jobbery of the original directorate. Idle.

ANCHORIA COPPER MINING CO. **WYOMING.**

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Copperton, Carbon Co., Wyo. D. H. Craig, president; H. O. Granberg, secretary-treasurer; E. M. Sanders, superintendent; Frank Earle, consulting engineer. Organized April, 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, area 82 acres, patented, in the Battle Lake district, developed by a 200′ shaft and tunnels of 45′ and 60′, showing an ore body estimated at 45′ width, giving average assays of 17% copper and from a trace to $5 gold per ton. Has a 40-h. p. steam plant, with hoist good for 500′, 3 power drills and 4 substantial mine buildings, of logs.

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ANCHOR MINING CO. **UTAH.**

Office: Hancock, Mich. Operating office: Salt Lake City, Utah. Chas. A. Wright, Henry L. Baer and John D. Cuddihy, directors. Organized June, 1908, with capitalization $150,000, shares $25 par. Lands are in Wasatch county, Utah.

COMPAÑIA MINERA DE ANDACOLLO. **CHILE.**

Office: Santiago de Chile. Mine office: Andacollo, Coquimbo, Chile. Organized July 4, 1906, under the laws of Chile, with capitalization 1,125,000 pesos, shares 15 pesos par.

ANDERSON-APACHE COPPER CO. **NEW MEXICO.**

Office: Douglas, Ariz. Mine office: Hachita, Grant Co., N. M. Employs circa 35 men. Geo. H. Neil, president; Harry Duey, vice-president; Chas. H. Howe, secretary & treasurer; Arthur Houle, general manager; L. H. Houlton, mine superintendent. Organized June 1, 1907, under laws of Arizona, with capitalization $500,000, shares $1 par; issued, $160,925. Lands, 5 claims, area 100 acres, circa 6 miles from Hachita, known as the Apache mine, held under a $100,000 bond and lease. Property, opened 1883, was worked continuously, until 1907, by chloriders, producing approximately $200,000. Lands show contact deposits between porphyry and Carboniferous limestone, carrying cuprite, malachite, chalcocite, chalcopyrite and chrysocolla, ores being mainly oxidized to present depth, and estimated by company to average about 10% copper and 20 oz. silver per ton. Mine has a 2-compartment 300′ shaft, with about 3,500′ of workings, estimated to show about 250,000 tons of ore, with about 40,000 tons blocked out for stoping, which estimates seem high. Equipment includes a 25-h. p. Fairbanks & Morse gasoline hoist. Property is shipping about 120 tons of ore weekly, averaging about $17 in value, to the Copper Queen smelter, and is considered promising.

ANDERSON MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Alberni, Vancouver Island, B. C.

ANDES COPPER MINING & EXPLORATION CO., LTD. **CHILE.**

Office: 18 Bishopsgate St., London, E. C., Eng. Wm. B. Broderick, chairman; A. M. Harris, secretary. Organized July 29, 1897, under laws of Great Britain, with capitalization £100,000, shares, £1 par; issued, £6,707, one-half paid. Lands are in the province of Tarapacá, Chile. Idle some years and apparently moribund.

SOCIEDAD BENEFICIADORA DE MINERALES ANDINA. **PERÚ.**

Mine office: Chico, Yauli, Junín, Perú. Has argentiferous copper ores. Idle.

SOCIÉTÉ DES MINES DE CUIVRE ANDREA. **SPAIN.**

Office: Brussels, Belgium. Mine office: Andrea, Badajoz, Spain. Organized Sept. 27, 1907, under laws of Belgium, with capitalization f1,000,000, in 10,000 shares of f100 par, with 10,000 shares without assigned value. Lands include the Andrea, Esperanza and Neustra Señora del Carmen mines, in the district of Lloreña.

ANGANG COPPER CO. **MEXICO.**

Office: Coliseo Nuevo, 4, Mexico, D. F. Mine office: Chiranganguco, Zitácuaro, Michoacán, Mexico. Arthur Chippendale, superintendent. Stock issue supposedly owned by Arimex Copper Co., a short-winded promotion by Thomas W. Lawson. Has a considerable body of low to medium-grade chalcopyrite, with a limited amount of development. Idle practically since birth.

COMPAÑIA METALURGICA DE ANGANGUEO. **MEXICO.**

Mine office: Angangueo, Zitácuaro, Michoacán, Mex. Property was leased from the Michoacán Railway & Mining Co., Ltd., and the smelter was

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practically rebuilt. Owing to excessive royalties, high cost of coke and insufficient development of mines, property was closed down, and company apparently is a failure.

ANGEL MINING CO. **ARIZONA.**

Dead. Property passed to Arizona Gold & Copper Mines Co. Formerly at Wickenburg, Maricopa Co., Ariz.

ANGLO-AMERICAN COPPER CO., LTD. **ARIZONA.**

Office: 21 Ironmonger Lane, London, E. C., Eng. Mine office: Kelvin, Pinal Co., Ariz. Jos. H. Gordan, J. P., managing director; C. M. Gordan, general manager; W. R. Feldtman, consulting engineer; C. E. L. Norris, secretary. Organized Jan. 21, 1905, under laws of Great Britain, with capitalization £100, shares £1 par. Debentures, £12,000 authorized; £2,000 issued. Lands include the old Ray mine, which has a concentrator that was overhauled 1906, and some diamond drill boring done. Property presumably sold.

ANGLO-AMERICAN COPPER MINING COMPANY OF PARRY SOUND, LTD. **ONTARIO.**

Letter returned unclaimed from former office, 211 State St., Chicago, Ills. Mine office: Parry Sound, Parry Sound district, Ont. Isaac Block, president; Jacob Newman, Jr., secretary and treasurer. Organized 1900, under laws of Ontario, with capitalization $3,000,000, shares $1 par. Lands are on Wilcox Island, near Parry Sound, showing veins carrying copper, silver, gold, cobalt and zinc, rendering the ore exceedingly refractory. Company estimates average ore values at 20% copper and 10 oz. gold per ton, which, of course, is untrue. Has one shaft, 125′ deep. Mine could be operated opencast. Idle for some years and company apparently moribund.

ANGLO-AMERICAN DEVELOPMENT CO. **MEXICO.**

Office: El Paso, Texas. Mine office: Barranca de Cobre, San Andres del Rio, Chihuahua, Mex. H. T. R. Cowell, president. Was said, 1908, to plan taking over property of the Barranca Copper Co.

ANGLO-AMERICAN GOLD & COPPER CO. **MEXICO.**

Dead. Lost its lands. Formerly at La Cananea, Arizpe, Sonora, Mex. Fully described Vol. IV.

ANGLO-BUTTE COPPER, LTD. **MONTANA.**

Office: 564 Salisbury House, London, E. C., Eng. Mine office: Butte, Silver Bow Co., Mont. Organized Apr. 11, 1907, under laws of Great Britain, with capitalization £6,030, in 6,000 ordinary shares of £1 par and 600 deferred shares of 1s. par, to carry on the business of copper mining.

COMPAÑIA ANGLO-CHILENA DE COLLAHUASI. **CHILE.**

Office: Valparaiso, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized May 17, 1906, under laws of Chile, with capitalization £200,000, shares £1 par.

ANGLO-CHILIAN EXPLORATION CO., LTD. **CHILE.**

Dead. Was liquidated 1905. Formerly at Canutillo, Huasco, Chile.

ANGLO-CHILIAN NITRATE & RAILWAY CO., LTD. **CHILE.**

Mine office: Tocopilla, Antofagasta, Chile. Property includes the San Juan, Altamira, San Carlos, Feliciana, Colorada and Bella Vista mines. Production, 1904, was 3,150 metric tons of ore ranging 14 to 19% in average copper tenor, the largest production being 2,400 tons or ore from the Mina Feliciana, averaging 15%.

ANGLO-CHILI CONCESSIONS, LTD. **CHILE.**

Office: Broad Street House, London, E. C., Eng. W. S. Miln, managing director; C. B. Parry, secretary. Organized Apr. 12, 1907, with capitalization £15,000, shares £1 par; issued, £5,250, fully paid. No trace of operations discovered in Chile.

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ANGLO-MEXICAN MINING & EXPLORATION CO. **MEXICO.**

Office: St. Louis, Mo. Mine office: Guachinango, Mascota, Jalisco, Mex. Geo. B. Clark, president; Thos. B. Rowe, general manager; John Broderick, vice-president; Chas. L. Rucker, secretary; E. W. Farnham, treasurer. Was organized with capitalization $650,000, as a holding company. Lands, 9 groups, including the Santa Laura group, area 67 hectares, south of Ajuchitlán de las Cañas, Tepic; mineral lands in Durango and the Jalisco group of 42 hectares, circa 42 miles from Guachinango, latter carrying several small veins of auriferous and argentiferous copper sulphides, and one gold vein, apparently an antigua, said to be 15′ in width and to carry 20 grams gold per metric ton. Company plans a 50-ton mill and plant to treat gold ores by direct cyanidation.

ANGLO-ROUMANIAN FINANCE & TRADING CO., LTD. **ROUMANIA.**

Dead. Dissolved, August, 1904. Formerly at Baia Arama, Mehedintze district, Roumania. Described Vol. V.

ANGLO-SPANISH COPPER CO., LTD. **SPAIN.**

Office: 4 Broad Street Place, London, E. C., Eng. Mine office: Alosno, Huelva, Spain. C. F. Lupson, secretary. Organized Jan. 9, 1907, under laws of Great Britain, with capitalization £300,000, shares £1 par. Lands include perpetual leases of the San Vicente, Fronteriza, Valrubio, Carolina and Infanta groups of copper mines, area 180 hectares, between the Rio Tinto and Tharsis mines, said to carry upwards of 3 miles of the strike of the San Vicente vein, giving average assays of 2.71% copper, 28.1% sulphur, 1 dwt. 6 grains gold and 2 oz. 13 dwts. silver per long ton. La Carolina and La Infanta mines are undeveloped, but have good ores, La Carolina giving assays up to 30% copper and La Infanta giving average assays of 4% copper and 12 oz. silver per metric ton. The Valrubio group carries the extension of the San Vicente vein, and the Fronteriza is considered a promising property. Principal development is on the San Vicente, which has an 1,800′ tunnel with about 1 mile of workings. Company planned, for 1909, an ore production of about 75,000 tons, but at last accounts vendors, who control company, were in litigation with cash purchasers of shares over value of company's lands.

ANGLO-WESTPHALIAN COPPER CO., LTD. **GERMANY.**

Office: 9 St. Mildred's Ct., London, E. C., Eng. A. W. Johanning, secretary. Organized Aug. 29, 1904, under laws of Great Britain, with capitalization £1,000,000, shares £1 par. Property includes the Kampf mine, area 84.7 hectares, also the Gottessegen and Gottesgabe concessions, area 874 hectares, in Rhenish Prussia.

ANGUS COPPER MINING & MILLING CO.

Office: 10 North Eighth St., St. Louis, Mo. Location of property, if any, unknown.

ANIMAS MINING & SMELTING CO. **MEXICO.**

Office: care of P. Sandoval y Ca., Nogales, Mex. Letter returned unclaimed from former mine office, Llano, Magdalena, Sonora, Mex. Ores carry gold, silver, copper and lead. Main shaft, 400′. Has steam power and a 40-ton smelter, employing about 30 men, at last accounts.

ANI MINE. **JAPAN.**

Owned by Furukawa Mining Co

ANITA CONSOLIDATED COPPER CO. **ARIZONA.**

Dead. Reorganized, 1903, as Anita Copper Co. Formerly at Williams, Coconino Co., Ariz.

ANITA COPPER CO. **ARIZONA.**

Dead. Property sold, under foreclosure, and company practically succeeded by Titanic Copper Co. Formerly at Williams, Coconino Co., Ariz. Fully described Vol. VI.

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ANITA COPPER MINES CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Douglas Copper Co.

ANITA MINING CO. **MEXICO.**

Dead. Formerly at Colotlán, Jalisco, Mex. Described Vol. VI.

SOCIEDAD ESPAÑOLA DE FUNDICION DE LOS ANJELES. **CHILE.**

Office: Valpariso, Chile. Mine office: La Ligua, Aconcagua, Chile. Organized March 21, 1900, under laws of Chile, with capitalization 60,000 pesos, shares 100 pesos par. Property is Los Anjeles mine and San José smelter, latter having a matting furnace, property formerly making circa 650,000 lbs. fine copper yearly. Idle at last accounts.

ANNA MINE. **ARIZONA.**

Office: care of Fairbanks, Morse & Co., owners, Chicago, Ills. Letter returned unclaimed from former mine office, Providence, Yavapai Co., Ariz. Has copper-gold ores, opened by shaft, with a 15-stamp mill. Idle for some years.

ANNANDALE COPPER MINES & SMELTERS, LTD. **AUSTRALIA.**

Office: 4 Broad Street Place, London, E. C., Eng. Mine office: Blayney, N. S. W., Australia. C. H. Pinkey, chairman. Organized July 2, 1905, under laws of Great Britain, with capitalization £200,000, shares £1 par.

ANNANDALE MINE. **AUSTRALIA.**

Owned by New South Wales Mines & Smelters, Ltd.

ANNIE MINING CO. **WYOMING.**

Office: Laramie, Wyo. Mine office: Jelm, Albany Co., Wyo. J. F. Johnson, treasurer; Louis Miller, president and general manager; L. A. Hancock, secretary. Organized 1903, under laws of Wyoming, with capitalization $250,000, shares $1 par. Lands, 100 acres, 32 miles southwest of Jelm, said to show two 4′ contact veins between granite and schist, opened by a 140′ shaft and a 138′ tunnel, showing azurite and bornite, assaying up to 20% copper and $10 gold per ton. Idle since 1904.

ANTELOPE GOLD & COPPER CO. **CALIFORNIA.**

Mine office: Loyalton, Sierra Co., Cal. In 1907 was sinking on a quartz vein of fair size.

ANTELOPE MINING & MILLING CO. **CALIFORNIA.**

Office: 704 Columbia Bank Bldg., Pittsburg, Pa. Mine office: Clio, Plumas Co., Cal. C. E. Christman, president; Henry Rosser, treasurer; Robt. Dilworth, secretary. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, in 2 groups, carrying considerable timber and having a vein of 2′ to 4′ width giving assay values of $15 to $22 per ton, mainly in gold and silver.

ANTIGUA COPPER CO. **MEXICO.**

Office: 201 Ward Bldg., Battle Creek, Mich. Mine office: Alamos, Sonora, Mex. H. A. Clapp, general manager; D. H. Livingston, superintendent; A. W. Davis, treasurer. Organized 1906, as successor of Sonora Mining Co. Lands, 261 acres, showing contact fissures between granite-porphyry and limestone, carrying copper, lead, silver and gold values, mainly in sulphide ores. Has 5 shafts, deepest 105′, and about 700′ of tunnels, longest being the Margarita, 340′, showing 4 veins, having claimed average widths of 3′, 10′, 12′ and 15′, said to give average assays of 6.8% lead, 17 to 30 oz. silver and $1 to $2 gold per ton from oxidized ore. Company claims that its gold, silver and lead will leave the copper without cost, as a by-product, which claim is not warranted.

ANTIGUA GOLD-COPPER CO. **HONDURAS.**

Office: 224 St. Charles St., New Orleans, La. Mine office: Minas de Oro, Honduras. W. W. Duson, president; Jas. L. Wright, vice-president; L. S. Scott, secretary and treasurer; preceding officers, Sylvan Levy, Lionel L. Lyons and E. L. Chappuis, directors; A. Neustadter, superintendent; E. B. Thompson,

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mine superintendent. Organized March 26, 1907, under laws of Arizona, with capitalization $2,000,000, shares $5 par. Annual meeting, first Tuesday in September. Lands, 531 acres, near the Honduras Rosario, circa 100 miles southeast of Puerto Cortez, carrying considerable timber, in both hard and soft woods. Property shows antigua workings, with about 1,500′ of new workings, developing argentiferous and auriferous copper ores in limestone. Improvements include 4 buildings and a 48x80′ frame stamp-mill, of 30 tons estimated daily capacity, having 5 Allis-Chalmers stamps and 3 Huntington mills. Ore has given assays of 2 to 3% copper, 2 to 4 oz. silver and $2 to $4 gold per ton.

MINA ANTIGUA PILAR. **SPAIN.**

Mine office: Colmenarejo, Madrid, Spain. Property is an old mine, reopened 1906, which was producing small quantities of cupriferous pyrite at last accounts.

COMPAÑIA DE COBRES DE ANTOFAGASTA. **CHILE.**

Office: Blanco No. 144, Valparaiso, Chile. Mine office: Chuquicamata, Antofagasta, Chile. Federico Lesser, chairman; Edourado I. I. Sandiford, vice-chairman; Carlos R. Harrison, secretary; Alejandro Muirhead, general manager. Organized Oct. 5, 1900, under laws of Chile, with capitalization £65,000, shares £10 par. Lands, 30 claims, area 100 hectares, also 2 kilometers of river frontage for water power. Property is served by a branch of the Bolivian Railway. Property considered well located.

COMPAÑIA INDUSTRIAL DE COBRE DE ANTOFAGASTA. **CHILE.**

Office: Santiago de Chile. Mine office: Antofagasta, Antofagasta, Chile. Organized Nov. 23, 1905, under laws of Chile, with capitalization 500,000 pesos, shares 10 pesos par.

APACHE CHIEF MINING CO. **ARIZONA.**

Dead. Lands sold, circa 1907, to Arizona Success Mining Co. Formerly at Salome, Yuma Co., Ariz.

APACHE CONSOLIDATED COPPER CO. **ARIZONA.**

Office: P. O. Box 101, Denver, Colo. Mine office: Globe, Gila Co., Ariz. Employs 10 men. Hon. John I. Mullins, president; F. S. Pfister, vice-president and general manager; Chas. T. Martin, secretary; E. M. Hurd, treasurer; preceding officers and Joseph Pfister, directors; Frank Pfister, mine superintendent. Organized May, 1906, under laws of Arizona, with capitalization $2,000,000, shares $1 par; issued, $1,200,000. Lands, 15 claims, unpatented, area 300 acres, in the Richmond district, showing fissure veins and contact deposits between limestone and quartzite, of which 1 vein, of about 5′ width, is traceable about 1,200′. Mine has shafts of 65′, 45′ and 20′, with 6 tunnels, longest 335′, giving 719′ of workings, showing about 400 tons of ore averaging about 3.5% copper, up to 15 oz. silver, and from a trace to $2.50 gold per ton. In 1907 produced 148 tons of ore returning 3.84% copper. Company plans continuing tunnel, deepening shaft and installing a hoist.

APACHE COPPER CO. **ARIZONA.**

Office: 72 Trinity Place, New York, N. Y. Meyer Zulick, president. Capitalization $2,500,000. Lands are in Yuma county, circa 25 miles east of the Colorado river and 100 miles west of Congress Junction, Ariz. Mine is developed by shafts and tunnels, showing ore with good gold and silver values. Considerable ore has been mined and is on the dumps. Property is considered valuable, if given adequate transportation facilities, or a near-by smelter. Idle.

APACHE DEVELOPMENT CO **NEW MEXICO.**

Dead. Lands sold, 1907, to Anderson-Apache Copper Co. Formerly at Hachita, Grant Co., N. M. Described Vol. VI.

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APEX COPPER CO. **COLORADO.**

Office: 304 Colorado Bldg., Colorado Springs, Colo. Mine office: Hayman, Park Co., Colo. Officers: John K. Vanatta, president; J. J. O'Driscoll, vice-president and general manager; C. W. Dolf, secretary. Organized March, 1903, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 9 claims, area circa 90 acres, on Apex Hill, in the Lower Tarryall district, showing 2 nearly vertical contact veins, of 3′ average width, between spar and limestone, carrying chalcopyrite and bornite assaying 2 to 30% copper, 7 oz. silver and $1.20 gold per ton, opened by shafts of 50′, 120′ and 250′, and by 4 tunnels of 250′ aggregate length. Has a 10-h. p. steam plant, with hoists, and a 7-drill Leyner air-compressor. Management is regarded favorably.

APOLLO COPPER MINING & MILLING CO. **UTAH.**

Dead. Formerly at Frisco, Beaver Co., Utah.

APOLLO GOLD MINING CO. **WASHINGTON.**

Office: New Haven, Conn. Mine office: Republic, Ferry Co., Wash. W. A. Case, superintendent. Property is the California mine, carrying auriferous and argentiferous copper and lead ores. Has steam power.

APPLE TREE COPPER CO., N. L. **AUSTRALIA.**

Office: 371 Queen St., Brisbane, Queensland, Australia. Mine office: Mount Cannindah, Queensland, Australia. Wm. Hasley, secretary; T. J. B. Howard, mine manager. Organized 1906, under laws of Queensland, with capitalization £1,200, shares £6 par. Lands, 4 leases, area 45 acres, 1½ miles from Mount Cannindah, having old workings consisting mainly of a 20′ trench 500′ long, showing a 6′ vein with paystreaks of 2′ to 4′ width carrying 10 to 47% copper and up to 5 oz. silver and 3½ dwts. gold per long ton. Mine is said to show about 2,000 tons of ore.

ARAGON COPPER MINES, LTD. **SPAIN.**

Office: 12 Lime St., London, E. C., Eng. Mine office: Tobed, Zaragoza, Spain. Employs 10 men. Gaston de Fontenilliat, chairman; Aimé Bonna, vice chairman; preceding officers and J. D. O'Brien, directors; A. L. Lanseigne, secretary and treasurer. Organized Oct. 29, 1903, under laws of Great Britain, with capitalization £100,000, shares £5 par; issued, £5,000. Title changed January, 1907, from Rio Grio District Copper Co. (Tobed & Codos Exploration), Ltd. Lands, 14 claims, area reported by company as 1,100 acres. Ore is reported to average about 7% copper. Company has been handicapped by lack of capital, but hopes to secure additional funds shortly.

ARAKAWA MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

ARAMO COPPER MINES, LTD. **SPAIN.**

Office: 2 Metal Exchange Bldgs., London, E. C., Eng. Mine office: Pola de Lena, Asturias, Spain. C. W. Aston Key, secretary. Organized, July 3, 1897, under laws of Great Britain, with capitalization £40,000, shares £1 par. Property is the Aramo copper and cobalt mines. Idle for some years; no accounts made public, and apparently moribund.

ARAPAHOE GOLD & COPPER MINING CO. **COLORADO.**

Mine office: Sunset, Boulder Co., Colo. Organized, circa 1899, under laws of Colorado. L. D. Longhi, president and treasurer; J. S. Riggs, secretary. Lands, 4 claims and a tunnel-site, in the Sugar Loaf district of Boulder county, Colorado. Idle since 1902 except for annual assessment work, done at the personal expense of the president.

ARCADIAN COPPER CO. **MICHIGAN.**

Office and mine: 205 Montezuma St., Houghton, Houghton Co., Mich. Robert H. Shields, president and general manager; Sylvester T. Everett, vice president; William F. Miller, secretary and treasurer; preceding officers, John

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C. Shields, James W. Shields, Wm. B. Anderson, Lucius J. Kilmer and Simon J. Beahan, directors. Organized Mar. 31, 1899, under laws of New Jersey, with capitalization $3,500,000, shares $5 par.

Lands, circa 3,200 acres, including 5 old mines, worked in a small way at various periods in the past. Present company operated vigorously, 1898-1901, and equipped the property with magnificent buildings and machinery, including a 3-stamp mill at Grosse Pointe. Operations proving unsatisfactory, all work was suspended June 15, 1903, hoists, machinery and shafthouses were sold to the Trimountain Mining Co., stampmill was sold to the Centennial Copper Co., and mine buildings disposed of, property being almost completely dismantled. Exploratory work was resumed October, 1905, on an amygdaloidal bed about one-fourth mile east of the Isle Royale lode, previously worked, and crosscutting from the 200′ level of the new shaft disclosed 5 copper bearing beds in a distance of about 110′. Work was suspended March, 1908, but the company plans diamond drilling from the bottom of the exploratory shaft, as there remains about a quarter mile of undrilled territory on the eastern boundary, which may carry the southern extension of the Kearsarge lode and the northern extension of the Baltic bed. Equipment includes a new air-compressor. The old workings and equipment are fully described in Volumes I and II.

The floating debt, Oct. 11, 1906, was upwards of $714,000, but the company sold 800 acres of land to the Quincy Mining Co. for $750,000, liquidating the large floating indebtedness. At the annual meeting in January, 1908, cash, supplies and bills receivable aggregated $42,449. The property is large and should contain workable copper deposits at some point. The quarter mile of undrilled territory is, without question, the most promising part of the company's lands, especially in view of recent important developments on the Kearsarge lode to the north and the Baltic lode to the south.

ARC GROUP MINING CO. **WASHINGTON.**

Mine office: Kettle Falls, Stevens Co., Wash. Mine has a 70′ shaft, on the Queen claim, showing an 8′ vein carrying gray copper ore. Planned smelter shipments, 1908.

ARCTIC CHIEF COPPER MINES CO. **YUKON.**

Office: Spokane, Wash. Mine office: White Horse, Yukon. T. B. Garrison, president; W. J. C. Wakefield, secretary; W. J. Elmendorf, consulting engineer. Lands, 6 miles west of White Horse, with good wagon road connecting, include the Arctic Chief and White Horse mines, with sundry other claims. Principal development is on the Arctic Chief, developed mainly opencast, with tunnels and 820′ of underground workings, showing argentiferous bornite and chalcopyrite, disseminated in massive magnetite, in a vein of 50′ estimated average width, also a west ore body, discovered 1907, showing ore said to average 8% copper and $5 per ton in combined gold and silver values. The Best Chance mine, held under bond, shows an outcrop of capriferous magnetite, 25′ to 60′ high, 60′ wide and 400′ in length, carrying bornite and chalcopyrite, with some oxidized ores, and several seams of chalcocite, opened by sundry cuts, two 15′ pits and a 35′ shaft, showing ore assaying about 25% copper and 3 oz. silver per ton. Production, to end of 1907, was 707 tons, shipped to coast smelters, returning an average of 4.45% copper, 1.49 oz. silver and 0.194 oz. gold per ton, equivalent to circa 63,000 lbs. fine copper.

ARDILLA COPPER MINES, LTD. **PORTUGAL.**

Dead. Property seized, 1905, by debenture-holders. Formerly at Barrancos, Alemtejo, Portugal.

AREACHAP COPPER MINES, LTD. **CAPE COLONY.**

Office: P. O. Box 5754, Johannesburg, Transvaal. Mine office: Upington, Gordonia, Cape Colony. Francis Oats, chairman; Jas. M. Calderwood,

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M. I. M. M., consulting engineer. Organized under laws of Cape Colony, with capitalization £20,000, shares £1 par; working capital, £4,000. Lands, circa 44,000 acres, 16 miles from Upington, held under 2-year lease, at royalty of 3s. per long ton on ore shipped, with right to purchase base minerals only for £25,000 cash and £23,000 in shares. Mine has several shallow shafts and an opencut known as Bezuidenhout's quarry. Surface trenching at intervals, for 750', shows a cupriferous zone about 200' wide, with strike NNW., between granite and schist, with a gossan capping carrying considerable ore assaying 25 to 60% copper. Company plans smelting with a 20-ton reverberatory furnace, and made several small shipments, 1908, of ore returning 30 to 60% copper. Property considered promising.

ARENILLAS COPPER MINES, LTD. **SPAIN.**

Dead. Voluntarily wound up, May, 1904.

ARGENTA COPPER CO. **UTAH.**

Letter returned unclaimed from former mine office, Robinson, Juab Co., Utah. Idle for several years.

ARGENTA MINES CO. **BRITISH COLUMBIA.**

Office: 622-50 Congress St., Boston, Mass. Mine office: Ainsworth, Kootenay, B. C. Wm. F. Almy, president and general manager; Geo. R. Angus, secretary and treasurer; L. Hanna, superintendent; Alfred C. Gardé, engineer. Organized April, 1902, under laws of Maine, with capitalization $2,000,000, shares $1 par. Lands, 17 claims, are 550 acres, showing limestone, schist, and black slate, traversed by porphyry and trap dykes, a fissure in the schist, ranging 7' to 30' in width, showing chalcocite and chalcopyrite assaying 3 to 20% copper, up to 10% lead and 7 to 46 oz. silver per ton, with a trace of gold. Has tunnels of 93', 572', 644' and 1,288', with a total of 3,051' of openings, estimated to show 150,000 tons of ore. Company has developed 300 h. p. from a waterfall of several thousand horse power available. Has a 10-drill air-compressor and 5 power drills, with necessary mine buildings; is served by the Canadian Pacific Railway, and is 5 miles from Ainsworth, connected therewith by wagon road, built by the government. Officials and promoters sued January, 1908, for an accounting.

ARGENTINA-TIERRA DEL FUEGO EXPLORATION CO. **ARGENTINA.**

Office: care of Banco de Italia, Buenos Ayres, Argentina. Organized 1905, with capitalization £1,000,000.

ARGENTINE COPPER MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands, sundry claims adjoining holdings of the Utah Consolidated. Idle.

ARGENTINE & GENERAL EXPLORATION CO., LTD. **ARGENTINA.**

Office: 35 Queen Victoria St., London, E. C., Eng. Organized March 23, 1908, under laws of Great Britain, with capitalization £50,000, shares £1 par, to buy, of Señor Don Justo Pastor Fonseca, mines known as Las Animas, Desengaño and Restauradora, in Argentina.

ARGENTINE MINERALS, LTD. **ARGENTINA.**

Office: 62 London Wall, London, E. C., Eng. Seymour Caldwell, chairman; Henry Bacon, secretary. Organized January 4, 1904, under laws of Great Britain with capitalization £11,000, in 10,000 shares of £1 par and 20,000 deferred shares of 1s. par. Property is a mine known as San Antonio de los Cobres, in the province of Los Andes, Argentina. Company also has a smelting concession for the province of Salta, Argentina. Presumably idle.

ARGHANA MAADEN MINES. **TURKEY.**

Office: care of Imperial Minister of Forests & Mines, Constantinople, Turkey. Mine office: Arghana Maaden, Turkey. Is owned and operated by the Turkish crown. Mine was opened circa A. D. 1600, and has been operated vigorously for about 3 centuries. Development is mainly by adits. The ore,

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averaging about 12% copper, is smelted with charcoal to a matte of 50 to 60% copper tenor, which is shipped by camel to Tokat, for export. The workmen are paid in food, clothing and tobacco, and mining processes are archaic in all respects. Production, which is hampered by lack of adequate transportation facilities and by scarcity of fuel, is about 5,000,000 lbs. fine copper yearly.

ARGO COPPER MINING CO. **MONTANA.**

Dead. Merged, March 7, 1904, in Eclipse-Argo Mining Co. Formerly at Canyon Ferry, Broadwater Co., Mont.

ARGOLIS COPPER MINING SYNDICATE, LTD. **GREECE.**

Office: 19 Eastcheap, London, E. C., Eng. Mine office: Nauplia, Epidaurus, Greece. H. H. Waller, secretary. Organized March 1, 1904, with capitalization £5,000, shares £1 par; issued, £2,025. Property is a 25-year lease, expiring December, 1929, of 854.4 hectares, at a rental royalty of 4s. per ton on ore produced. Idle.

ARGO MINING, DRAINAGE, TRANSPORTATION & TUNNEL CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Chas. C. Parsons, president; H. W. Robinson, secretary; Samuel Newhouse, managing director. Capitalization, $100,000. Entire stock issue is owned by Argo Transportation & Tunnel Co., Ltd., property being the Newhouse tunnel.

ARGO TRANSPORTATION & TUNNEL CO., LTD. **COLORADO.**

Office: 3 Great Winchester St., London, E. C., Eng. Mine office: Idaho Springs, Clear Creek Co., Colo. F. Hargreaves, chairman; Jos. C. E. Gillham, secretary. Organized Nov. 29, 1905, under laws of Great Britain, with capitalization £150,000, shares 10s. par; issued, 269,883 shares, fully paid. Was a reconstruction of the Argo Tunnel & Mining Co., which, in turn, was a reconstruction of the Newhouse Tunnel Co., and property is the stock of the Argo Mining, Drainage & Tunnel Co. Property, better known as the Newhouse tunnel, 17,740′ in length, and of 21,300′ projected length, probably the longest mining tunnel in existence, has double tracks laid with 30-pound rails of 18″ gauge. For the first 12,000′ the tunnel is 9′ high and 10′ wide, the remainder being 8′ high and 6′ wide. The tunnel was begun January, 1894, and has a grade of 5″ per 100′.

The mines under which this tunnel passes have produced about $70,000,000 in metallic values, and the tunnel has cut sundry veins of ore carrying gold, silver, lead and copper, and several laterals have been driven, opening various ore bodies of more or less promise. The Eureka shaft, sunk to depth of several hundred feet, is planned to connect with the tunnel at a depth of 1,600′. Plant is equipped with steam and electric power.

ARGO TUNNEL & MINING CO., LTD. **COLORADO.**

Dead. Reorganized Nov. 29, 1905, as Argo Transportation & Tunnel Co., Ltd.

ARGYLE MINING CO., LTD. **ARIZONA.**

Office: 194 St. Vincent St., Glasgow, Scotland. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. A. Mitchell, secretary. Organized Dec. 29, 1900, under laws of Great Britain, with capitalization £100,000, shares £1 par; issued, £66,000. Lands, 2 claims, area 40 acres, known as the Examiner and Mineral Hill, near Huron, Yavapai county, Arizona. Idle for some years.

ARICHISE COPPER CO. **ARIZONA.**

Mine office: Safford, Graham Co., Ariz. J. E. Carpenter, president. Organized February, 1907, under laws of Colorado, with capitalization $2,500,000. Lands are the Buena Vista group, north of Safford, said to have been bought for $40,000 and said to show a 6′ vein of low grade copper ore carrying silver

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and gold values, opened by a 100′ shaft and a 530′ tunnel. Shipped a little ore, late 1907.

ARIMEX CONSOLIDATED COPPER CO. **ARIZONA & MEXICO.**

Office: 85 Ames Bldg., Boston, Mass. Chas. H. Dickey, president; C. D. Burrage, secretary. Organized under laws of New Jersey, with capitalization $5,000,000, shares $25 par. Property includes the Copper Prince group of 30 claims, in the Silver Bell district, Pima county, Arizona, held through Oxide Copper Co.; seven-eighths of the stock of the Table Mountain Copper Co., which has 27 claims in the Bunker Hill Mining district of Pinal county, Arizona, and nine-tenths of the stock issue of the Angang Copper Co., which holds about 400 hectares, known as the Chirangangueo mines, near Zitácuaro, Michoacán, Mexico. Neither of the Arizona properties is of apparent promise, but the Mexican claims might be of some value if properly developed. Company was promoted by Thomas W. Lawson, and, like his other copper mining companies, apparently is merely a stock-jobbing scheme.

ARIO COPPER CO. **MEXICO.**

Office: 1525-25 Broad St., New York, N. Y. Mine office: Ario de Rosales, Ario, Michoacán, Mex. Geo. H. Walsh, Jr., treasurer. Lands include La Roma, Bohemia and Flora mines, on the projected line of the Morelia & Tacambaro railroad, which was under construction at last accounts, and the San Antonio and San Valentin mines, old properties carrying silver and copper ores.

ARISPE MINING & DEVELOPMENT CO. **MEXICO.**

Office: Chicago, Ills. Capitalization $10,000,000, shares $1 par. Supposed to have lands located somewhere in the district of Arizpe, Sonora, Mexico.

ARIZONA AMALGAMATED COPPER CO. **ARIZONA.**

Dead. Was organized, circa 1907, under laws of Maine, with capitalization $15,000,000, shares $5 par; name changed, circa November, 1907, to Copper Company of Arizona. Formerly at Clifton, Graham Co., Ariz.

ARIZONA-APACHE MINING CO. **ARIZONA.**

Office: care of W. J. Guthrie, president, Pasadena, Cal. Mine office: Tucson, Pima Co., Ariz. A. G. Pohndorf, vice-president; Thos. Stafford, superintendent. Organized March, 1907, with capitalization $2,500,000, shares $5 par. Lands, known as the Foran group, are circa 32 miles from Tucson, in the Santa Catalina Mountains. Company plans sinking a double compartment shaft and adding gas power. In December, 1907, Frank Foran, original owner of the ground, took forcible possession. Company dispossessed and practically out of business.

ARIZONA & ARKANSAS LEAD, ZINC & COPPER MINING CO. **ARIZONA & ARKANSAS.**

Dead. Formerly at Gila Bend, Maricopa Co., Ariz. Described Vol. V.

ARIZONA BANNER COPPER CO. **ARIZONA.**

Dead. Formerly at Globe, Gila Co., Ariz. Described Vol. VI.

ARIZONA BELLE MINING CO. **ARIZONA.**

Dead. Formerly at Vail, Pima Co., Ariz.

ARIZONA BLUE BELL COPPER CO. **ARIZONA.**

Dead. Was successor of Butte & Arizona Copper Co., and was succeeded by Arizona Exploration Co. Formerly at Mayer, Yavapai Co., Ariz. Fully described Vol. V.

ARIZONA-BOSTON COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. O. S. Paul, president; J. W. Hawes, treasurer and clerk. Organized May 6, 1907, under laws of Maine, with capitalization $1,500,000, shares $1 par. Lands, 26 claims, in 3 groups, area circa 500 acres, one adjoining the McMillen-Stonewall Mining Co., circa 18 miles northeast of Globe.

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ARIZONA CENTRAL COPPER CO. **ARIZONA.**

Office: 1304 Keystone Bldg., Pittsburg, Pa. Mine office: Dewey, Yavapai Co., Ariz. Hon. J. F. Wilson, president; J. B. Cleveland, vice-president and manager; J. M. Elder, secretary; J. W. Norton, treasurer; preceding officers and J. S. Carmichael, directors. Capitalization $2,000,000. Lands, 18 claims, area 368 acres, in one group, on the western slope of the Black Hills, 6 miles northeast of Dewey, the nearest railroad station, and 2 miles south of the Yaeger Cañon mine. Property has a contact mineral zone of 800′ to 1,200′ claimed width, showing a gossan carrying quartz veins, up to 16′ in width, giving good assay values in copper, gold and silver. Mine has about 15 openings, including the 485′ Shylock incline shaft, said to show, at depth of 230′, a 4′ paystreak of black copper sulphide ore, with 7 additional ore bodies of 3′ to 8′ width, to depth of 340′, giving good assays in copper, lead, silver and gold. Has gasoline power. Property considered promising.

ARIZONA-COLORADO COPPER BELT & GOLD MINING & MILLING CO. **ARIZONA.**

Office: 305 State Life Bldg., Indianapolis, Ind. Mine office: Globe, Gila Co., Ariz. Hon. Robt. N. Foree, president and general manager; Chas. H. Jollner, vice-president; Chas. Trotter, secretary; C. Fenger, Sr., treasurer; Jos. W. Bandhauer, superintendent. Organized September, 1901, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, 21 claims, area 400 acres, 3 miles northeast of Globe, showing veins of 3′ to 100′ estimated width, carrying auriferous and argentiferous copper oxides and carbonates, giving assays of 8 to 30% copper, 20 to 50% lead, 1 to 200 oz. silver and $3 to $30 gold per ton. Has 7 pits and shafts, deepest 800′, cutting several small veins and one vein of 40′ estimated width, latter cut at depth of 150′. Has a 100-h. p. boiler, 1,000′ hoist and 10-drill air-compressor. Has shipped a little ore of fair grade.

ARIZONA COMMERCIAL CO. **ARIZONA.**

Dead. Succeeded, 1904, by Arizona Commercial Copper Co. Formerly at Globe, Gila Co., Ariz.

ARIZONA COMMERCIAL COPPER CO. **ARIZONA.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Globe, Gila Co., Ariz. Nathan L. Amster, president; W. M. Bradley, secretary; R. Townsend McKeever, treasurer; C. R. Jeffers, assistant secretary and treasurer; preceding officers, William A. Paine, Charles H. Paine and A. B. Clough, directors; J. W. Bennie, general manager; H. A. Collins, superintendent; Patrick C. O'Neil, mine superintendent.

Organized January, 1905, under laws of Maine, with capitalization $2,500,000, increased, 1908, to $3,000,000, shares $25 par. Has authorized an issue of $500,000 of 6% bonds, convertible into stock at $20. It is planned to devote $300,000 from the bond issue to the erection of a smelter, balance of proceeds going to working capital. Annual meeting, second Wednesday in January. Shares are listed on the Boston stock exchange. American Loan & Trust Co., Boston, transfer agent. Federal Trust Co., Boston, registrar.

Lands, 11 claims, 3 fractional, in 2 groups, known as the Black Hawk and Copper Hill mines, separated by the Iron Cap mine of the National Mining Exploration Co., in Copper Gulch, circa 2 miles from Globe, lying just north of the Old Dominion and adjoining the United Globe and Superior & Boston mines. The property has large bodies of low grade carbonate ore, but principal values, as developed, are in sulphide ores of medium and high grades.

The Copper Hill mine has an 800′ shaft showing a vein up to about 20′ in width, with a 5′ paystreak assaying about 4% copper, and is connected underground with the Gray mine of the Old Dominion. There are several

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opencuts on silicious surface ores, and about 15,000 tons of such ores have been shipped.

Principal developments are on the Black Hawk mine, where there are 2 shafts, one being a 3-compartment 500′ shaft. The Black Hawk has a surface capping of low-grade iron ore, above a 45′ vein of silicious ore estimated to average about 4% copper, with excess of iron. There also is a hematite vein of 3′ to 4′ width, giving assays of 4.5% copper, with small silver values. At depth the vein is larger, being up to 60′ in width on the 400′ level, and carrying sulphide ore of 6 to 7% copper tenor.

Railroad connections were secured March, 1907, when active shipments were begun, and in six months the company shipped about 25,000 tons of ore returning about $7.50 per ton, after deducting freight and smelting charges. Production was suspended September, 1907, on account of the drop in the price of copper. The Black Hawk mine shipped about 500 tons of high grade ore for test purposes in 1907. Mr. Amster estimates an average extraction of about 7% copper from Black Hawk ores, at a cost of 6.5 cents per pound. Cash on hand, Dec. 31, 1907, was $51,106.61; supplies, $22,440.17; accounts receivable, $5,900.38, as against about $6,000 actual liabilities. Production, 1906, was 939,102 lbs. fine copper, and for 1907 was 1,638,610 lbs. fine copper and 1,644 oz. fine silver.

The company plans erecting a reduction plant of about 300 tons daily capacity, and estimates that $3.50 per ton can be saved by doing its own smelting. The company has a strong management financially, and is being developed vigorously.

ARIZONA CONSOLIDATED COPPER MINES, LTD. **ARIZONA.**

Office: Throgmorton House, Copthall Ave., London, E. C., Eng. Mine office: Clifton, Graham Co., Ariz. Hon. H. A. Stanthorpe, director; W. Fairhall, secretary. Organized June 17, 1899, under laws of Great Britain, with capitalization £150,000, shares £1 par. Lands include claims in the Copper Mountain district, also a millsite on the San Francisco River, former said to show veins of 5′ to 10′ width carrying a considerable variety of copper ores of different grades. Idle at last accounts, except for endeavors to raise money for a 50-ton smelter.

ARIZONA CONSOLIDATED GOLD & COPPER CO. **ARIZONA.**

Office: Phoenix, Ariz. Mine office: Winkelman, Gila Co., Ariz. Employs 4 men. H. B. St. Claire, president; J. S. Miller, vice-president; H. H. McNeil, secretary and treasurer; S. G. Gardom, superintendent. Organized June 12, 1907, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Lands, 19 claims, area 380 acres, held by location, also a 20-acre millsite, showing numerous fissure veins, of which 4, under development, are said to average 30″ width. Property has several pits of 10′ to 15′, shafts of 70′, 32′, 50′, 40′, and a 40′ tunnel.

ARIZONA CONSOLIDATED MINING CO. **ARIZONA.**

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Johnson, Cochise Co., Ariz. Alfred S. Miller, president; Jas. W. Stetson, secretary and treasurer; Samuel J. Entrikin, general manager; Hale McCormick, mine superintendent. Organized July 21, 1904, under laws of Delaware, with capitalization $1,000,000, shares $1 par, in $300,000 of 6% preferred stock and $700,000 of common stock. Is operated as a close corporation.

Lands, 12 claims, area 240 acres, 7 miles northwest of Cochise, formerly owned by Russell Consolidated Copper Co., showing 5 ore bodies, of which 3, under development, range 4′ to 6′ in average width, carrying carbonate and sulphide ores, estimated by company to average 8% copper and 1.2 oz. silver per ton. Sulphide ore was encountered at depth of 671′. Property is opened by 6 shafts. Lands include the Mammoth and New Republic groups, latter

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opened to depth of about 700′, with circa one mile of workings. The Mammoth mine is about 350′ deep. Both properties are equipped with power hoists. The Russell Consolidated shipped, 1880-1882, considerable quantities of rich carbonate ores, of about 30% average copper tenor. Production, 1907, was 245,040 lbs. fine copper, and 3,122 oz. fine silver, valued at $51,057.08.

ARIZONA COPPER CO., LTD. **ARIZONA.**

Office: 29 St. Andrews Square, Edinburgh, Scotland. Mine office, Clifton, Graham Co., Ariz. Employs circa 2,000 men. John Gill, chairman; John G. Hopkins, managing director; preceding officers, Col. J. Bald Harvey, P. Dickson, J. P., Lord Salvesens, G. Readman, Alex McNab, J. P., and J. Wilson, directors; Norman C. Carmichael, assistant general manager; Wm. Exley Miller, secretary; Robert Addie, consulting engineer; Geo. Fraser, smelter superintendent; Archibald Morrison, mill superintendent; C. D. Clark, mechanical engineer.

Organized Aug. 5, 1884, under laws of Great Britain, with capitalization £755,000, of which £736,504 is issued, as follows: £40,000 in 160,000 A preference shares, 5s. par, upon which no calls have been made, but £7,840, 10s. is paid in advance; £316,530 (part of £320,000) in full paid preference stock; £316,530 (part of £320,000) in 1,266,120 shares of fully paid preferred stock, shares 5s. par; and £63,440 (part of £75,000) in 253,776 shares of fully paid deferred stock, shares 5s. par. Profits are divided as follows: 10% cumulative dividend on A preference shares, 7% cumulative dividends on preference shares, 10% non-cumulative dividends on preferred ordinary shares, 10% non-cumulative dividends on deferred shares; balance, if any, to be divided pro rata between preferred ordinary and deferred ordinary shares. Debentures, £175,210 terminable 5% bonds outstanding. Fiscal year ends Sept. 30. For fiscal year ending Sept. 30, 1907, mining profits were £351,650 and railroad profits were £129,070, dividends being £24,531 on preferred shares and £284,900 on ordinary shares, with £108,000 credited to reserve capital outlay and £36,950 credited to surplus. About 20% of the stock issue is held in the United States.

Lands are circa 4,000 acres, including 8 producing mines, at Morenci, Metcalf, Longfellow, Garfield and Coronado, in Graham county, Arizona. Ores, as produced, give average returns of about 3.5% copper, production being about 10% smelting ore and 90% concentrating ore. Mines, except the Coronado, are developed to a depth of about 500′ only, being opened mainly by tunnels, giving cheap extraction. Notwithstanding the comparatively shallow zone of development a tremendous amount of ore is in sight, ore reserves, March, 1905, being estimated at 10,870,600 tons practically in sight.

The Humboldt mine, which is the largest producer, shows a large body of low grade disseminated chalcocite. Extraction from this property is partly open-cast, but mainly through tunnels equipped with electric lights and electric traction. The haulage system uses the overhead trolley, power being furnished by a 150-h. p. Crossley gas-engine, driving a 100-h. p. generator that furnishes a 225-volt current. Electric locomotives of 10-h. p. haul 40-ton loads, the line having a single track laid with 10-lb. rails, running 600′ directly through the mountain, with a loop reaching all workings of the Humbolt mine, the tunnel running through International Hill direct to the new concentrator.

The Longfellow mine is the oldest important copper producer of Arizona, having been opened circa 1877. A 1,300′ tunnel driven from Chase creek connects with a 600′ blind shaft, obviating about 3 miles of railroad haulage over bad grades. The Longfellow Extension mine is developing satisfactorily.

The Metcalf group, 7 miles from Clifton, is worked open-cast, and is an extensive producer of low grade oxidized ores, which are concentrated with the sulphide ores from the Humboldt and Yavapai groups.

The Coronado group, 9 miles from Clifton, has 3 shafts, deepest 700′, the

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latter having found, at a depth of 700′, in the granite, an ore body of about 5.5% copper tenor, apparently disproving the claim that all ore values are cut off at about 500′ depth. The Coronado group shows considerable high grade ore.

The Clay mine, which was but a small producer in the past, has been developed to important dimensions, and shows a large tonnage of low and medium grade ore.

Ore is taken from the different mines by 6 gravity tram-lines to storage bins on the Coronado railroad, whence hauled to the reduction plant at Clifton. The Coronado railroad is of standard gauge for 4 miles, from Clifton to Longfellow, and is of 36″ gauge for 3.2 miles, from Longfellow to Metcalf, the road having 30-ton ore cars. The company also operates the Arizona & New Mexico railroad, a highly profitable standard-gauge line of 107 miles, running from Clifton to Hachita, N. M., where connection is had with the El Paso & Southwestern.

The mines and works use about 3,000 h. p., supplied in about equal portions from steam, gas and distillate engines. The gas-engine plant is exceptionally complete and effective. It has been planned to develop hydro-electric power and transmit same from a dam about 50 miles distant.

The works at Clifton, Morenci, Longfellow and Metcalf, being somewhat scattered, were remodeled and enlarged 1902, 1904 and 1905, now including 6 concentrators, a smelter, leaching plant and acid plant. The concentrators, having about 2,400 tons combined daily capacity, are operated by gas and electric power, putting 6.6 tons of crude ore into one ton of concentrates. No. 6 concentrator, put into commission July, 1906, is the largest, having about 900 tons daily capacity. The building, of steel, is equipped with two 600-ton crushers and a 250-h. p. Nordberg engine direct-connected to a 125-h. p. dynamo, steam being furnished by three 400-h. p. Stirling boilers. No. 6 mill has a large settling basin, from which tailings are removed and filled into the mine. Chase creek was dammed to prevent tailings going into the Frisco river, and thence into the Gila river, as they caused considerable damage to farmers and ranchers, but the damming of Chase creek brought about floods that have caused great damage to the company and to the village of Clifton, hence, in 1908, a pipe-line was built to carry the tailings and discharge same on the flat, several miles down stream. Milling equipment at the various concentrators includes 2 Hancock jigs, installed 1905, handling 600 tons daily, which replace 35 Frue Vanners, 2 Wilfley tables and 8 other machines. The Hancock jigs are highly economical of floor space and require little water. There also are Allis-Chalmers high-speed rolls for crushing and Huntington mills for regrinding.

The smelter is of steel frame with slate roof and floor of iron plates laid in cement. There are six 300-ton water-jacket blast-furnaces, each 39x240′ at the tuyeres, with blast supplied by Nos. 7, 9 and 10 Connersville blowers, operated by a 275-h. p. engine. Gases from the blast-furnaces pass through a 480′ tunnel and 300′ stack. Slag settlers are 7x14x3′, with a 6″ fire-brick lining. Matte of 50 to 55% copper tenor is charged into the converters by a 10-ton ladle, handled by a 30-ton electric crane. The conversion plant has 3 stands and six 7-ton shells, with a daily capacity of 50 tons of 99.5% blister copper. Disintegration of slag by running water has been discontinued, and molten slag again is handled in ladle cars, by a steam locomotive. A 25-ton briquetting plant was built, 1905, using coal breeze for a binder, under 2,000 lbs. pressure per square inch. Plant is entirely automatic, fines going in at one end and briquettes being loaded upon cars at the other.

The acid plant makes about 3,000 tons of sulphuric acid yearly from the fumes of the roasters, the entire product being used in the leaching plant,

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which treats an average of about 250 tons of low grade oxidized ores daily. In connection with the leachery there is a 125-ton bluestone plant, turning out bluestone equivalent to about 3,000,000 lbs. fine copper yearly. This is perhaps the most successful leaching plant in the United States, and the management is entitled to credit therefor.

Miscellaneous enterprises include a well equipped foundry, machine shop, sawmill, planing mill and 20-ton ice plant, all built of brick. The company also has general merchandise stores at Clifton, Longfellow and Metcalf, and a good library and reading room are maintained for employes.

High water mark in production was reached in 1904, with an output of 32,197,760 lbs. of fine copper; output of 1907 amounting to 30,794,092 lbs. fine copper, valued at $6,150,050. A recent change in management, by which Mr. Hopkins was put in charge of the property, is expected to result, eventually, in increased production. The management has been criticized freely for alleged shortcomings, but some of these criticisms seem to have been founded more upon prejudice against the British management than upon reasonable grounds. While there are doubtless opportunities for improvements in various directions, it should be borne in mind that the Arizona has been a large and highly profitable producer of copper for many years, and that its ore bodies, while extensive, are low in average tenor. Under these circumstances the management has made a decidedly creditable record.

ARIZONA COPPER BELT MINING CO. **ARIZONA.**

Office: 612-25 Broad St., New York, N. Y. Mine office: Constellation, Yavapai Co., Ariz. Wm. J. Dilthey, president; Alex. McNear, vice-president and secretary; Chas. H. Peckworth, treasurer; E. G. Straub, general manager; preceding officers, J. P. Rappold and Wm. A. Garrison, directors; Harry E. Jones, superintendent. Organized February, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 11 claims, area 220 acres, including the Wren and Texas groups, in the Black Rock district, said to show a 4′ to 22′ fissure in granite-porphyry, traceable 2,000′, each claim having shallow shafts, 2 deepest circa 115′ each. Eight claims carry mainly gold values, up to $48 per ton, and 3 claims carry principally ore assaying 8 to 17% copper, 0.83 oz. silver and circa $10 gold per ton. Has gasoline power. Apparently more attention has been devoted to company's financing than to developing ore.

ARIZONA COPPER CHIEF SMELTING CO. **ARIZONA.**

Office: 714 Hartford Bldg., Chicago, Ills. Claimed July, 1906, to have hundreds of tons of copper glance in sight. Location of lands unknown.

ARIZONA COPPER-GOLD MINES CO. **ARIZONA.**

Office: 1011 Pabst Bldg., Milwaukee, Wis. Mine office: Prescott, Yavapai Co., Ariz. Employs 12 men. R. H. Burmister, president and general manager; Chas. McKenney, vice-president; F. E. Wildish, secretary; F. L. Wright, treasurer; preceding officers, C. N. Smith, W. V. Jones, A. S. Duffies, J. W. Howell and T. S. Norris, directors; J. S. Sheehan, superintendent. Organized Oct. 12, 1903, under laws of Arizona, with capitalization $1,000,000, as Arizona Gold-Lode Mines Co., and reorganized Apr. 10, 1906, under present title, with capitalization $1,500,000, shares $1 par.

Lands, 17 claims, area 340 acres, in the Cherry Creek district, circa 15 miles northeast of Humboldt. Development is by several shallow shafts and short tunnels with circa 3,500′ of workings, on a 2′ fissure vein, reported by company's engineer to give 17,329 tons of ore in sight. Ore apparently averages about 2% copper, with gold values. Has a 40-h. p. steam hoist, good for 1,000′ depth, with 4 mine buildings, including a 10-stamp mill. Management plans sinking shafts to 1,000′ depth. Company was promoted by Pierce Underwood, and advertised extensively, some very wild statements being made in

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the advertisements. At last accounts company was indebted to its general manager and superintendent.

ARIZONA COPPER & GOLD MINING CO. **ARIZONA.**

Letter returned unclaimed from former office, Phoenix, Ariz. Mine office: Salome, Yuma Co., Ariz. Company owns a 20% stock interest in the Savage Gold & Copper Mining Co. Lands, 5 claims, unpatented, in the Harcúvar Mountains, having a 55′ tunnel showing a 5′ vein of auriferous copper ore, and a 320′ shaft bottomed in a vein of circa 20′ width carrying malachite and chalcopyrite. Is claimed to have about 1,000 tons of smelting ore on the dump.

ARIZONA COPPER HILL MINING CO. **ARIZONA.**

Dead. Property sold under foreclosure. Formerly at Oracle, Pinal Co., Ariz. Described Vol. VI.

ARIZONA COPPER MINING CO. **ARIZONA.**

Office: care of Geo. H. Parker, secretary and treasurer, Los Angeles, Cal. Mine office: Tucson, Pima Co., Ariz. E. C. Griffith, president; Louis F. Fletcher, vice-president; preceding officers and P. G. Turner, directors; B. C. Brechta, superintendent. Lands, 20 claims, in the Tucson Mountains, having a 400′ tunnel, said to show an 8′ vein carrying ore of good grade. Presumably idle.

ARIZONA COPPER MOUNTAIN MINING CO. **ARIZONA.**

Office: care of B. T. MacMasters, secretary and treasurer, First National Bank Bldg., Chicago, Ills. Organized Jan. 25, 1901, under laws of Utah, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, area 120 acres, in process of patenting, 25 miles from a railroad, in the Copper Mountain district of Mohave county, Arizona, developed by 4 shafts, deepest 200′, and a tunnel of 183′, with a total circa 1,500′ of underground openings, showing 5 veins of 3″ to 30″ width, carrying oxide and carbonate ores, with a little chalcocite, giving good assays in copper, with gold values of $1.20 to $8.90 per ton. Presumably idle.

ARIZONA COPPER MOUNTAIN MINING CO. **ARIZONA.**

Dead. Title changed, 1904, to Copper Butte Mines. Formerly at Phoenix, Maricopa Co., Ariz.

ARIZONA COPPER PLACER MINING & MILLING CO. **ARIZONA.**

Mine office: Quartzite, Yuma Co., Ariz.

ARIZONA COPPER QUEEN MINING CO. **ARIZONA.**

Office: New York Life Bldg., Kansas City, Mo. Mine office: Mayer, Yavapai Co., Ariz. Shannon C. Douglas, president; Edwin Herrider, secretary; Ernest J. White, treasurer; Wm. Burr Douglass, general manager; preceding officers and H. C. Crowell, directors; John McIlwhee, superintendent. Organized July 24, 1907, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Lands, 6 claims, on Copper Creek, circa 25 miles southeast of Mayer, claimed to show 10 practically parallel veins, carrying ore assaying 6 to 84% copper, 2 to 57 oz. silver and $10 to $100 gold per ton. Development is by various trenches and by shafts of 30′, 30′, 35′, 40′, 60′ and 90′. Has a power plant with air-compressor. Suspended operations circa November, 1907, but planned resumption 1908.

ARIZONA COPPER SMELTING CO. **ARIZONA.**

Office: care of L. C. Miller, vice-president, Los Angeles, Cal. Letter returned unclaimed from former mine office, Kelvin, Pinal Co., Ariz. Dr. O. B. Bachman, president; Chas. H. Peck, secretary and treasurer; preceding officers and Edw. A. Gill, directors. Dr. O. B. Bachman, the president, cannot be located at former addresses in Los Angeles or New York; H. M. Sorrick, understood to be a director, says that he is not, and Chas. H. Peck, formerly secretary and treasurer, says he has resigned. William R. de Grouchy & Co., of Boston, the fiscal agents, have disappeared. Organized under laws of Arizona, with capitaliza-

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tion of $1,000,000, shares $10 par. Lands, said to be 20 claims, area circa 400 acres, on the western slope of the Pinal Mountains, 12 miles northeast of Kelvin, including the Bobtail, Black Jack and Brooklyn groups, having a 215′ shaft, said to be bottomed in a 9′ vein and claimed to have 1,800′ of workings, with alleged ore blocked out valued at $1,120,000, which is more than doubtful. The Bobtail mines are considered valuable, and some of the officers enjoy good local standing, but the company apparently is merely a bit of stock-jobbery.

ARIZONA COPPER SYNDICATE. **ARIZONA.**

Dead. Succeeded, Dec. 29, 1903, by Clifton Copper Mines, Ltd. Formerly at Clifton, Graham Co., Ariz.

ARIZONA COPPER SYNDICATE, LTD. **ARIZONA.**

Dead. An English twin of the Arizona Copper Syndicate. Formerly at Clifton, Graham Co., Ariz.

ARIZONA COPPER SYNDICATE OF PROVIDENCE. **ARIZONA.**

Office: 171 Westminster St., Providence, R. I. Mine office: Pearce, Cochise Co., Ariz. T. F. Gilbane, trustee and manager. Organized February, 1907, by a pool of old shareholders of the Copper King of Arizona, a concern of evil reputation and frequent reconstructions, which lost its property, under foreclosure, Aug. 28, 1905. Lands, 28 claims, 17 patented, and 2 millsites Mine has a 225′ incline shaft, with about 350′ of tunnels, showing some ore of good tenor. Smelter, having a 30-ton water-jacket blast-furnace, has been idle since 1902. Property is idle and company is desirous of selling out.

ARIZONA DIAMOND DRILL MINING DEVELOPMENT CO. **ARIZONA.**

Office: 313 West Second St., Los Angeles, Cal. Hon. Owen McAleer, president; Dr. Wm. Dodge, first vice-president; A. W. Bruner, second vice-president; J. S. Van Doren, secretary; Edwin F. Hill, treasurer; Oscar Reinholt, general superintendent. Organized under laws of Arizona. Owns a controlling interest in the Cashier Copper Mining Co., and is said to have an option on the McClure North Extension property, in the Bully Hill district of Shasta county, California. Is well equipped with diamond drills, and does a general drilling business, under the management of Mr. Reinholt, a practical man of experience.

ARIZONA & EASTERN MINES & POWER CO.

Office: 6-135 Grand Ave., Milwaukee, Wis. J. O. Buckley, president and treasurer; Henry R. Buckley, vice-president; Thos. T. Somers, secretary; Donald Ferguson, general manager and consulting engineer. Capitalization $7,500,000, shares $100 par. Company advertises that it wishes to purchase mining properties in Arizona or Sonora. No trace of operations.

ARIZONA & EASTERN MINING CO. **ARIZONA.**

Office: 637 Endicott Bldg., St. Paul, Minn. Mine office: Globe, Gila Co., Ariz. W. H. Sisson, president; T. W. Teasdale, vice-president; Maj. E. L. DeLestry, secretary and general manager; preceding officers, A. C. Osborne, W. H. Ulmer, Otto Bremmer and M. P. Ryan, directors. Organized December, 1905, under laws of District of Columbia, with capitalization $1,500,000, shares $1 par. Lands, 19 claims, area 380 acres, with a 20-acre millsite and 60 acres miscellaneous lands, in the Globe and Kelvin districts, including the Patterson group of 6 claims in the Mineral Creek district, some miles west of Globe. Properties are said to show 3 veins, of which one, under development, is reported as of 7′ average width, traceable 3,900′, ore being reported to carry an average of 2% copper, up to 50 oz. silver and $2.25 gold per ton, in covellite, bornite and chalcopyrite. Development is by a 181′ tunnel and by shafts of 120′, 165′ and 114′, with a total of 613′ of workings, estimated by company to put 116,000 tons of ore in sight, which estimate is excessive. Equipment includes a 500′ hoist and 5 buildings.

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ARIZONA, EASTERN & MONTANA SMELTING & ORE PURCHASING CO. **MONTANA.**

Dead. A swindle, promoted by the notorious parson-swindler, Dr. R. C. Flower.

ARIZONA-ECHO COPPER MINING CO. **ARIZONA.**

Office: Pasadena, Cal. Mine office: Planet, Yuma Co., Ariz. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands are sundry claims near the Signal mine, on the Bill Williams Fork River.

ARIZONA & ELY COPPER CO. **ARIZONA.**

Office: 704 Citizens National Bank Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Ariz. Frank Newnham, president; L. M. Lyle, secretary; M. A. Proper, treasurer. Organized 1906 with capitalization $3,000,000, shares $1 par. Lands, 3 claims, unpatented, 12 miles northeast of Wickenburg, said to carry 2 veins showing oxidized and sulphide copper ore, opened by 150′ of tunnels and drifts, also 2 claims near Ely. At last accounts company was offering stock at one cent per share. Idle. Is not regarded favorably.

ARIZONA EXPLORATION CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Ariz. R. D. F. Johnson, superintendent. Company is composed mainly of shareholders of the Arizona Smelting Co. and also is closely connected with the De Sote Mining Co. Property is the Blue Bell group, connected with the Prescott & Eastern Railway by aerial tram. The group of 3 claims has 3 fissure veins in Algonkian slates, with quartzite footwall and grano-diorite hanging, developed by 6 shafts, deepest 300′, and by tunnels of 70′ and 75′, showing cuprite, malachite and chalcopyrite, all slightly argentiferous and auriferous, with a large ore body opened on the 300′ level. Machinery is actuated by electric power, carried by a 10-mile transmission line.

ARIZONA EXPLORATION & DEVELOPMENT CO. **ARIZONA.**

Letter returned unclaimed from former office and mine, Globe, Gila Co., Ariz. S. L. Gibson, president; G. S. Van Wagenen, vice-president. Organized under laws of Arizona, with capitalization $1,000,000, shares 10 cents par. Lands, 5 groups, area 850 acres.

ARIZONA GIANT COPPER CO. **ARIZONA.**

Office: 229 Byrne Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Ehrenburg, Yuma Co., Ariz. R. M. Furlong, president; H. Franklyn Hiller, secretary and treasurer. Capitalization $3,000,000, shares $1 par. Lands, 320 acres. Old management, which sold considerable stock, at fancy prices, was ousted, September, 1903. Moribund.

ARIZONA GOLD & COPPER CO. **ARIZONA.**

Mine office: Winkelman, Gila Co., Ariz. Organized circa January, 1908, under laws of Arizona, with capitalization $500,000, by Chas. Bauer and C. A. Bauer—presumably the right and left. Lands are 6 miles northeast of Winkelman, near the Saddle Mountain mine. Presumably idle.

ARIZONA GOLD & COPPER CO. **ARIZONA.**

Dead. Lands sold, January, 1907, to Trenton Mining Co. Formerly at Patagonia, Santa Cruz Co., Ariz. Fully described Vol. VI.

ARIZONA GOLD & COPPER MINES CO. **ARIZONA.**

Dead. Formerly at Wickenburg, Maricopa Co., Ariz.

ARIZONA GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz.

ARIZONA GOLD & COPPER REDUCTION CO. **ARIZONA.**

Dead. A swindle, perpetrated by the notorious Theodore Stegner. Lands were claimed to be in Yuma and Mohave counties, Arizona.

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ARIZONA GOLD LODE MINING CO. **ARIZONA.**

Dead. Reorganized, circa 1906, as Arizona Copper-Gold Mines Co. Formerly at Humboldt, Yavapai Co., Ariz.

ARIZONA GOLD MINING CO. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Wood Poland, superintendent. Has gold and copper ores, with steam power.

ARIZONA GOLD MINING CO. **ARIZONA.**

Dead. Formerly at Wickenburg, Maricopa Co., Ariz.

ARIZONA GOLD MINING & DEVELOPING CO. **ARIZONA.**

Office: 706-140 Dearborn St., Chicago, Ills. Mine office: P. O. Box 1300, Bisbee, Cochise Co., Ariz. E. C. Reichwald, president. John M. Dunphy, vice-president; Wm. E. Blakemore, treasurer; Geo. A. Smith, secretary; S. Mercer, superintendent. Capitalization $2,500,000. Lands, in Tombstone Cañon, near the divide, are slightly developed by tunnel.

ARIZONA GOLD MINING & MILLING CO. **ARIZONA.**

Dead. Formerly at Briggs, Yavapai Co., Ariz.

ARIZONA-HANCOCK CONSOLIDATED MINING CO. **ARIZONA.**

Office: Hancock, Mich. Mine office: Florence, Pinal Co., Ariz. John D. Cuddihy, president; Alfred C. Sieboth, vice-president and superintendent; Henry L. Baer, secretary and treasurer. Organized Mar. 26, 1903, under laws of Arizona, as successor to the Arizona & Hancock Mining Co., with capitalization $500,000, shares $10 par. Annual meeting, first Tuesday after first Monday in March. Lands, 4 claims, patented, 2 miles south of Superior, showing a vein traversing two claims parallel to the vein of the Lake Superior & Arizona, with diabase footwall and limestone hanging, opened by a short tunnel and a winze of 55′, with drifts on two levels, showing lead above and copper below. Idle for some years.

ARIZONA & HANCOCK MINING CO. **ARIZONA.**

Dead. Succeeded, March 26, 1903, by Arizona-Hancock Consolidated Mining Co. Formerly at Florence, Pinal Co., Ariz.

ARIZONA HERCULES COPPER MINING CO. **ARIZONA.**

Office: 386 Pacific Electric Bldg., Los Angeles, Cal. Mine office: Kelvin, Pinal Co., Ariz. W. T. Dunham, president; Wm. Bayly, vice-president; E. G. Thomas, secretary and treasurer; preceding officers, R. H. Reid and Clarence K. McCornick, directors. Organized September, 1906, under laws of Arizona, with capitalization $10,000,000, shares $10 par. Lands, on Mineral creek, near the Ray and Silver King mines, about 7 miles from Kelvin, are slightly developed by shaft and diamond drill borings.

ARIZONA LE ROI COPPER MINING CO. **ARIZONA.**

Office and mine: Kingman, Mohave Co., Ariz. J. N. Turrentine, president; W. H. Bradley, vice-president; preceding officers, W. S. Shafer, Geo. H. Craig, Francis M. Townsend and J. H. Sampson, directors; Maj. W. A. Mensch, secretary and treasurer. Organized Nov. 17, 1906, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, well watered and timbered, adjoining the Enterprise mine, circa 18 miles from Kingman, with good wagon road to within 1 mile. Has about 400′ of openings, showing carbonate ores.

ARIZONA MERCANTILE, TRANSPORTATION & SMELTING CO. **ARIZONA.**

Office: Leavenworth, Kans. Mine office: Casa Grande, Pinal Co., Ariz. Capitalization 1,000,000 shares, presumably $1 par. Lands, 5 claims and a millsite, near Casa Grande, with a 20-stamp mill and a 50-ton smelter. Is not regarded favorably.

ARIZONA-MEXICAN COPPER CO. **MEXICO.**

Office: Phoenix, Ariz. Mine office: Caborca, Altar, Sonora, Mex. J. E. Hubinger, president; W. E. Defty, vice-president and consulting engineer; W. C. Foster, treasurer; C. T. Vincent, superintendent. Organized Feb. 14,

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1902, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Lands, 79 pertenencias, known as La Gran Provedora de Cobre, 75 miles from the Sonora Railway. Country rock is granite, ores carrying an iron and spar gangue, giving a self-fluxing ore. Vein is up to 228′ wide, giving average assays of 6.7% copper, 12 oz. silver and $2 gold per ton, and is opened by shafts of 102′ and 200′, and by tunnels of 209′ and 228′, with a total of about one-half mile of openings. From the 400′ level down some ore bodies assayed 22% to 30% copper and as high as 131 oz. silver per ton. Management is good and property is considered promising.

ARIZONA-MEXICAN MINING & SMELTING CO. **ARIZONA & MEXICO.**

Office: Allentown, Pa. Works office: Needles, San Bernardino Co., Cal. Dr. H. K. Hartzell, president; H. H. Godshall, secretary and treasurer; Dr. L. D. Godshall, general manager and resident director; Saml. Fields, mine superintendent. Organized Dec. 6, 1904, under laws of Arizona, with capitalization $2,500,000, shares $10 par.

Lands include property formerly held by the W. S. Fletcher Mining & Smelting Co., holdings including mining properties at Siam, California; Cerbat and Kingman, Arizona, and 16 idle claims near Florence, Pinal County, Arizona. The Valley Wells mine produced a little copper ore in 1906. The Stockton Hill or Banner mine, 12 miles north of Kingman, opened by a tunnel of circa 1,300′ length, has silver-lead ore, slightly auriferous, of good average tenor. The Infallible mine is said to show a 20′ vein of high grade ore.

The smelter, remodeled and slightly enlarged to about 125 tons daily capacity, is well designed and equipped, though small, having both lead and copper stacks, with a six-hearth McDougal calciner and a 100′ steel smoke-stack. The lead furnace is 46x120″, with No. 6 Connersville blower and 65-h. p. engine. Works include a small but complete sampling mill, 35x37′ in size, and are well located to serve a district having numerous small mines with rich ores, in which there is no smelter. Lead mines were idle at last accounts, but planned early resumption.

ARIZONA & MICHIGAN DEVELOPMENT CO. **ARIZONA.**

Office: Benson, Ariz. Mine office: Johnson, Cochise Co., Ariz. A. J. Pidgeon, president and general manager; Hon. Stephen Roemer, secretary and treasurer; Mortimer Wien, superintendent. Organized 1904, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands, 7 claims, patented, area 140 acres, showing porphyry and limestone carrying 4 ore bodies, 1 under development by vertical and incline shafts and by tunnels, showing a 5′ vein with poorly defined walls and impregnations in the limestone hanging and porphyry footwall. Has a 150′ two-compartment main shaft. Ores are cuprite, malachite and copper sulphides giving average assays up to 12% copper, 18 oz. silver and $1 gold per ton. Has a 60-h. p. gasoline engine with double-drum hoist, and has shipped a little good ore to El Paso smelter.

ARIZONA MINE. **WYOMING.**

Office and mine: care of Horace E. Adams, owner, Hecla, Laramie Co., Wyo. Lands, 4 claims, area 80 acres, in the Silver Crown district, opened by a 160′ shaft and tunnels of 100′, 100′, and 120′, showing native copper, oxides, carbonates, chalcocite and chalcopyrite. Has gasoline power and a small leaching plant.

ARIZONA MINES CO. **ARIZONA.**

Mine office: Casa Grande, Pinal Co., Arizona. C. L. Shaw, superintendent, at last accounts. Idle.

ARIZONA MINING CO. **NEW MEXICO.**

Office: 311 Pozzoni Bldg., St. Louis, Mo. Letter returned unclaimed from former mine office, Pinos Altos, Grant Co., N. M. Apparently moribund.

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ARIZONA MINING & TRADING CO. **MEXICO**

Office: care of C. A. Overlock, general manager, Douglas, Ariz. Letter returned unclaimed from former mine office, Nacozari, Moctezuma, Sonora, Mex. C. W. Crawford, assistant general manager; H. C. Holbrook, mine superintendent. Organized 1906. Lands are in 2 groups, 8 miles and 16 miles southeast of Nacozari, former, known as Los Angeles mine, having a 75′ shaft showing chalcopyrite of good grade. A carload of ore shipped, 1907, to the Copper Queen smelter, gave returns of 12.5% copper and 46 oz. silver per ton. Has a concentrater and employed about 30 men at last accounts. Property considered promising.

ARIZONA MINING & MILLING CO. **ARIZONA.**

Mine office: Poland, Yavapai Co., Ariz. Property, immediately south of the Poland Mining Co., was held formerly by Poland Extension Gold Mining & Milling Co. Mine is being developed by a blind shaft from the 170′ Fitzhugh Lee tunnel, latter, run jointly with the Cardinal Mining Co., showing copper, lead and zinc sulphides. Has a hoist and air-compressor.

ARIZONA NATIONAL COPPER CO. **ARIZONA.**

Office: 327 Pine St., Williamsport, Pa. Mine office: Globe, Gila Co., Ariz. Thos. M. B. Hicks, president and treasurer; C. S. Messerly, secretary; LeRoy Scholl, general superintendent; Thos. Kelley, mine foreman. Organized Feb. 1, 1906, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Bonds, $300,000, at 5%. Lands, 14 claims, also a 15-acre millsite and 100 acres timber lands, formerly known as the McNelly-Crowley property, on Pinto Creek, carrying contact veins between schist and granite, said to average 14′ in width and traced 785′, showing considerable high-grade oxidized ores, including chrysocolla and native copper, with some chalcopyrite and occasional bornite. The 80′ ledge of decomposed schist is impregnated with copper sulphides, and perhaps could be concentrated. Development is by shafts of 50′ and 85′, and by tunnels of 195′, 250′ and 300′, with a total of circa 2,000′ of workings. Has steam power. President Hicks has disclaimed responsibility for statements emanating from other officers claiming 18,840,000 tons of concentrating ore, and 3,297,000 tons of smelting ore in sight, with 1,000,000 tons blocked out for stoping.

ARIZONA-NEVADA CONSOLIDATED GOLDFIELD MINING CO. **ARIZONA.**

Mine office: Bisbee, Cochise Co., Ariz. Clarence H. Woodcock, manager. Presumably idle.

ARIZONA & NEW SOUTH MINING CO. **ARIZONA.**

Letter returned unclaimed from former office, 501 Delta Bldg., Los Angeles, Cal. Mine office: Oracle, Pinal Co., Ariz. Chas. W. Pressley, president; Jas. H. Bennett, treasurer and general manager. Lands, 7 claims, in the Cañada del Oro district, fairly watered and timbered, showing ore carrying copper, silver and gold values. Has a gasoline hoist.

ARIZONA & OHIO MINING CO. **ARIZONA.**

Dead. Formerly had an office at 409 Republic Bldg., Cleveland, Ohio.

ARIZONA-PACIFIC COPPER CO. **ARIZONA.**

Office: 705 State Life Bldg., Indianapolis, Ind. Mine office: Florence, Pinal Co., Ariz. F. P. Jeffries, president; John W. Sharpe, vice-president and general manager; Henry Severin, treasurer; Murat W. Hopkins, secretary. Organized March 30, 1903, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Lands, 16 claims, area 320 acres, also an 80-acre smelter site and 160 acres of possible oil lands, lying at Wooley, about 7 miles south of Kelvin, connected by 4-mile wagon-road with the Phoenix & Eastern railway. Property shows sundry minor veins, assaying 3 to 20% copper and $5 to $20 gold per ton. A much shattered quartz-porphyry dike, 1,200′ long

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and about 500′ in extreme width, with axes east and west, is cemented by veins carrying cuprite, melaconite and chalcocite, having estimated average values of 3% copper, 1 oz. silver and $2 gold per ton. Has shafts of 80′ and 350′, also tunnels of 260′ and 342′. Has 2 gasoline hoists, air-compressor, power drills, and necessary mine buildings. Officers of company are men of good standing and property is regarded as promising, owing to great size of the ore body, though the ore is low in tenor, but well adapted to close and economical concentration.

ARIZONA-PITTSBURG MINING & SMELTING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. T. A. Cox, general manager. Lands, 3 miles east of Patagonia, have a 240′ shaft showing mainly galena, with small silver and copper values.

ARIZONA SMELTING CO. **ARIZONA.**

Office: 71 Broadway, New York, N. Y. Works office: Humboldt, Yavapai Co., Ariz. J. Kearney Rice, receiver; T. H. Oxnam, general manager. Is supposedly controlled by Thomas W. Lawson, of Boston. Most of the old officers resigned, very wisely, as soon as Lawson secured control, this being followed promptly by a receivership. Organized February, 1905, under laws of New Jersey, with capitalization $150,000, shares $1 par, which capitalization probably has been increased. Is controlled, through ownership of entire stock issue, by Consolidated Arizona Smelting Co., and is closely connected with De Soto Mining Company. Bonds were $180,000, issued at 5%. Annual meeting, first Monday in December.

The concentrator, size 160x200′, known as the De Soto mill, of 400 tons daily capacity, in two 200-ton units, is equipped with 2 Blake crushers, 2 centrifugal crushers, 4 trains of rolls, 2 Hancock jigs, 16 Overstrom tables, 16 vanners and 8 sizers. The sampling mill, fully equipped, is rated at 1,000 tons daily capacity. The yard had 4 miles of 65-lb. railroad tracks, and there is a complete water system for fire protection. All buildings are of structural steel frame, with brick walls or corrugated iron sheathing, floored with cement. Miscellaneous buildings include a well-equipped machine shop, smithy, laboratory, offices, etc., and the works are lighted by electricity. The entire plant was designed and constructed under the supervision of Cyrus Robinson and Charles E. Finney.

The smelter, of 1,100 tons daily capacity, is so planned that it can be increased to 1,500 tons when desired. The works have both lead and copper stacks, the 200-ton lead furnace being 48x60″, and there are four 250-ton copper blast-furnaces. The works have three 100′ Edwards mechanical roasters, with a daily capacity of 350 tons, burning petroleum. There are three 100′ reverberatory furnaces, of the Anaconda type, rated at 400 tons daily capacity, which burn petroleum. The converter department has 2 stands, with shells of barrel type, rotated electrically. Slags are granulated. The power plant has four 345-h. p. Stirling water-tube boilers, burning waste gases from the reverberatories, with 3 cross-compound Nordberg engines of 1,600 h. p. aggregate capacity, 2 Connersville blowers and electrically driven turbine pumps. Fuel is California petroleum and water is secured from the underflow of a nearby river. The smelter has a 40-ton Whiting electric crane and a 15-ton auxiliary crane. The works include an electric light and power plant, which also furnishes power for operation of the Blue Bell mine, 18 miles distant, transmitting current at a voltage 15,000, stepped down to 440 volts at the Blue Bell transforming station, before delivery to the motors. The smelter is well located for a general custom business, and apparently was doing well before the break in the metal market of July, 1907, but a receiver was appointed, November, 1907. The works employed nearly 300 men when running with full forces.

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ARIZONA & SONORA COPPER INVESTMENT CO. **MEXICO.**

Dead. Dissolved, 1901. Formerly in Sonora, Mexico.

ARIZONA-SOUTHWESTERN COPPER CO. **ARIZONA.**

Office: 10 Board of Trade, Pueblo, Colo. Mine office: Cedar, Mohave Co., Ariz. P. C. Schramm, president; L. Hoffman, vice-president and manager; J. H. Hoffman, secretary and treasurer; preceding officers, W. G. Laidely, R. H. Weber, P. T. Ward and E. T. Mischeler, directors. Organized 1907, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 9 claims, area 180 acres, in the Hualapai Mountains, slightly developed by shaft showing veins reported as 4′ to 60′ wide, giving assays up to 4% copper, 8% lead, 4% zinc and 12 oz. silver per ton.

ARIZONA SUCCESS MINING CO. **ARIZONA.**

Mine office: Salome, Yuma Co., Ariz. B. T. Hickman, president; Austin E. Park, vice-president; Adolph Moltzen, secretary. Organized under laws of Arizona with capitalization $1,000,000, shares $1 par. Lands include 2 claims near Goldfield, Esmeralda county, Nevada, 8 claims southeast of Quartzite, formerly held by Apache Chief Mining Co., having circa 800′ of workings, and a group of 6 claims in the Plomosa district, Arizona, latter said to show 5 contact veins, 2 of which, of 21′ average width, are said to carry oxidized ores giving average assays of 15% copper, 40 oz. silver and $1 gold per ton, which figures seem high. Property has shafts of 50′, 75′, 110′ and 250′, and is said to have circa 1,700′ of workings. The equipment includes a 16-h. p. hoist and several mine buildings, and company is said to plan a concentrator. A 15-ton ore shipment to the Humboldt smelter is claimed to have netted $1,087. Company claims to guarantee a dividend of 1½ cents per share on all stock placed at 5 cents per share, and is regarded with suspicion. Employed circa 10 men at last accounts.

ARIZONA SYNDICATE. **ARIZONA.**

Dead. Formerly at Kelvin, Pinal Co., Ariz. Described Vol. VI.

ARIZONA UNION CONSOLIDATED GOLD & COPPER MINES CO. **ARIZONA.**

Office: care of J. B. Hall, president, Cincinnatus Bldg., Cincinnati, Ohio. Jos. H. Mageer, secretary. Lands are said to be 54 claims in northern Arizona, circa 150 miles from Fairfield, Utah, the nearest railroad station. Company's literature deals liberally in glittering generalities. Property idle at last accounts, with every likelihood of remaining so.

ARIZONA UNITED COPPER CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

ARIZONA UNITED COPPER MINING CO. **ARIZONA.**

Dead. Formerly had an office in St. Louis.

ARIZONA-UTAH COPPER CO. **ARIZONA.**

Office: care of H. C. Weaver, secretary and treasurer, Salt Lake City, Utah. Mine office: Jerome, Yavapai Co., Ariz. W. H. Jones, president; S. S. Pond, vice-president; preceding officers, Geo. B. Weaver, J. F. Harding and H. H. Cornforth, directors. Organized 1906, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, known as the Exchange group.

ARIZONA & WEST LAKE COPPER CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. V.

ARIZPE GOLD & COPPER CO. **MEXICO.**

Dead. Demise occurred 1905, under suspicious circumstances. Formerly at Arizpe, Sonora, Mex.

ARIZPE MINING CO. **MEXICO.**

Office and mine: Ap. 130, La Cananea, Arizpe, Sonora, Mex. Jas. H. Kirk, president; J. P. Hallihan, vice-president; Frank S. Wilhelm, second vice-president and general manager; Guy Hurlbut, third vice-president; Geo. Young,

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secretary; M. H. C. Vedder, assistant secretary. Organized Nov. 20, 1903, under laws of Arizona, with capitalization $1,000,000, shares $5 par. Direct title to lands is held through the Moctezuma-Arizpe Development Co., S. A., organized under laws of Mexico. Chicago Title & Trust Co., registrar and transfer agent. Annual meeting, last Monday in January.

Lands, 6 groups, area circa 27,000 hectares, in the Manzanal Mountains, 15 miles southeast to 17 miles northeast of La Cananea, the nearest railroad point, and about 2½ miles from the Sonora River, with a good wagon road from the mine to the river. Lands have been divided by the company into 25 full blocks of 1 square kilometer each, and 5 fractional blocks.

Principal property is the Alacran mine, area 75 hectares, showing ore at the contact of quartz-porphyry with andesite, in a vein of 3′ to 4′ width, carrying mainly gold and silver values, with lead and some copper, having produced ore assaying up to $270 per ton in values.

The Rey del Cobre mine, area 125 hectares on Block 21, shows low-grade copper ore.

The Palo Seco mine, area 86 hectares, on Block 11, has a tunnel said to show a ledge of about 200′ width, carrying some high-grade silver, lead and copper ore, and second-class argentiferous ore of about 4% copper tenor.

The Manhattan mine, area 2,274 hectares, on Blocks 15 and 16, shows native copper.

Miscellaneous holdings include La Victoria mine and La Sevilla mines, area 24 hectares each, and La Princessa mine, area 15 hectares.

The property is one of considerable promise.

ARKANSAS & ARIZONA COPPER CO. **ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. J. T. Robertson, president; Chas. T. Lynch, vice-president; Walter C. Miller, treasurer; Ralph A. Smith, secretary; J. E. Leeper, general manager; preceding officers, W. M. Kavanaugh and S. P. Part, directors. Organized June 25, 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 14 claims, area 280 acres, known as the Royal Irish group, in the Verde district, having a 552′ shaft, sunk through alluvium, carrying a little gold, shaft evidently being sunk in a deep basin. Has a 50-h. p. Leyner hoist, good for 1,500′ depth, and an 8-drill Rand air-compressor, with 30x40′ power-house and 7 miscellaneous buildings. Officers stand well locally.

ARKANSAS MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Helena, Lewis and Clark Co., Mont. Lands, 2 miles west of the summit of Mount Helena, show a vein traceable 800′, assaying well in copper, with small gold and silver values.

ARKANSAS VALLEY SMELTING & REFINING CO. **COLORADO.**

Works office: Leadville, Lake Co., Colo. Is controlled by the American Smelting & Refining Co.

ARLINGTON-BURNS COPPER-GOLD CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Greenwood, Boundary district, B. C. Described Vol. VI.

ARLINGTON COPPER CO. **NEW JERSEY.**

Dead. Lands, at Arlington, Hudson Co., New Jersey, sold Sept. 30, 1903, for debt. Described Vol. II.

ARLINGTON MINING CO. **MONTANA.**

Office and mine: Mullan, Shoshone Co., Idaho. Organized under laws of Idaho. Lands, 30 claims, in the Mountain House unorganized mining district of Sanders county, Montana, showing ores said to give good average assays in copper, and to carry up to 6% lead.

ARLINGTON MINING CORPORATION. **WASHINGTON.**

Letter returned unclaimed from former mine office, Conconnully, Okanogan Co., Wash. Mine has a shaft, and an old crosscut tunnel nearly 1,000′ in length,

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planned to give a 400′ back, showing auriferous and argentiferous copper ore, with some native silver, copper being in small percentages, but increasing with depth. Has gasoline power and an air-compressor. Idle and presumably moribund.

FRANCISCO ARMENDAIZ SUCESSORES. **MEXICO.**

Office: Apartado 37, Monterey, N. L., Mex. Mine office: Cerralvo, Nuevo León, Mex. Don Francisco Armendaiz, manager; Don José Armendaiz, assistant manager. Property includes the Refugio and Barredon mines, carrying slightly argentiferous lead ores, which are properties of merit, and the Colorado mine, carrying ore up to 3% in copper tenor. Employs circa 60 men.

ARM EXPLORATION CO. **CALIFORNIA.**

Office: Kennett, Cal. Mine office: Raymond, Madera Co., Cal. Is said to have a fair sized ore body, carrying high grade melaconite.

COMPAÑIA LA MINA ARMONIA. **CHILE.**

Mine office: Carrizal Alto, Freirina, Atacama, Chile. Property is an old mine, opened to depth of 414 metres, which has been a considerable producer in the past, but output, according to last official returns available, is now insignificant.

ARNOLD MINING CO. **MICHIGAN.**

Office: 64-50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. C. Howard Weston, president; John Brooks, secretary and treasurer; Wesley Clark, superintendent. Annual meeting, second Tuesday in May. Organized 1864, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $1,550,000. Lands, 3,323 acres, in T. 58 N., R. 31 W., in two tracts, including the Old Copper Falls mine and the Arnold mine proper, with frontage of about 3 miles on Lake Superior. The Copper Falls mine, worked, circa 1850 until August, 1893, made 12,843 tons, 429 lbs. fine copper, mainly from the Owl Creek fissure, and paid dividends of $100,000. The Arnold mine proper, developed on the Arnold ashbed, was opened 1863, reopened 1897, closed 1901, rock stamped averaging under 0.8% copper. Has a stamp-mill and 2½ mile narrow-gauge railroad, known as Arnold & Eagle Harbor, rolling stock of which has been sold. No. 1 shaft of the Arnold is about 1,000′ deep, sunk at an angle of 26° with the horizon. Employs 4 men on exploratory work and found a considerable mass of native copper, June, 1907.

ARRINO PROPRIETARY COPPER MINING CO. **AUSTRALIA.**

Office: 17 Queen St., Melbourne, Australia. David Blair, manager. Property, in Western Australia, shows sandstone beds of Permian age, ore occurring as bunches and thin veins following the joints and fissures of the sandstone. Ores are mainly oxides and carbonates, with a little sulphide ore exposed recently. Sandstone formation, occupying a basin with gneiss walls, is about 300′ wide by one mile long. Bulk parcels of ores shipped have given returns of 3.75% to 25% copper. Property has rail connections, but the process best adapted to treating ores of such unusual nature and occurrence had not been decided upon, at last accounts. Idle.

ARTOLA HERMANOS. **CHILE.**

Dead. Sold their property at Cobija, Tocopilla, Antofagasta, Chile, to the Compañia de Minas i Fundiciones de Gatico.

ARZARD MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. L. Bryant, manager. Lands, 160 acres, patented, on Round Mountain, 5 miles south of Chewelah, opened by an 80′ tunnel, said to show a 30′ vein of medium grade copper ore.

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ERZBERGWERKE ASBECK BRÜGGEN-UND BRÜGER-ROBERT. **GERMANY.**

Mine office: Rönsahl, Westfalen, Germany. Idle for several years.

ASHBED MINING CO. **MICHIGAN.**

Office: 64-50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. C. Howard Weston, president; John Brooks, secretary and treasurer; Wesley Clark, superintendent; preceding officers, T. P. Farmer and W. C. Fiske, directors. Organized, 1880, under laws of Michigan, with capitalization $1,000,000, shares $25 par. Annual meeting, second Tuesday in March. Lands, 1,143 acres, in vicinity of Copper Falls, adjoining the Arnold mine. Was known originally as the Petherick. Did some exploratory work 1905-1906; since idle. Very fully described Vol. II.

ASHEBORO COPPER MINING CO. **NORTH CAROLINA.**

Mine office: Asheboro, Randolph Co., N. C. H. D. Landers, president; D. M. Holliday, vice-president; W. C. Hammond, treasurer; M. W. Parrish, secretary; W. L. Thurber, manager. Organized under laws of North Dakota, with capitalization $100,000, shares $1 par. Lands 93 acres, on which a little mining was done in the Nineteenth Century. A carload of ore gave returns of $16.85 per ton, with 8.6% copper and small gold values. Also had an option on 400 acres of gold-bearing lands at last accounts.

ASHIO MINES. **JAPAN.**

Owned by Furukawa Mining Co.

ASHLAND MINING CO. **COLORADO.**

Mine office: Ohio, Gunnison Co., Colo. Carroll M. Carter, superintendent, at last accounts. Property is the Carter group, carrying gold, silver, lead, copper and zinc ores. Has steam power.

ASH PEAK MINING CO. **ARIZONA.**

Mine office: Duncan, Graham Co., Ariz. Arthur J. Murphy, Jr., manager. Has secured assays giving high values in copper, silver and gold. Has power equipment and ore-bins.

COMPAÑIA MINERA DE ASIENTOS. **MEXICO.**

Mine office: Asientos, Ocampo, Aguascalientes, Mex. Harry Rab, superintendent. Lands include the Nopensada and Alta Palmira mines, antiguas, and the Veta Grande and Refugio mines. The Nopensada, said to have been a considerable producer in early days, carries mainly slightly argentiferous copper ore. The Alta Palmira, having a 200′ shaft, produces mainly silver ore, with small copper values in the upper workings. The Refugio is said to show ore carrying up to 13% copper, with 1,100 grams silver per metric ton, and small gold values. Mines are not developed extensively. Equipment includes a steam and electric plant at the Nopensada and 2 electric hoists at the Alta Palmira. Property was leased to Asientos Copper Co., but latter said, June, 1908, to plan relinquishing the lease. Considerable ore was shipped, 1907.

ASIENTOS COPPER CO. **MEXICO.**

Mine office: Asientos, Ocampo, Aguascalientes, Mex. J. F. Foster, superintendent. Company is said to plan relinquishing the property, which is held under lease from the Compañia Minera de Asientos.

WALTER ASKEW. **MEXICO.**

Office and mine: Guachinago, Jalisco, Mexico. Property is known as the Ocote, showing a large vein giving good assay values in copper, silver and gold.

ASMUS BOYSEN MINING CO. **WYOMING.**

Office: 226 South Clark St., Chicago, Ills. Mine office: Thermopolis, Frémont Co., Wyo. Asmus Boysen, president; N. C. Brorson, secretary and

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treasurer. Organized under laws of Wyoming, with capitalization $25,000,000, shares $100 par. Boysen claimed the right to locate 180,000 acres on the Shoshone Indian reservation, in consideration of reliquishing a contract with the Shoshone and Arapahoe Indians, but fell afoul of the United States government, and finally compromised on 640 acres. Company claims to own silver, oil and coal lands. Several long tunnels have been driven, and a tram built, but whether ore has been found or not is known only to the management. Company is building a light and power plant.

SOCIÉTÉ CIVILE DES MINES DE CUIVRE D'ASPEICH. FRANCE.

Office: 3, Rue de Milan, Paris, France. G. Caton, manager, at last accounts. Lands are in the Basses Pyrenees, France. Idle for some time.

ASTOR MINING CO. COLORADO.

Mine office: Eureka, San Juan Co., Colo. E. C. Condit, superintendent. Property includes the Surprise, Mogul and other claims, carrying ores of gold, silver, lead and copper. Has steam, water and electric power.

ASTROLABE MINING SYNDICATE. NEW GUINEA.

Mine office: Port Moresby, British New Guinea. Lands, 150 acres, near Sapphire Creek, circa 16 miles from Port Moresby, main tract of 120 acres being a reward claim for discovery. The main tract has a 50′ shaft, said to show a 6′ vein carrying cupriferous and arsenical pyrite, giving assays of 3% copper, with traces of gold and silver, but the surface ores, in alluvium, are mainly malachite, giving returns, 1906, from shipment of 17 tons, of 26.8 to 32% copper, with traces of gold. Apparently this ore was secured from detrital material, deposited by the Laloki river. A 30-acre tract lying one mile east of the main workings shows a gossan carrying green carbonate stains assaying 3 to 4% copper, and a short tunnel shows a little malachite and cuprite. Was making, early 1908, bi-monthly shipments to Newcastle, of 40 tons of ore, ranging 20 to 40% in copper tenor.

SOCIEDAD INDUSTRIAL ASTURIANA. SPAIN.

Dead. Formerly at Torres, Teruel, Spain.

SOCIEDAD INDUSTRIAL DE ATACAMA. CHILE.

Office: Copiapó, Atacama, Chile. Works office: Tierra Amarilla, Copiapó, Atacama, Chile. Mine office: Almolanos, Copiapó, Atacama, Chile. Principal mine is the Lautaro, in the San Antonio district, carrying an abundance of chalcopyrite of 5 to 7% copper tenor, with limestone gangue, in a porphyry dyke. A modern concentrator was built, 1904, at Lautaro, and a large hydro-electric installation, to utilize the power of a nearby river and distribute same for some distance, was under construction at last accounts. The Descubridora mine, at Puquios, also has been rehabilitated with a new plant, including steam and electric power.

The smelter, on the line of the Copiapó & Interior railway, does a custom business also, treating silver-lead ores as well as copper. The Tierra Amarilla plant includes 6 reverberatory furnaces turning out Chile bars, two 3-deck calcining furnaces, 2 reverberatory furnaces for bars and two 54x54″ blast-furnaces. The power plant includes four 110-h. p. boilers and 3 small electric motors. Fuel is local coal and imported coke, latter used in charges of 1 ton to 6 tons of ore. Product is auriferous and argentiferous Chile bars and ejes, ores treated, 1903, averaging 11.74 to 12.42% copper. Smelter employs 150 men, at average wages of 2.25 pesos daily.

Company also owns a smelter at Caldera with a 120-ton rectangular blast furnace and converter. This has gas engines, run by producer gas, which show a great economy over the old steam plant, works also having electric power, with independent motors for each department. Production of the company, 1903, was 2,396,252 lbs. fine copper.

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ATACAMA MINERAL CO., LTD. **CHILE.**

Dead. Voluntarily liquidated, July, 1902. Formerly at Taltal, Atacama, Chile.

ATBASAR COPPER FIELDS, LTD. **SIBERIA.**

Office: care Speyer & Sons, 65 London Wall, London, E. C., Eng. Organized Nov. 28, 1907, under laws of Great Britain, with capitalization £350,000, shares £1 par, to acquire copper properties in Siberia.

ATE MINE. **JAPAN.**

Mine office: Komatsu, Kaga, Japan. The mine has two main veins, in liparite and brecciated tuff, one being a fissure and one a contact vein. These veins cross, the intersection giving the richest ore, while at a little distance from the point of intersection the veins thin out and become of poor quality. Ore is mainly chalcopyrite, with iron pyrites, showing some bornite and tenorite, and averages about 10% copper in the upper portions. Production, 1900, was 231,484 lbs. fine copper, and in 1907 was only 194,305 lbs. fine copper.

ATHELSTAN GOLD MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Absorbed, 1907, by Dominion Copper Co., Ltd.

ATHELSTON & JACKPOT MINING CO. **BRITISH COLUMBIA.**

Dead. Absorbed, 1904, by Montreal & Boston Cons. Mining & Smelting Co.

ATLANTIC MINING CO. **MICHIGAN.**

Office: 15 William St., New York, N. Y. Mine office: Atlantic Mine, Houghton Co., Mich. Joseph E. Gay, president; John R. Stanton, secretary and treasurer; preceding officers, J. Wheeler Hardley, William A. Paine and Samuel L. Smith, directors; F. McM. Stanton, agent; Theodore Dengler, superintendent; F. G. Coggin, mill superintendent; John Stratton, mining captain; Hon. A. D. Edwards, clerk; John Grigg, master mechanic.

Organized December, 1872, under laws of Michigan, reincorporated, 1901, for term of 30 years, and capitalization increased, 1902, to $2,500,000, shares $25 par; $9.80 paid in. Annual meeting, second Tuesday in March. American Loan & Trust Co., Boston, transfer agent. Boston Safe Deposit & Trust Co., registrar. Has paid dividends of $990,000, last dividend being $50,000, in 1905.

The old Atlantic mine lies about 2 miles south of Portake Lake, and 4 miles southwest of Houghton, on a 640-acre tract, including the mines known before 1872 as the South Pewabic and Adams. The Atlantic lands, all on the mineral belt, are the South ½ of Section 4, except the Southeast ¼ of the Southeast ¼; North ½ of Section 9; Northwest ¼ of Section 10, and Section 16, all in town 54 North, Range 34 West; also several thousand acres of timber lands, a millsite on Lake Superior and valuable frontage on Portage Lake. The old mine, fully described in Vol. V., was opened on an amygdaloidal bed of about 15′ width, the lode being the most westerly worked in Houghton county, and known locally as an ashbed. This bed returned an average of about 14 lbs. fine copper per ton. There are 6 shafts, lettered in order from north to south as A to F. C shaft was abandoned after the fire of 1908; E shaft was used for a manway only and F shaft was put out of commission in 1902. Beginning 1904, serious trouble was experienced from caving ground and air-blasts, the latter being merely artificial earthquakes caused by subsidence of the hanging wall. The old stopes average about 15′ width for nearly a mile in length and for nearly a half mile in depth. Air-blasts continued with increased severity, finally ruining the shafts and putting the mine out of commission May, 1906. Efforts were made previously to work on a modification of the caving system, but were too late, and the mine was lost. It may be reopened at some future time, by sinking new incline shafts on the footwall. Probably 2 new shafts of large capacity would be sufficient to operate the entire mine, which is estimated to contain about 6,000,000 tons of stamp-

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rock, which, though low in grade, should be worked at a fair profit, as the Atlantic was noted, for two decades, as the lowest grade profitable mine in the world, the management performing wonders in the way of economical extraction of values that, under ordinary circumstances, would have been hopelessly unpayable.

At the old mine there is an unusually well-built mining town of 3,000 population, having about 500 buildings, half owned by the company, with several churches and one of the best graded schools in the state. Mining equipment included a number of shops, engine-houses and shafthouses, with powerful and effective hoists, air-compressors and general mining machinery.

The lands of the old Atlantic mine should carry the southern extension of the Pewabic lode, worked by the Quincy Mining Co., though this never has been located. Sections 4, 9 and 10 were tested, 1907, by trenching and diamond-drill bores, and a shallow shaft was sunk on the so-called Calico lode, which parallels the Atlantic ashbed about one-half mile to the eastward, but nothing of especial promise was developed.

The future of the Atlantic apparently lies in the new mine now being opened on Section 16, between the rich Baltic mine and the highly promising Superior mine. An exchange of 39 acres, made 1905, between the Atlantic and Baltic corporations, corrected lines for both, and obviated pocketing the northernmost shaft of the Baltic and the southernmost shaft of the Atlantic, while the Atlantic also secured the hinterland of the Baltic lode, necessary for engine-houses, shafthouses, power plants and general shops, and giving the Atlantic sufficient outcrop of the Baltic bed to sink 2 shafts. Exploratory work, 1897-1903, failed to locate the extension of the Baltic lode, owing to a marked flexure, accompanied by faulting. The Section 16 mine is opened on the Baltic by a single 3-compartment shaft having 2 skipways, though a second shaft is planned, tentatively. The Baltic bed, as developed on Section 16, is wide and strong, but disturbed to great depth, the first ground to carry good copper values having been opened on the 12th level. The mine was opened to the 16th level, September, 1908, the bottom showing more regular ground with considerable good stamprock. In crosscutting west from the shaft on the 13th level, an unidentified lode carrying a little copper was discovered July, 1908. Equipment at Section 16 includes 4 boilers and 3 air-compressors, one of 15 drills capacity. The old mine has ample machinery to equip 2 shafts on the Baltic lode with an efficient plant, while leaving sufficient machinery to operate 2 new shafts at the old mine, if reopened.

The Atlantic railroad, owned by the company, connects mine and mill with 9 miles of main line, and a 3-mile branch line runs from the mine to the old millsite on Portage Lake, where there are coal and merchandise wharves for receipt of fuel and supplies. The railroad has 4 Baldwin and 1 Brooks locomotives, 130 hopper cars for rock and coal, and 60 flat cars for wood and general freight. The mine, also, is on the main line of the Copper Range railroad.

The stampmill, built 1895, at Redridge, Lake Superior, on a site having nearly 2 miles of water frontage, is 151x234′, of wood, on stone foundations. Water is furnished from a dam, described in the article on Baltic. The mill has 6 stamps with 18″ cylinders, of about 400 tons daily capacity each. Chilean regrinding mills are used for raggings, and round tables have been displaced by Overstroms. Power is supplied by a 14x42″ Reynolds engine of Corliss pattern. There are 7x14x12″ Gardner fire pumps in the mill and boiler-house adjoining. A machine shop in the mill is supplied with all tools required for repair work and fitting. Adjoining the mill is the 71x101′ boiler-house, of wood, on stone foundations. A Green fuel economizer saves about 12% in coal bills.

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There also are a number of comfortable dwellings for workmen, a 30x36' frame warehouse, store building and smithy. The mill treats the rock of the Michigan mine.

Trouble at the old mine, which begun in 1904, was reflected by decreased production, output being 5,505,598 lbs. fine copper in 1903; 4,049,731 lbs. fine copper in 1905, and only 1,539,082 lbs. fine copper in 1906, with no production in 1907.

The Atlantic enjoys the inestimable advantage of a management that is highly experienced, economical and efficient, and while the developments at the new mine on Section 16 are not yet sufficient to warrant an absolute prediction of success, the results secured, though slow in coming, are decidedly promising.

ATLAS COPPER MINING CO., LTD. **IDAHO.**

Office: care of Lyman Wood, Wallace, Idaho. Property is in Shoshone county, Idaho.

ATLAS COPPER SYNDICATE, LTD.

Dead. Compulsorily wound up, July, 1901. Was an English corporation.

ATLAS CORPORATION. **CALIFORNIA & WASHINGTON.**

Mine office: Granite Falls, Snohomish Co., Wash. Jos. Weissbein, president; Karl A. A. Stahlgren, vice-president; H. S. McCartney, secretary and treasurer. Property includes the Gold Flat gold mine, at Nevada City, Cal., and the Wayside mine, near Granite Falls, latter showing sulphide copper ore. Company in hands of receiver June, 1908, and former office at 71 Broadway, New York, closed.

ATLAS EXPLORATION & MINING CO. **ARIZONA & MEXICO.**

Office: Douglas, Ariz. R. O. Johnson, president; N. W. Chase, treasurer; D. T. Dunlap, secretary; James Ray, superintendent. Organized June 14, 1902, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Annual meeting, first Tuesday in January. Has undeveloped mineral lands, known as the Atlas group, in the Warren district of Cochise county, Arizona, and a fair prospect about 15 miles south of Douglas, in the northern part of the Arizpe district of Sonora, Mexico, latter showing auriferous copper ore. Idle for several years.

ATTUNGA MINE. **AUSTRALIA.**

Mine office: Attunga, N. S. W., Australia. W. H. Edwards, superintendent. Property, in the Tamworth division of the Peel and Uralla mining district, has a main shaft of 280'. Was developing, in search of sulphides, expected with greater depth, at last accounts.

AKTIEBOLAGET ATVIDABERGS KOPPARVERK. **SWEDEN.**

Office: Atvidaberg, Sweden. Mine and works office: Bersbo, Ostergothland, Sweden. Baron Th. Adelsward, president and general manager; Axel Nygren, superintendent; C. A. Rudelius, smelter superintendent. Organized 1900, under laws of Sweden, with capitalization 900,000 kroner, shares 1,000 kroner par, fully paid. Ore is slightly argentiferous chalcopyrite, averaging 2% copper. Mine has 8 shafts, of 300' to 1,400' depth, with about 4,000' of workings. Water power generates electricity that operates the mines and works. Has a smelter, at Bersbo, 9 kilometers from mine, with rail connection, with 3 roasting furnaces, 3 reverbeatory furnaces, and settling tanks for cementation, which was partly burned, 1905. Has been developing, without production, since 1902, when output was 163,270 lbs. fine copper.

GEWERKSCHAFT AUGUSTE I. **GERMANY.**

Dead. Formerly at Herscheid bei Bärenstein, Westfalen, Germany.

KUPFERHERZBERGWERK AURORA. **GERMANY.**

Mine office: Huckelheim, Bavaria, Germany. Idle.

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AURORA CONSOLIDATED MINING CO. **MEXICO.**

Mine office: Mulegé, Sur, Baja California, Mex. G. W. Russell, manager. Property includes the Aurora and Princesa mines, carrying auriferous copper ores. Has steam power, 5-ton mill and 50-ton smelter, employing about 40 men, at last accounts.

AURORA MINES CO. **NEW MEXICO.**

Office: care of Robt. F. Fitz, Elgin, Ills. Mine office: Lordsburg, Grant Co., N. M. D. H. Kedzie, local agent. Organized under laws of Arizona. Company fell into debt and closed down, but obligations were paid. Presumably idle.

AURORA MINING CO. **MEXICO.**

Dead. Formerly at La Cananea, Arizpe, Sonora, Mex.

AUSTRALIAN COPPER SYNDICATE, LTD. **AUSTRALIA.**

Dead. Voluntarily wound up, February, 1903. Was an English corporation.

AUSTRALIAN MINING CO., LTD. **AUSTRALIA.**

Office: 63 Queen Victoria St., London, E. C., Eng. Colonial office: Burnside, Adelaide, South Australia. Mine office: Reedy Creek, Robe Co., South Australia. Walter J. C. Cutbill, chairman; Sir Samuel Davenport, K. C. M. G., colonial agent; Edgar Collier, secretary. Organized Feb. 22, 1902, under laws of Great Britain, with capitalization £40,000, shares £2 par, as reconstruction of a company of same name, chartered 1865. Paid a 2s. dividend September, 1905. Lands, circa 20,000 acres, formerly included the Tungkillo mine, sold, 1906, to Port Lincoln Copper Co., Ltd.

AVALANCHE COPPER MINING CO. **MONTANA.**

Office: care of J. W. Beckett, secretary, Spokane, Wash. Mine office: Cañon Ferry, Broadwater Co., Mont. W. H. Hill, president and general manager; A. M. Baldwin, vice-president; C. E. Russell, superintendent; R. C. Vanderford, engineer. Lands, 10 claims, area 200 acres, circa 25 miles northeast of Helena, having several shallow shafts and short tunnels, showing an ore body assaying up to 20% copper, and a 300′ crosscut tunnel, latter cutting a 20′ vein carrying a 3′ paystreak of smelting ore said to carry high copper values, 1 oz. silver and $12.40 gold per ton. Is said to plan a concentrator or small smelter.

MINA AVENTURERA. **MEXICO.**

Mine office: Sabinal, Chihuahua, Mex. D. C. Sutton, general manager. Ore bodies occur irregularly in slate dikes, and carry silver, lead and copper. Mine is opened by shafts, and equipped with steam power. Employs about 100 men.

AVINO MINES OF MEXICO, LTD. **MEXICO.**

Office: 138 Salisbury House, London, E. C., Eng. Mine office: Avino, Gabriel, San Juan del Rio, Durango, Mex. James B. Palmer, chairman; Ralph Nichols, resident manager and consulting engineer; F. F. Fuller, secretary. Organized Feb. 24, 1905, under laws of Great Britain, with capitalization £1,000,000, shares £1 par; issued, £978,429. Debentures, £18,000. Operations to June 30, 1906, showed net expenditures of £6,899 above receipts. Lands, 250 acres and a 302-acre damsite, 10 miles from a railroad. Mine has an 800′ shaft and 600′ tunnel, with several large pits, one being nearly 400′ in width and of considerably greater length. Property is said to show about 2,000,000 metric tons of low grade silicious argentiferous copper ore, average value of ore produced, July and August, 1907, being reported at 36s. per ton. Mine is claimed to have produced about $60,000,000 in the past, mainly in silver, but presumably this should be 60,000,000 pesos, equal to about $30,000,000. Property produces a little smelting ore, but is mainly of concentrating grade.

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Property has steam, gas and electric power, with a 300-h. p. electric plant operated by a Crocker-Wheeler gas engine. A large concentrator was found unsuitable and was replaced by a hyposulphite lixiviation plant, which was claimed to save 85% of the silver and 30% of the gold values. Property has been poorly handled, former management spending too much money on surface and not enough in the mine, in addition to making a serious mistake in the plan of ore treatment. The mine has an immense amount of ore of dangerously low average tenor, but there have been too many changes in local management and processes, by reason of which no management or process has been given a fair test. Company is in such a financial position that either reconstruction or liquidation seems imperative.

AWAYA-IKEDA CO., LTD. **BRITISH COLUMBIA.**

Office: 46 Davis Chambers, Vancouver, B. C. Mine office: Ikeda Bay, Morseby Island, Queen Charlotte group, B. C. Employs 92 men. Shinazo Awaya, president; Arichika Ikeda, vice-president and general manager; K. Hidano, secretary and treasurer; Joseph Marco, mine superintendent; S. Harada, engineer. Organized 1907, under laws of British Columbia, with capitalization $100,000, shares $100 par.

Lands, 42 claims, area 2,100 acres, on Ikeda Bay, at the southern end of Morseby Island, in several groups, including the Lilly group of 8 claims, area 400 acres, on the southwest side of Ikeda Bay, which shows numerous ore bodies in contact deposits between diorite and limestone, of which one, under development, is of 5′ average width, proven for 1,000′ in length and about 300′ in depth. The 20′ ore-chute carries lenses of ore with gangue of silicious country rock, and occasional stringers of quartz and limestone. Development is by tunnels of 110′, 220′, 170′, and 330′, the upper tunnel carrying about 11′ of low grade ore and the lower tunnel having about 5′ of high grade chalcopyrite, ranging 8 to 12% in average copper tenor, 3 to 5 oz. silver and about $5 gold per ton.

The mine, about 6,000′ from tidewater, is connected by a 36″ gauge horse-tram with a 150′ wharf having a 110′ ell. The inlet is charted and admits steamers of fair size at flood tide, shipments being made from ore-bunkers on the wharf. The company's office, hospital and sleeping quarters were in an old stern-wheel steamer, beached for the purpose, but this has been succeeded by 12 buildings, including 2 shops, hospital, store, boarding-house, superintendent's house, etc. Equipment includes an Ingersoll-Sergeant air-compressor. Fuel is wood. Production, 1907, was 500 tons of ore; in 1908 about 4,500 tons, and should be about 10,000 tons in 1909. Ore shipped, 1907, to Ladysmith smelter, gave average returns of about 9% copper, 3.5 oz. silver and $5 gold per ton, and production, 1907, is estimated at 125,000 lbs. fine copper. The company was organized for fishing purposes, but, on the discovery of copper, interested the Furukawa Mining Co., of Japan, which is said to have set aside a capital of 500,000 yen for development purposes. The property is exceptionally promising and has an excellent management.

AXIS COPPER MINING CO. **WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. Lands lie between the Doane mine and holdings of the Dill Gold & Copper Mining Co.

NICOLÁS AZALIA. **PERÚ.**

Office and mine: Morococha Junín, Perú. Lands, 2 pertenencias, including the Alicia mine, yielding ore averaging about 10% copper. Production, 1904, was 115,609 lbs. fine copper.

COMPAÑIA MINERA LA AZTECA y ANEXAS. **MEXICO.**

Letter returned unclaimed from former mine office, Ensenada, Norte, Baja California, Mex. Property has silver-copper ores.

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AZTEC-ALGOMAH DEVELOPMENT CO. **MICHIGAN.**

Dead. Formerly at Greenland, Ontonagon Co., Mich. Described Vol. VI.

AZTEC COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office, 136 Hartford Bldg., Chicago, Ills. Mine office: Prescott, Yavapai Co., Ariz. E. M. Sanford, attorney. Lands, 20 claims, showing copper ores. Idle.

AZTEC COPPER CO. **MICHIGAN.**

Office: care of John C. Watson, president, 68 Devonshire St., Boston, Mass. Mine office: Greenland, Ontonagon Co., Mich. F. W. Morandi, secretary and treasurer. Organized August, 1863, under laws of Michigan, and reorganized, 1880, under laws of Michigan, with capitalization $1,000,000, shares $25 par. Lands, 320 acres, being W. ½ of Section 31, T. 51 N., R. 37 W., also 1,214 acres of agricultural and timber lands in Sections 10, 12 and 14, T. 50 N., R. 38 W. Work was begun 1862, and property had a stampmill in early days, producing 353 tons, 863 lbs. fine copper, of which 100 tons were secured in a single mass. Exploratory work was done, 1905-1906, on the Knowlton lode, by the Aztec-Algomah Development Co. Property should carry the amygdaloid bed now being opened by the Lake Copper Co. Idle.

AZTEC COPPER MINING & SMELTING CO. **MEXICO.**

Dead. Succeeded by Aztec Copper Smelting Co. Formerly at Guachinango, Mascota, Jalisco, Mex.

AZTEC COPPER SMELTING CO. **MEXICO.**

Office: 1309 Stephen Girard Bldg., Philadelphia, Pa. Mexican general office: Alcalde, 29¼, Guadalajara, Mex. Mine office: Guachinango, Mascota, Jalisco, Mex. Dr. Pemberton Dudley, president; J. W. Tyrell, vice-president; Geo. J. Graham, manager; preceding officers, Perry H. Dudley, G. H. D. Martin, F. B. Graham, Wm. A. Young and E. J. Fithian, directors; J. F. Graham, secretary. Organized June, 1901, under laws of New Jersey, as successor of the Aztec Copper Mining & Smelting Co., with capitalization $300,000, shares $1 par. Lands claimed are circa 10,000 acres, of which 8,000 acres are said to be well timbered with oak and pine, and to be well watered, with an available water power on the Rio Ameca. Lands include 2 mines, known as La Concha and La Perla, opened by shafts and tunnels, and claimed by company to show ore averaging about $30 per ton in values. Has an 80-ton concentrator with 2 Elspass mills and 6 tables. Present officers apparently are not responsible for the atrocious lies of a former management, which promised speedy dividends, which of course have not materialized.

AZTEC GOLD & COPPER MINING CO. **COLORADO.**

Office: 18 Tremont St., Boston, Mass. Mine office: Needleton, La Plata Co., Colo. David W. Williams, president; Chas. A. Howland, vice-president; Geo. F. Bradstreet, secretary and treasurer; Josiah Moore, general manager; W. C. Kinney, engineer. Organized Nov. 10, 1899, under laws of Maine, with capitalization $2,000,000, shares $1 par; issued, $1,619,260. Lands, 19 claims, in 5 groups, lying in the Needle Mountains, circa 16 miles south of Silverton, showing 2 fissure veins in granite and porphyry, these averaging about 2' width, one, opened by a 1,500' tunnel, showing argentiferous galena above and copper sulphides below, ores giving assays of $30 to $65 per ton. Equipment includes a 25-h. p. electric motor and 25-h. p. gasoline engine, with a 3,000-h. p. waterfall available for development. Has 7 buildings, and plans extending main tunnel and constructing an aerial tram to the concentrator.

AZURE MINING CO. **NEW MEXICO.**

Office: 170 Broadway, New York, N. Y. Mine office: Leopold, Grant Co., N. M. Louis Kahn, president; M. D. Rothschild, secretary and treasurer; M. Kahn, manager; Wm. R. Wade, superintendent. Lands, near the Burro Chief group of the Chemung, have a 415' shaft, showing a little ore on the 250'

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level, and the Emerald claim shows oxide ore in a 140′ diamond drill hole, bored 1907. Lands show gossans carrying no copper, but with copper values at depth below, as proven by churn and diamond drill borings. Mine formerly was a considerable producer of turquoise, and is said to have been the largest turquoise mine in the United States, but such production has practically ceased, and present developments are for copper. The turquoise mine has an open cut and two tunnels. Holes bored, 1905, by churn drills, are said to have shown sulphide ores of 2.5% average copper tenor.

AZURITE COPPER CO. **ARIZONA.**

Dead. Formerly at Williams, Coconino Co., Ariz. Described Vol. VI.

AZURITE COPPER & GOLD CO. **ARIZONA.**

Dead. Lands sold to Mineral Hill Consolidated Copper Co. Formerly at Tucson, Pima Co., Ariz.

AZURITE COPPER MINING CO. **ARIZONA.**

Letter returned unclaimed from former office and mine, Globe, Gila Co., Ariz. Organized 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par, by Carl Eder, H. Sidow, Jacob Suter, C. W. Clement and C. W. Parsons.

AZURITE MINING CO. **WYOMING.**

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. Henry L. Larsen, president; Arthur Bishop, vice-president; H. O. Granberg, secretary, treasurer and general manager; E. N. Sanders, superintendent; Frank Earle, consulting engineer. Organized Dec. 17, 1904, under laws of Wyoming, with capitalization $1,000,000, shares $1 par; issued, $635,000. Lands, 5 claims, area 100 acres, in the Battle Lake district, showing 3 fissure veins in gabbro, of 15′ to 20′ estimated width, opened by a 65′ shaft and 70′ tunnel, showing ore giving assays of 18% copper.

BABY McKEE GOLD MINING CO. **OREGON.**

Mine office: Sumter, Baker Co., Ore. Ores carry gold, silver, lead and copper. Has steam power. Presumably idle.

BACHELOR GOLD MINING CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. C. F. Meek, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has water power.

BACKUS & JOHNSTON. **PERÚ.**

Office: 74 Calle San Pedro, Lima, Perú. Works office: Casapalca, Oroya, Junín, Perú. The Natividad mine, employing circa 200 men, in 1907 produced 2,507 metric tons of ore averaging 14% copper and 14 to 70 oz. silver per ton. The smelter, known as the Fundición Casapalca, is a small but well-equipped matting furnace, on the Oroya railroad, 88 miles from Lima, at an altitude of 3,606′, having two 75-ton water-jacket blast-furnaces. Water power is used, and ores under 12% in tenor are not treated. Fuel is mainly German and English coke, costing 25 pesos delivered, though Peruvian coke is used at times, from necessity. Product is exported as a matte of 50 to 55% average copper tenor. Wages are 50 cents to $2 per 12-hour shift. Production, 1907, is estimated at 750,000 lbs. fine copper.

BADAJOZ COPPER MINES, LTD. **SPAIN.**

Office: 14 Bishopsgate St. Without, London, E. C., Eng. Mine office: Pueblada, Badajoz, Spain. Lord Armstrong, chairman; J. W. Chalkley, secretary. Organized July 25, 1906, under laws of Great Britain, with capitalization £10,000, shares £1 par; issued, 3,000 shares, 1s. called up. Lands, 320 hectares, including the Suerte and Extramena copper mines. Presumably idle.

BADEN-BADEN GOLD MINING CO. **COLORADO.**

Dead. Formerly at Black Hawk, Gilpin Co., Colo.

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BADGER COPPER CO. **WYOMING.**

Letter returned unclaimed from former office, Laramie, Wyo. Organized, 1902, to operate in Albany county, Wyoming, and in 1906 was driving a tunnel.

BADGER COPPER MINING CO. **WISCONSIN.**

Office: care of B. J. Van Vleck, president, West Superior, Wis. Organized circa 1898, with capitalization $2,500,000, shares $1 par. Lands, 210 acres, in Section 8, Town 27, Range 12, Douglas county, Wisconsin, lying next west of the North Wisconsin mine. Idle since circa 1900.

BADGER-HALL MINING CO. **ARIZONA.**

Office: Douglas, Ariz. Mine office: Paradise, Cochise Co., Ariz. Organized 1907, under laws of Arizona, with capitalization $1,000,000, shares $2 par. Is controlled, through ownership of entire stock issue, by Bisbee-Sonora Development Co. Lands, 30 claims, area 545 acres, said to show an ore body 62′ wide at surface and 50′ wide at depth of 200′, opened by tunnel. Is said to plan a smelter, but should develop a mine first.

BADGER MOUNTAIN MINING & MILLING CO. **COLORADO.**

Dead. Was organized under laws of Wyoming, with capitalization $150,000, shares 10 cents par. Lands were 6 claims. Formerly at Florissant, Teller Co., Colo.

BADGER STATE MINING & MILLING CO. **WYOMING.**

Office and mine: Saratoga, Carbon Co., Wyo. Gustav Jensen, president and manager; John H. Davis, vice-president and superintendent; C. E. Jensen, treasurer; A. H. McDougal, secretary. Organized Dec. 26, 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 8 claims, area 140 acres, on Jack Creek, showing 3 fissure veins, averaging 4′ width, claimed to give average assays of 50% copper, 50% lead and from a trace up to 400 oz. silver per ton, opened by shafts of 60′ and 105′, and by a 90′ tunnel. Presumably idle.

BAGDAD GOLD & COPPER CO. **CALIFORNIA.**

Office: care of Gordon & Co., 254 Wilcox Bldg., Los Angeles, Cal. Mine office: Bagdad, San Bernardino Co., Cal. Sherman Washburn, president; V. L. Carrol, secretary. Is a prospect only, with about 250 feet of openings. Idle for several years.

BAHIA EXPLORATION CO. **BRAZIL.**

Mine office: Jaguarary, Pará, Brazil. Lands, sundry claims about 50 miles west of Jaguarary, giving ore assaying 2 to 4% copper.

BAILEY'S COPPER, LTD. **TRANSVAAL.**

Office: P. O. Box 3170, Johannesburg, Transvaal. Mine office: Barberton, Middelburg, Transvaal. A. Y. Niven, chairman; L. K. Jacobs, secretary. Organized circa May, 1907, under laws of Transvaal, with capitalization £15,000, shares £1 par. Lands, 96 base metal claims, in the De Kaap Valley, near the Barberton Copper Syndicate, on which work was begun circa July, 1907. Property has a 5′ vein, traceable a quarter mile, opened by 2 shafts, A shaft being 85′ deep.

BAKER CONSOLIDATED COPPER MINING CO.

Office: 4 Campau Bldg., Detroit, Mich. John Baker, general manager. Organized under laws of District of Columbia, with capitalization $2,500,000. Location of property, if any, unknown. Is regarded with suspicion.

BAKER MILLING, SMELTING & REFINING CO.

Office: 4 Campau Bldg., Detroit, Mich. John Baker, president; John E. Rolland, secretary and treasurer. Organized under laws of Oklahoma, with capitalization $10,000,000. President claimed to be putting a plant in Detroit, to be in operation during 1906, but no such plant materialized. Is regarded with suspicion.

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BALADE MINE. **NEW CALEDONIA.**

Mine office: Ouegoa, Diahot, New Caledonia. Mine, opened to depth of 150 metres, produced ore which was concentrated to average tenor of 17 to 20% copper, and exported to Australia for smelting. Idle since circa 1885.

BALAKLALA CONSOLIDATED COPPER CO. **CALIFORNIA.**

Office: 60 State St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Works office: Coram, Shasta Co., Cal. W. H. Brevoort, president; Thos. A. Barbour, vice-president; Roy N. Bishop, secretary and mine manager; T. M. T. Raborg, treasurer; Duncan McVichie, manager director; Robeson T. White, smelter manager. Organized under laws of Nevada, with capitalization $10,000,000, shares $25 par. Bonds, $750,000, at 6%, balance of bond issue of 4 series, being "C" series, $375,000, maturing July 1, 1909, and "D" series, $375,000, maturing July 1, 1910. Present company was a reorganization of the Balaklala Mining Co., control of which was sold simultaneously to two parties, requiring reconstruction to untangle matters. Windsor Trust Co., New York, and Federal Trust Co., Boston, transfer agents. Trust Company of America, New York, and First National Bank, Boston, registrars. Entire stock issue was owned by the Balaklala Copper Co., which has been reorganized as the First National Copper Co. An issue of $2,000,000 of convertible collateral bonds, at 10%, was authorized, but the public wisely was suspicious of bonds bearing such high interest, and issue was not floated, vote authorizing these bonds being rescinded at annual meeting, January, 1908.

Lands, variously reported as 64 claims, 72 claims and 80 claims, patented, area circa 1,200 acres, also about 300 acres of mill and smelter sites, and miscellaneous lands giving total holdings of 1,600 acres, well timbered, in the Flat Creek district, adjoining the Trinity. Company platted the townsite of Coram, and sold every lot therein. Lands, December, 1906, were 72 claims, area 1,149 acres, carrying 3,040′ of the strike of an ore body developed for 1,100′, showing an ore lense of 20′ to 60′ width and about 900′ length. In 1907 the Sheridan group of 40 acres was bought for $20,000, and the Stowell group of claims has been added. Company reports 12 ore bodies, of which 3 are under development, these being reported as having average dimensions of 312′ width, which obviously is an error, one ore body being 900′ long and one being 1,100′ long. The company reports that ore averages about 3% copper, 1 oz. silver and 0.03 oz. gold per ton.

Mine development is by tunnels, with upraises, providing for open-cast mining, which should give very cheap extraction. There are about 20 tunnels, the Weil tunnel being about 600′ in length. Surface above the main lense has been stripped, preparatory to open-cast operations. Development shows 3 distinct lenses, all more or less displaced by a series of step-faults from south to north. Ore is pyritic and must be smelted direct, without concentration. It has been claimed that average assays of the ore show 2.7% copper, and at an earlier date it was claimed, in the press, that one ore body averaged 11%, but in actual practice it is probable that extraction will not exceed 2.25%, or 45 lbs. per ton, and possibly may not be more than 2%, or 40 lbs. fine copper per ton. Assays show 75 cents to $1 per short ton in combined gold and silver values. The main ore body, according to the company's figures of December, 1906, carried 2.462% copper, or 49¼ lbs. per ton, 0.846 oz. silver, equal to about 50 cents, and 0.025 oz. gold, equal to 50 cents. The report of Duncan McVichie, early 1907, gave 540,142 tons of ore in sight, with 342,307 tons reasonably safe to infer. Company's direct report of Aug. 11, 1908, claims 2,000,000 tons of ore in sight, with 1,000,000 tons blocked out for stoping, which figures seem unduly high, though there is no question that there are large ore bodies proven and blocked out.

The machinery plant of the mine includes installations of about 1,000 h. p.,

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including a number of hoists, 5 compound air-compressors, and about 40 rock-drills. There also are a sawmill, store, school, hospital and about 75 dwellings. Company has a 5-mile private railroad of 4′ 8″ and 36″ gauges, with 5 locomotives. The mine and smelter are connected by a Bleichert aerial tram of 16,130′ length, having 62 wooden towers, highest 85′. The smelter, being lower than the mine, tram is operated automatically, by gravity, having an estimated hourly capacity of 75 tons.

The smelter, begun May, 1906, and practically completed, except converter plant, July, 1908, at a cost of approximately $2,000,000, is near the mouth of Cottonwood Creek, which flows into the Sacramento river at a point 4 miles south of Keanett and 13 miles north of Redding. The smelter building is of steel frame with roof and siding of galvanized iron, no wood being used. There may be trouble with the roof on account of sulphur fumes, but the smelter is well designed, though lacking a converter plant, which obviously will be necessary later. The smelter nominally is of 1,200 tons daily capacity, having three 400-ton blast-furnaces and an 18x96′ reverberatory furnace. Dust chamber is 120x180′, being much wider than ordinary. The stack is 250′ high, of 18′ inside diameter. The smelter has bunkers for 750 tons of ore, and steam is furnished by two 250-h. p. Stirling boilers, fired with petroleum, in addition to the boilers fired by waste gases from the reverberatory furnace. Electric power will be used exclusively, except for running 3 blowers for the blast-furnaces. Installation includes various motors of 5 to 150-h. p. each. The smelting plant includes a machine-shop, smithy, carpenter-shop, bunk-house and 24 dwellings for workmen.

The American Smelters Securities Co. had a contract for treating the ores of the Trinity Copper Co., which was turned over to the Balaklala. It has been stated that this contract allowed an estimated profit of $2 per ton on treatment of Trinity ores, but this estimate is excessive. The Balaklala also had a contract with the American Smelters Securities Co. providing for the treatment of matte, but the latter company does not seem to be in a position to carry out this contract advantageously.

There have been many wild assertions made regarding the prospective profits of the Balaklala. Interested parties have put forth estimates of 15,000,000 lbs. fine copper production yearly, at a cost of 9 cents per pound, and estimates as low as 8 to 8½ cents per pound have been made. It is unlikely that the ore in considerable quantities will average better than 2.25% copper, and may be less. Figured on a fair basis, costs should be about 75 cents to $1 per ton for mining, 25 cents for transportation, $2.50 to $3.50 for smelting, and 50 cents to $1 for incidentals, giving totals of $4.50 to $5.75 per ton for a product brought to matte. Allowing 45 lbs. fine copper per ton recovery, the cost would be 10 cents per pound for fine copper in the form of matte, if average costs were as low as $4.50 per ton of ore, or 12¾ cents per pound if ore costs were $5.75. An estimate of 10 cents per pound for copper brought to matte would seem to be as low as can be made with safety. The cost of conversion, if done at the Balaklala smelter, as it should be, would be about 1½ cents per pound, in all likelihood, and freight and refining would cost about 2 cents per pound additional, a total of 3½ cents added to previous cost, giving a minimum cost of 13½ cents per pound, or a maximum cost of 16¼ cents per pound, from which should be deducted about 2 cents per pound for included gold and silver values saved by electrolytic refining, this offsetting costs of freight and refining. Allowing for deduction of gold and silver values from gross cost, the Balaklala copper should cost a minimum of 11½ cents, or a maximum of 14¼ cents per pound, when placed on the market. There is some possibility that the minimum figure may be slightly reduced, also a possibility that the maximum may be exceeded slightly, but the figures given may

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be accepted as conservative estimates, although they differ very much from those of 8 or 9 cents, given out by interested parties.

The work at the mine and smelter has been good, with the exception of the omission of a converter plant, but the company has been poorly financed, and apparently was injured by its affiliations both with the Guggenheim and Lawson interests. The Guggenheims were said to own 80,000 shares. The plan of an operating company and holding company is one that seems in high favor with many financiers, but about the only excuse for such a bifurcated corporation is that somebody is to be kept in the dark, this somebody usually being the innocent investor. The excuses of delayed shipments, etc., given out for non-completion of the smelter, seem to have been a euphemistic method of accounting for delays due to shortage of cash.

The company being practically bankrupt at the close of 1907, and 10% bonds being absolutely unsalable, reorganization was necessary, and the holding company, known as the Balaklala Copper Co., has been reorganized under the name of the First National Copper Co., as set forth in the description of the latter-named corporation. While the Balaklala Consolidated Copper Co. has been poorly financed, and many exaggerations have been made public regarding the richness of the mine, and its possible earnings, the property is valuable beyond doubt, and with sufficient capital, and under good management, the mine, though low in grade, should be operated at a profit.

BALAKLALA COPPER CO. **CALIFORNIA.**

Office: 60 State St., Boston, Mass. Mine office: Coram, Shasta Co., Cal. Clarence K. McCornick, president; N. Adams Egbert, vice-president and secretary; T. M. T. Raborg, treasurer; preceding officers, Edgar L. Newhouse and Geo. A. Baird, directors. Organized Feb. 24, 1906, under the laws of Maine, with capitalization $10,000,000, shares $25 par; capitalization reduced, March, 1907, to $4,000,000, and increased immediately thereafter to $6,000,000, shares $10 par. The only property of the company is the entire stock issue of the Balaklala Consolidated Copper Co. Company, becoming bankrupt at the end of 1907, has been practically reorganized through the formation of the First National Copper Co., which, March, 1908, loaned $450,000 to the Balaklala Copper Co., taking as security therefor the entire stock issue of the Balaklala Consolidated. About 98% of the shareholders of the Balaklala Copper Co. have deposited their stock for new stock of the First National. This leaves the Balaklala Copper Co. a mere shell, and, to all practical intents and purposes, it is out of business.

BALAKLALA MINING CO. **CALIFORNIA.**

Dead. Succeeded, circa 1904, by Balaklala Consolidated Copper Co. Formerly at Coram, Shasta Co., Cal.

BALACLAVA COPPER MINING CO. **AUSTRALIA.**

Mine office: Broken Hill, N. S. W., Australia. W. O. H. Simons, superintendent, at last accounts. Has auriferous copper ores. Presumably idle.

BALBACH SMELTING & REFINING CO. **NEW JERSEY.**

Office and works: Newark, Essex Co., N. J. Edw. Balbach, Jr., general manager. Property is an electrolytic refinery, having in connection a small smelting plant. Refinery has 480 tanks, operated on the multiple system, with one 300-kw. generator and two 125-kw. generators. Capacity of plant is circa 2,750,000 pounds electrolytic copper monthly. The metallurgical practice of the works ranks deservedly high. Employs circa 250 men.

BALD MOUNTAIN MINING CO. **WASHINGTON.**

Mine office: Clear Lake, Skagit Co., Wash. A. H. Rogers, superintendent, at last accounts. In March, 1907, was said to have secured ore assaying 15 to 25% copper.

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BALD MOUNTAIN MINING & SMELTING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. E. W. Conrad, superintendent. Was developing, with a small force, in 1907.

BALHANNAH COPPER & GOLD MINE, LTD. **AUSTRALIA.**

Dead. Formerly at Onkaparinga, South Australia.

BALHANNAH MINE. **AUSTRALIA.**

Mine office: Onkaparinga, South Australia. Property is an old mine, with 8 shafts, deepest 300′, 14 miles southeast of Adelaide. Ores include copper, zinc, lead, silver and gold. Idle many years.

BALKAN COPPER CORPORATION, LTD. **TURKEY.**

Office: 6 Great St. Helen's, London, E. C., Eng. Mine office: Yardimli, Turkey. Sir Owen R. Slack, chairman; Ernest A. Foster, secretary; Mario Krieger, managing director in London. Organized Sept. 5, 1899, under laws of Great Britain, with capitalization £250,000, shares £1 par; issued, £220,000. Lands include the Yardimli mine, area 7,900 acres, and the Chapzi-Hani mine, area nearly 2,500 acres, in the Rhodope Mountains, northwest of Constantinople, held on a 99-year lease by firman from the Turkish crown at annual royalty of £300. Property also includes a small undeveloped mine at Shab-Khaneh, in the district of Xanthi, held under annual royalty of £100. Idle for some years.

BALLA BALLA COPPER MINES, LTD. **AUSTRALIA.**

Dead. Reorganized, Apr. 16, 1901, as New Balla Balla Copper Mines, Ltd.

BALLARAT COPPER MINING CO. **WASHINGTON.**

Mine office: Newport, Stevens Co., Wash. Ores carrying copper, gold and silver, have been opened by a crosscut tunnel. Idle for some years.

BALL COPPER CO. **ARIZONA.**

Office: 526 Security Bldg., Los Angeles, Cal. Mine office: Winkelman, Gila Co., Ariz. Chas. E. Finney, president; Paul Burkes, vice-president; E. J. Mitchell, secretary; N. A. Vyne, treasurer; preceding officers, W. H. M. Drescher, Chas. P. Joslin and John M. Ross, directors; Edw. V. Brooks, engineer. Organized Feb. 1, 1908, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Has authorized a $50,000 bond issue, at 6%. Company plans sinking a 3-compartment 800′ shaft, at a cost of about $150,000.

BALTIC MINING CO. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Baltic, Houghton Co., Mich. Employs about 1,000 men. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; preceding officers, Samuel L. Smith, Cameron Currie, J. Henry Brooks and R. Townsend McKeever, directors; Fred W. Denton, general manager; Clarence G. Mason, engineer; F. G. Coggin, mill superintendent; John Jolly, superintendent; Wm. C. Cole, clerk; W. J. Richards, master mechanic.

Organized December, 1897, under laws of Michigan, with capitalization $2,500,000, shares $25 par; $18 paid in. American Trust Co., Boston, transfer agent. Old Colony Trust Co., Boston, registrar. Annual meeting, first Monday in March. Owns $80,000 stock of Michigan Smelting Co. Practically entire stock issue is owned by Copper Range Consolidated Co. Dividends have been $1,250,000 in 1905; $1,400,000 in 1906, and $1,000,000 in 1907.

Assets, Jan. 1, 1908, were $1,261,862.41, with liabilities of $649,115.23, giving an excess of assets of $612,747.18. For 1907 the mining profit was $1,477,650.25, with construction account of $265,782.48, leaving net earnings for the year of $1,157,971.57, with a surplus of $454,775.61.

Lands, 800 acres, near the Eastern Sandstone of the Keweenawan copper belt, about 75 acres being on the sandstone and non-mineralized. Holdings comprise all of Section 21 except the southeast quarter, and the west half of Section 20, Town 54 North, Range 34 West. Lands are bounded on the north

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by the Wheal Kate and Section Sixteen of the Atlantic; on the east by St. Mary's Mineral Land Co.; on the south by St. Mary's lands, lands of Hussey, Howe & Co. and the Trimountain mine; on the west by the Trimountain. In 1905 exchanged 39 acres with the Atlantic mine, which will enable the Baltic to sink No. 5 shaft to much greater depth than otherwise possible. To the southward the Trimountain and Champion mines are opened on the same lode, which has a strike of N. 63° E., from Baltic shafts 2 to 5, and to the northward is the Superior mine, on the same bed. The dip of the lode averages about 73°, being the sharpest of any developed cupriferous bed in the Lake district.

The shafts are numbered from south to north, with a distance of 3,025′ between the extreme shafts, there being room for one additional shaft at the southern end.

No. 1, the discovery shaft, located between Nos. 2 and 3, was sunk at a wrong angle, and was abandoned at a depth of 219′.

No. 2, the southernmost shaft, on Jan. 1, 1908, was 1,150′ deep, and began production 1906. The surface plant at No. 2 includes a boiler-house with two 250-h. p. Stirling boilers; compressor-house with Nordberg air-compressor reducing 4,000′ of free air per minute to a pressure of 70 lbs. per square inch, and a Nordberg hoist with double-conical drum. The shaft-rockhouse has a crusher operated electrically, and the shaft has concrete stringers.

No. 3 shaft, 1,170′ northeast of No. 2 and 1,500′ deep, has a steel shaft-rockhouse, built 1908 by the Wisconsin Bridge & Iron Co. This is of the circular type, with 1,200-ton bins, equipment including a 16x18″ engine, two 18x24″ Blake crushers and a large crusher operated electrically.

No. 4 shaft, 900′ northeast of No. 3 and 1,475′ deep, has a frame shaft-rockhouse sheathed with steel, 36x71′ with 17x31′ wing, 88′ high, with 1,400-ton rock-bins and two 18x24″ Blake crushers.

No. 5 shaft, the northernmost, 855′ northeast of No. 4 and 1,125′ deep, has a shaft-rockhouse duplicating that at No. 4. Stoping is in progress on the 9th to 14th levels, inclusive, and drifts have been run to the Atlantic boundary. The ground was considerably disturbed in the upper levels, but is growing more settled at the bottom. Hoist is a duplex Nordberg, good for 1,500′ depth.

Hand-power cranes for handling mass copper have been installed at all shafts, and the mine has electric pumps.

The Baltic amygdaloid, taking its name from its first mine, was opened in 1882, but abandoned at 90′ depth, because a wrongly pitched drill hole ran into the hanging-wall. The Baltic is an exceptionally strong lode, ranging 15′ to 60′ in width, so well mineralized that at most point it must be more or less thoroughly beaten away from wall to wall. The great width of the stopes has brought about the use of a walling system, by which waste rock is built into dry-walls along the drifts, thus saving timbering, while giving stronger walls than any timber could supply, and saving the cost of hoisting lean rock. The walling system of the Baltic has proven a success under actual test, and is now in general use in the Lake district, the credit being due Mr. Denton. A little melaconite is found in narrow fissures crossing the lode, these being too small to follow, but the black oxide ore mined in the stopes is saved in the milling, carrying 35% to 40% copper as dressed, and smelts readily with the native copper mineral. The native copper of the Baltic is arsenical, and it is probable that some copper arsenides are mined and milled, as narrow arsenical fissure veins occur occasionally in the district south of Portage Lake. While the finished copper is arsenical, it makes wire of great tensile strength.

The compressor-house, between shafts 3 and 4, is 36x58′ in size, with concrete foundations, stone walls and steel roof, housing a compressor with

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capacity to reduce 4,000 cubic feet of free air per minute to a pressure of 70 lbs. per inch. Adjoining is a boiler-house of similar material, 49x76′, with wing 12x62′, having four 250-h. p. Stirling boilers and a 140′ self-supported steel smokestack. This boiler plant supplies steam for shafts 3 and 4. Adjoining the boiler-house is a 360′ coal trestle, of 5,000 tons capacity, underneath being a 5x8′ concrete tunnel, through which coal is hauled in tram-cars, on a down grade, by endless cable. There also is a coal trestle at No. 2 shaft. There is a 50x132′ combination machine shop and smithy, with stone walls and steel roof; a 42x72′ carpenter shop; a 30x90′ miners' changing house, supplied with hot and cold water, bath-tubs and lockers; a good office building and upwards of 100 well-built dwellings for employes. The mine has a complete electric light plant. A considerable town has grown up about the mine, on lands owned by the company, mine and town being served by the Painesdale branch of the Copper Range railroad, and also by a branch of the Atlantic railway.

The stampmill, at Redridge, on Lake Superior, one-half mile west of the Atlantic mill, went into commission December, 1901, and was enlarged 1907. Building is of structural steel, on stone foundation, equipped with 4 Allis simple heads of 560 to 625 tons daily capacity each, and 2 Nordberg compound heads of about 800 tons daily capacity each, the second head having been completed June, 1908, giving the mill a capacity of about 4,000 tons daily. Stamp foundations are massive, with 90-pound anvil-plates set beneath the mortars. Finisher-jigs and slime-tables were displaced by Wilfley tables, and Woodbury jigs have been added, also Deister concentrating tables for treating the finer slimes, both giving good results. The mill has crushing rolls and a Huntington mill for regrinding, and a settling tank for slimes. Mineral returns about 72% fine copper, and tailings, 1907, carried 0.24% copper, but are expected to be reduced, by the settling tank, to about 0.20% copper. The discharge at the mill is about 25′ above mean water datum, and with a drop of 1 in 10 provides for the wasting of many million tons of tailings by gravity alone. The mill is heated by the Coogan & Strothenke system, air being delivered from 4 blowers after previous heating by passing over steam-coils, radiation in the coils being insured by a vacuum system. Power is furnished by a 500-h. p. Nordberg cross-compound engine, and a 180-h. p. auxiliary engine.

Adjoining the mill is a 55x90′ boiler-house, of steel frame on stone foundations, housing five 250-h. p. Stirling boilers and a Green fuel economizer. Draft is secured by a set of duplex fans, driven by the mill engine. Behind the boiler-house is a 25,000-ton coal-storage yard, for the joint use of the Baltic and Atlantic mills, coal being brought to the boilers, through tunnels, by gravity.

Water for both the Baltic and Atlantic mills is furnished by a $150,000 gravity dam across the mouth of Salmon Trout river, built jointly by the Atlantic and Baltic mines. This structure is built of steel and anchored by its own weight, irrespective of the holding power of the rock. The plan was suggested by J. F. Jackson, of the Wisconsin Bridge & Iron Co., and the details were inspected and approved by Foster Crowell. The work required about 1,000,000 pounds of steel and 8,000 cubic yards of concrete. The dam impounds about 1,250,000,000 gallons of water, and at the river's lowest stage can furnish water to wash 5,000 tons of rock daily, 300 days yearly, effecting a saving over pumping of about 2 cents per ton of rock stamped. The dam is anchored in a cement foundation of great strength, and is in 5 sections, with a total length of 475′, the central or deepest section being 74′ high, with wings of 200′ on the west and 350′ on the east, in comparatively shallow water, made with cement cores built up from excavations in bed-rock, buttressed

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by earth enbankments. All 5 sections of the dam proper are of the same general design, the central section being highest, as it is bottomed in the bed of the river, with a wider and heavier concrete base and stronger steel bracing. The dam is of steel throughout, anchored in a concrete base, with braces between the crest of the dam and the extreme foot of the cement base. The following description of the central section will give an idea of the general construction of all 5 parts; the concrete base is 62′ wide, built up from rock excavations. The resultant of all pressures gives a pressure of 2,626,000 lbs. for each steel section of 8′ width and 74′ height. The upper 50′ of the dam in this central section of 100′ is inclined from the water at 45°, throwing the point of overturning within the central third of the concrete base, thus allowing an ample margin of safety. The dam is made of plates of best boiler steel, concave on the water side, 8x16′ in size and 3-8″ thick, riveted and caulked water-tight and supported by parallel inclined "I" beams 24″ thick, for the full depth of 50′ below the crest of the dam. On the lower section the steel plates are each 8x16′ and 3-16″ thick, concave, riveted and caulked, but resting directly against the concrete base. The "I" beams of the upper or main section are supported by heavy triangular frameworks of inclined steel columns and struts. The entire steel structure is anchored to a 2″ steel base-plate, at the bottom of the concrete, by a large number of 1½″, 2″ and 2½″ steel rods, of 15′ to 30′ length. Water is taken from the dam about 20′ below the crest by three 38″ riveted steel pipes, one pipe being on the Atlantic and two on the Baltic side. There is a system of valves and waste weirs, but the structure is of such a nature that it could not be injured were water to flow continuously over its crest for an indefinite period. Surmounting this structure is a trestle of the Copper Range railroad, built at the same time, but in nowise a portion of the dam. The center of the railroad track is 7′ above the crest of the dam, 10′ down-stream. In the central sections the foundations for the feet of the trestle are all in the concrete work, elsewhere the northern piers for the trestle are separately built.

The Baltic begun production with a leased stamp, August, 1899, starting one stamp in its own mill December, 1901. Production was 2,641,432 lbs. in 1901; 12,177,729 lbs. in 1903; 16,708,868 lbs. fine copper in 1907. The ultimate productive capacity of the mine cannot be predicted with safety, but the present milling capacity is equal to making about 25,000,000 lbs. fine copper yearly, and it is but a question of time when an output of this size will be made, and, ultimately, an even larger production may be secured. The management is in all respects equal to the mine, both being of the best.

BALTIMORE & ARIZONA COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Turkey, Yavapai Co., Ariz. Lands, known as the Rainbow group, in the Turkey Creek district, are opened by a 75′ shaft, claimed to show a large body of sulphide ore of 2.5 to 5% copper tenor. Presumably idle.

BALTIMORE COPPER CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Organized 1907 as successor of Chronicle Mining Co. Lands, 6 claims, circa 4 miles east of Prescott, having several shallow shafts.

BALTIMORE COPPER-GOLD MINING CO.

Office: London, Ontario. Location of lands, if any, unknown.

BALTIMORE COPPER & SILVER MINING CO. **MONTANA.**

Letter returned unclaimed from former office, Butte, Mont. Organized circa May, 1907, with capitalization $100,000, shares $5 par.

BALTIMORE COPPER SMELTING & ROLLING CO. **MARYLAND.**

Office and works: Keyser Bldg., Baltimore, Baltimore Co., Md. R. Brent

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Keyser, president; Jos. Clendenin and Wm. H. Pierce, vice-presidents; Albert H. Weld, treasurer. Succeeded the Baltimore & Cuba Smelting & Refining Co., which built the first American copper smelter, 1845. Supposedly is controlled by the American Smelting & Refining Co. Plant is located on one of the best harbors of the Atlantic coast and having direct rail connections, is very advantageously located for both domestic and foreign business. Plant is large and modern, including electrolytic works, bullion refinery, sheet copper rolling mill and a bluestone plant. The 100-ton electrolytic refinery has eleven 80-kw. generators and 540 tanks, with anodes arranged on both the series and multiple plans. Material treated is mainly auriferous and argentiferous copper matte from Arizona, Montana and various foreign countries. Employs circa 400 men.

BALTIMORE MINING & DEVELOPMENT CO. **MONTANA.**

Mine office: Comet, Jefferson Co., Mont. Lands, 15 claims, in the Boulder district. Made, 1907, several small smelter shipments.

BALTIMORE & SONORA GOLD & COPPER CO. **MEXICO.**

Letter returned unclaimed from former office, 909 Maryland Trust Bldg., Baltimore, Md. Mine office: La Cananea, Arizpe, Sonora, Mex. J. O. Johnston, president; Chester F. Johnston, secretary. Capitalization $5,000,000, shares $10 par. Lands, 387 acres, on the western slope of the Cananea Mountains, showing good outcrops of auriferous copper, carbonates and silicates. Idle.

BALVANERA MINING CO. **MEXICO.**

Office: 1202-24 Broad St., New York, N. Y. Mine office: Concheño, Rayón, Chihuahua, Mex. Herbert T. Beatty, president; Chas. W. White, secretary and treasurer. Is controlled, through ownership of majority of stock, by Greene Gold-Silver Co. Lands, circa 46,000 acres, in the Ocampo and Concheño districts.

BAMBERGER-PIOCHE MINING CO. **NEVADA.**

Office: care of Simon Bamberger, president, Salt Lake City, Utah. Mine office: Pioche, Lincoln Co., Nev. Edward Cutts, superintendent, at last accounts. Lands, 12 claims, lying to the westward of the Nevada-Utah. Presumably idle.

BANKER'S MINING & DEVELOPMENT CO. **MEXICO.**

Office: care of E. R. Chapman & Co., New York, N. Y. Mine office: Zautla, San Juan de los Llanos, Puebla, Mex. Chas. Q. Davis, president; W. L. Wilkins, general manager. Is said to plan a 250-ton smelter.

BANNACK CONSOLIDATED MINING CO. **MONTANA.**

Office: care of Carlton H. Hand, president, Butte, Silver Bow Co., Mont. Letter returned unclaimed from former mine office, Bannack, Beaverhead Co., Mont. Organized 1906, with capitalization $1,250,000, shares $5 par. Lands, 312 acres, covered with alluvium of 25' to 75' depth, opened by 2 shallow shafts, showing ores assaying up to 5% copper and $2.40 gold per ton.

BANNER GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. Dr. J. L. Jacobs, president; R. W. Eager, secretary. Main tunnel, 101', shows ores assaying up to 18% copper and $15 to $33 gold per ton. Idle.

BARABA MINING CO. **WISCONSIN.**

Office and mine: Mellen, Ashland Co., Wis. Nelson Baraba, Sr., president; Nelson Baraba, Jr., secretary. Organized 1906, with capitalization $1,000,000, shares $1 par. Has a shallow shaft showing ore assaying 2.8% copper, with traces of gold and silver.

BARAGUNDA MINES. **INDIA.**

Mine office: Baragunda, Hazaribagh, Bengal, India. Were operated, 1887

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to 1891, turning out about 1,000 tons of copper in five years. Ore occurs as chalcopyrite, running only 1 to 3% copper, in a gangue of micaceous schist. All ore treated was carted 24 miles to the smelter, at Giridhi. These are perhaps the most promising copper properties now known in India, despite the low grade of the ore, and might be worked successfully, if given rail facilities, adequate capital and good management. Idle.

SUCESIÓN DE BARAZARTE. **CHILE.**

Mine office: Paposo, Taltal, Antofagasta, Chile. Property includes the Reventon mine, 400′ deep, and the Abundancia mine, 380′ deep, both opened in 1830, also La Unión mine. Has steam power. Idle.

BARBERTON COPPER CO., LTD. **TRANSVAAL.**

Office: High Court Bldgs., Johannesburg, Transvaal. Mine office: Barberton, Middelburg, Transvaal. T. F. Allen, chairman. Organized July 25, 1907, under laws of Transvaal, as successor of the Barberton Copper Syndicate. Lands, 144 claims, near Noord Kaap. Manager states that he is opening the biggest mining and smelting proposition in South Africa, which seems a rather ambitious statement, in view of the small amount of work accomplished.

BARBERTON COPPER SYNDICATE, LTD. **TRANSVAAL.**

Dead. Reorganized July 25, 1907, as Barberton Copper Co., Ltd. Formerly at Barberton, Middelburg, Transvaal.

BARE HILL MINE. **MARYLAND.**

Office: care of F. R. Van Antwerp, owner, Hornell, N. Y. Letter returned unclaimed from former mine office, Mt. Washington, Baltimore Co., Md. Is an old but slightly developed mine, showing auriferous and argentiferous chalcopyrite and bornite. In 1907 owner planned installing a mine equipment. Idle some years.

BARISTE COPPER CO. **MEXICO.**

Office: 84 Adams St., Chicago, Ills. Mine office: Aguacaliente de Baca, Fuerte, Sinaloa, Mex. John E. Richardson, president; Harry Austin Clapp, vice-president and general manager; Paul H. Seymour, secretary; Edw. R. Austin, treasurer; Daniel H. Livingston, superintendent; preceding officers, Wm. Walden Shaw and Herbert F. Spellman, directors. Organized Feb. 23, 1906, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 104 hectares, in the Fuerte and Alamos districts, said to show 8 veins, of which 2, under development, of 24′ estimated average width, said to be traceable 1 mile, are slightly developed by tunnel, shafts and trenches, with about 800′ of workings, showing oxidized ores said to average 16% copper and 25 oz. silver per ton.

BARNES COPPER CO. **MONTANA.**

Office: 810-184 La Salle St., Chicago, Ills. F. E. Barnes, superintendent. Capitalization $1,500,000, shares $1 par. Lands are sundry unpatented claims in Granite county, Montana, said to show 2 veins of 4′ width, between diorite and slate, one carrying copper ore and one, of about 6′ width, between quartzite and sandstone, carrying silver-lead ores. Has a 120′ tunnel and several shallow shafts.

BAROTSE COPPER CO., LTD. **RHODESIA.**

Dead. Merged, 1902, in Rhodesia Copper Co., Ltd.

BARRANCA COPPER CO. **MEXICO.**

Office: 170 Broadway, New York, N. Y. Mine office: Barranca del Cobre, San Andres del Rio, Chihuahua, Mex. H. T. R. Cowell, manager. Lands, 25 miles east of a railroad, include La Purisima mine, having argentiferous and auriferous copper ores, opened by a 750′ shaft and a 2,100′ tunnel. Has shipped circa 2,000 metric tons of high grade ore, in concentrates, and is said to have large reserves of low grade copper ore. Has a 20-stamp mill with

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two 4′ Huntington mills, a 100-ton concentrator and a 60-ton smelter. Negotiations said to be under way for transfer of property to Anglo-American Development Co.

BARSTOW MINING & MILLING CO. **COLORADO.**

Office: Titusville, Pa. Mine office: Ironton, Ouray Co., Colo. John J. Carter, general manager; John Geisel, superintendent. Property is the Bobtail group, producing mainly gold, with silver, copper and lead as by-products. Has a 40-stamp mill with steam and electric power, employing about 60 men.

GEWERKSCHAFT BARTHOLOMÄUS. **GERMANY.**

Dead. Formerly at Menden bei Olpe, Westfalen, Germany. Described Vol. VI.

BASEL MINING CO. **NEVADA.**

Dead. Formerly at Tonopah, Nye Co., Nev. In 1907 was opening a mine in the Lone Mountain district, circa 16 miles west of Tonopah, on a 7′ vein showing auriferous and argentiferous copper ore.

BASIN & BAY STATE MINING CO. **MONTANA.**

Dead. Property sold July 30, 1907, for $302,865 to the Basin Reduction Co. Formerly at Basin, Jefferson Co., Mont.

BASIN-COMSTOCK CO. **MONTANA.**

Dead. Formerly at Cataract, Jefferson Co., Mont.

BASIN GOLD & COPPER MINING CO. **MONTANA.**

Office: care of E. R. Holden & Co., 20 Broad St., New York. Mine office: Basin, Jefferson Co., Mont. Hon. Robt. B. Smith, president; Marcus L. Hewett, vice-president and general manager; B. Lowinson, secretary and treasurer. Lands, 280 acres, patented, known as the Hope mine, on which considerable development has been secured. Company is entangled in litigation and apparently hopelessly involved.

BASIN REDUCTION CO. **MONTANA.**

Works office: Basin, Jefferson Co., Mont. W. A. Kidney, superintendent. Is controlled by La France Copper Co., which is dominated by United Copper Co. In August, 1907, bought the mill and smelter of the Basin & Bay State Mining Co. and the Katie mine, at sheriff's sale, for $302,865. Mill is of about 1,200 tons daily capacity. Has had some trouble with the county authorities because of polluting streams with tailings, but has built large dams to hold the slimes.

BASLER MINING & DEVELOPMENT CO. **CALIFORNIA.**

Office: 904 J St., Sacramento, Cal. Mine office: Lowry, Tehama Co., Cal. Dr. D. L. McLean, president; W. L. Rennie, secretary and treasurer; C. M. Basler, general manager. Organized under laws of California, with capitalization $200,000, shares $1 par. Lands, 14 claims, partly patented, also a 5-acre millsite and 320 acres miscellaneous lands, opened by a 1,200′ tunnel, with 3,000′ of underground openings, showing 3 ore bodies, one of 2′ to 75′ width, giving average assays of 2% copper, 2% lead, and $1 to $3 gold per ton, from malachite, bornite and chalcopyrite.

JOHN BATES. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Property is the Santo Tomás mine, carrying native copper in conglomerate. Has steam power and is a small producer of barrillas de cobre.

BATES MINING & SMELTING CO. **MASSACHUSETTS.**

Dead. Formerly at Charlemont, Franklin Co., Mass. Described Vol. IV.

BATTLE COPPER MINING CO. **WYOMING.**

Succeeded circa 1907 by Portland Copper Mining Co. Formerly at Battle, Carbon Co., Wyo. Described Vol. VI.

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BATTLE LAKE & BATTLE CREEK MINING CO. **WYOMING.**

Office: care of N. B. Noble, Rice Lake, Wis. Mine office: Battle, Carbon Co., Wyo. Idle.

BATTLE LAKE TUNNEL SITE MINING CO. **WYOMING.**

Office: 731 Monadnock Block, Chicago, Ills. Mine office: Rudefeha, Carbon Co., Wyo. E. M. Cobb, president. Organized 1900, under laws of Wyoming, with capitalization $2,500,000, shares $1 par. Is controlled, through stock ownership, by Penn-Wyoming Copper Co. Lands, 30 claims, area 600 acres, also 80 acres miscellaneous lands.

BATTLE MOUNTAIN COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

BATTLESHIP MINING & MILLING CO. **NEW MEXICO.**

Office: 412 Mack Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Lordsburg, Grant Co., N. M. Dr. O. L. Blachly, president; O. B. Crum, secretary and treasurer. Capitalization $100,000, shares $1 par. Lands, 2 groups of 2 claims each, area 79 acres, in the Virginia district, three to four miles from Lordsburg, connected therewith by a good wagon road. Property has no surface improvement, but is opened by 478′ of shafts, crosscuts, and opencuts, showing ores that are said to have given average returns, from smelter shipments to El Paso, of 8 to 14% copper, 1 to 20% lead, 22 oz. silver, and $10 to $20 gold per ton. Idle and apparently moribund.

BAUMANN COPPER CO. **ARIZONA.**

Office: 407 Keystone Bldg., Pittsburg, Pa. Mine office: Humboldt, Yavapai Co., Ariz. Thos. G. McClure, president; H. L. Dooley, vice-president; W. H. McClelland, secretary; R. Johnston, treasurer; J. M. McNeal, managing director. Organized Aug. 3, 1901, under laws of Arizona, with capitalization $600,000, increased, 1907, to $1,500,000, shares $1 par. Has an issue of 5-year 6% convertible bonds. Was practically reorganized, 1907. Annual meeting, first Monday in November.

Lands, 25 claims, area 500 acres, unpatented, in the Agua Fria district, including the Swiss Girl mine. Country rocks are quartz-porphyry and slate, principal veins occurring as fissures in quartz-porphyry, with heavy gouge on footwall. Ores are cuprite, malachite and azurite above, with chalcopyrite below, giving assays of 14 to 42% copper, from a trace to 312 oz. silver, and from a trace to $33.50 gold per ton. Development is by 11 shafts, three of 208′, 214′ and 690′, with 8 under 200′ depth, and by tunnels of 50′, 150′, 200′, and 305′, with a total of 2,650′ of underground openings. Equipment includes a 25-h. p. hoist, good for 1,500′, an 80-h. p. boiler, 2-drill Sullivan air-compressor, 2 power drills and several small mine buildings. Property considered promising. Idle at last accounts, but resumption planned.

SOCIEDAD MINERA y FUNDICIÓN DE RAUSCH y TIANI. **ARGENTINA.**

Office, mine and works: Chilecito, Rioja, Argentina. Property includes the Compañia and Mercedes mines. Has steam and water power and a smelter, known as the San Miguel, built 1876, for lead ores, at a cost of $120,000, and altered, 1893, to treat copper ores of the Mexicana district.

BAY COPPER MINES, LTD.

Office: 142 Palmerston House, London, E. C., Eng. John Robertson, managing director; W. R. Caldwell-Moore, secretary. Organized Jan. 24, 1902, with capitalization £35,000, shares £1 par; issued, £15,007. Claims to own an idle copper mine, but location unknown.

BAY HORSE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Riverside, Carbon Co., Wyo.

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BEACON CONSOLIDATED MINES CO. **COLORADO & MEXICO.**

Office: 609 Mack Bldg., Denver, Colo. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Lloyd Kenyon Jones, secretary, treasurer and promoter. Has two gold claims, on Beacon Hill, Cripple Creek, Teller county, Colorado, and in June, 1907, claimed to be acquiring 40 to 50 pertenencias of copper ground at La Cananea.

BEAD LAKE GOLD-COPPER MINING & MILLING CO. **WASHINGTON.**

Office: care of W. E. Allen, secretary, Spokane, Wash. Mine office: Newport, Stevens Co., Wash. B. F. Seeley, president; O. L. Smith, superintendent. Organized, 1901, under laws of Washington, with capitalization $3,000,000, shares $1 par. Lands, 13 claims, area 267 acres, developed by a 2,065′ tunnel, showing sulphide ore. Has steam power and air-compressor. Was exploring by diamond drill at last accounts.

BEAN AMALGAMATED COPPER CO. **NEW MEXICO.**

Letter returned unclaimed from former mine office, Lordsburg, Grant Co., N. M. Organized 1907, under laws of Arizona, with capitalization $6,000,000. Lands, 600 acres, formerly known as the Bean & Good claims, in the Shakespeare district, shortly south of Lordsburg.

BEAN COPPER CO. **ARIZONA.**

Dead. Formerly at Gila Bend, Maricopa Co., Ariz.

BEAR GULCH MINING CO. **MONTANA.**

Office and mine: Twin Bridges, Madison Co., Mont. Alex. Johnson, manager; Edson C. Baxter, superintendent. Property is the Mountain View group, carrying auriferous and argentiferous copper ores, opened by tunnel. Has steam power.

BEAR MOUNTAIN MINING & DEVELOPMENT CO. **WASHINGTON.**

Mine office: Colville, Stevens Co., Wash. C. G. Carruthers, superintendent, at last accounts. Has argentiferous and auriferous copper ore, opened by tunnel.

BEAR MOUNTAIN TUNNEL & MINING CO. **COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. H. H. Williams, superintendent, at last accounts. Has argentiferous and slightly auriferous copper ores, opened by tunnel, with water power.

BEAR TOOTH GOLD & COPPER MINES CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Redding, Cal. Organized October, 1907, under laws of California, with capitalization $900,000, by F. P. Burrie, Robt. Duffy, W. A. Courcy, W. A. Bender and H. W. Leach. Lands, 14 claims, in Trinity county, California, said to have 14 parallel veins carrying auriferous and argentiferous copper ore, these ranging from a few inches to several feet width, and said to give average assays of 4% copper, 5 oz. silver and $15 gold per ton. Has a shallow shaft and a 500′ tunnel, with considerable trenching.

BEATRICE MINING & MILLING CO. **MONTANA.**

Mine office: Elliston, Powell Co., Mont. D. G. Barringer, president; A. McNaughton, secretary and general manager; Abner Knapp, superintendent. Has ores of gold, silver, lead and copper, opened by tunnel. Has steam power and a 10-stamp mill.

A. K. BEATSON. **ALASKA.**

Business of Bonanza mine is done in name of A. K. Beatson.

BEAUPARK COPPER MINES CO., LTD. **IRELAND.**

Office: 36 College Green, Dublin, Ireland. W. Hume and D. Frame, directors. Organized Feb. 12, 1908, under laws of Great Britain, with capitalization £1,000, shares £1 par, to acquire mineral lands in County Meath, Ireland.

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BEAVER CAÑON GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Loomis, Okanogan Co., Wash. E. P. Gaillac, manager. Lands, sundry claims, circa 8 miles south of Loomis.

BEAVER CARBONATE MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Lands, 2 miles north of Frisco, have a 553′ shaft.

BEAVER CONSOLIDATED MINING CO. **UTAH.**

Dead. Merged, 1904, in Beaver-Harrison Mining Co. Formerly at Milford, Beaver Co., Utah.

BEAVER COPPER CO. **UTAH.**

Office: 222 D. F. Walker Bldg., Salt Lake City, Utah. Maj. Henry Catrow, president and general manager; A. J. Bettles, first vice-president; A. J. McMullen, second vice-president; A. D. McMullen, secretary; H. P. Clark, treasurer; preceding officers, Jos. H. Patterson, A. D. Moffat and Paul E. Banker, directors; D. P. Rohlfing, consulting engineer. Organized 1906. Lands, 14 claims, in the Beaver Lake district, showing a strong vein traceable about 1 mile, giving assays of .4 to 25% copper and up to 70 oz. silver, opened by a 100′ shaft showing 10% chalcopyrite at bottom. Under former ownership desultory mining operations produced a little high-grade ore.

BEAVER COPPER MINING CO. **WYOMING.**

Dead. Wound up. Formerly at Downington, Carbon Co., Wyo. Described Vol. V.

BEAVER-HARRISON MINING CO. **UTAH.**

Office: 23 Eagle Block, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. J. J. Trenam, president and manager; E. H. Jacobs, treasurer; B. L. Corum, secretary. Organized 1904, with capitalization $75,000, shares 5 cents par, as a merger of Beaver Consolidated Mining Co. and Ben Harrison Gold & Copper Mining & Milling Co. Lands, 21 claims, area 385 acres, in the Beaver Lake district, one group being near the O. K. mine of the Majestic company, showing sundry fissure veins, opened by 2 shafts of 300′ and 534′, with about 2,000′ of workings, showing a 10′ ore body assaying 5 to 50% copper, and up to 10 oz. silver and $7 gold per ton. Has steam power and an air-compressor, with necessary mine buildings. Presumably idle.

BEAVER LAKE COPPER CO. **PENNSYLVANIA.**

Mine office: Bloomsburg, Columbia Co., Pa. Has secured ores assaying 17% copper. Idle.

BEAVER MOUNTAIN MINING CO. **ALASKA.**

Mine office: Sulzer, Prince of Wales Island, Alaska. Henry Miller, president; George Comer, manager. Lands, sundry claims on the south side of Beaver Mountain, Hetta Inlet. Development is by tunnels, showing ore carrying copper, nickel and cobalt. Idle.

BEAVER VALLEY MINING & LAND CO. **COLORADO.**

Office: care of E. P. Castor, secretary and treasurer, Boulder, Colo. Letter returned unclaimed from former mine office, Rosemont, Teller Co., Colo. J. F. Peck, president; Jas. F. Smith, consulting engineer. Lands include sundry mining claims, water rights and a dam. Has 2 shallow shafts and a short tunnel, showing a quartz vein giving fair assays in copper, silver and gold. Was developing with a small force at last accounts.

BECKER COPPER CO. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Said to have been absorbed, 1907, by Copper Company of Arizona.

BECKMANN COPPER MINING & DEVELOPMENT CO., LTD. **TRANSVAAL.**

Office: Johannesburg, Transvaal. Capitalization £6,000, shares £1 par;

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working capital, £2,000. Lands, 192 base metal claims, in the Zoutpansberg district, northern Transvaal, slightly prospected.

BEDE METAL & CHEMICAL CO., LTD. **NORWAY & SPAIN.**

Office: Hebburn-on-Tyne, England. General Spanish office: Manriques 9, Córdoba, Spain. Mine office: Puebla de Guzmán, Huelva, Spain. Sir Andrew Noble, Bart., K. C. B., chairman; preceding officer, W. D. Cruddas, Sir Walter Scott, Bart., Alfred M. Palmer and Mason T. Scott, directors; W. W. Brown, secretary; Richard Eshott Carr, general manager; Chas. S. Sams, superintendent. Organized 1870, under laws of Great Britain, with capitalization £288,400, shares £25 par, since reduced to £115,360, shares £10 par, and, in 1908, reissued in 115,360 shares, £1 par. Dividends, 1879-1907, were £108,464. Dividends 1906 were £14,320, and 1907 were £20,048. Statement, as of Jan. 1, 1908, gave assets of £114,427, liabilities £135,763; cash on hand, £49,005. Is primarily a manufacturer of acid and chemical products, but is a considerable producer of copper, from Spanish and Norwegian cupriferous pyrite.

Spanish lands, 71 hectares, leasehold, expiring 1942, include Las Herrerias mine, which has 7 workings in 2 groups. Main ore body is a large, irregular mass of solid cupriferous pyrite, in schist, with dip from vertical to 40° N., there being 7 ore bodies, of which 6, under development, range 1 to 40 meters in width, with extreme length of 400 meters, ore averaging about 1.75% copper and 47% sulphur. Mine is opened by shafts of 246', 185' and 186', with about 200,000 tons of ore blocked out. The western portion of the mine is worked open-cast, while in underground workings all ore is removed and openings filled with waste.

Mining equipment includes a locomotive, 2 hoists, machine-shop, smithy, carpenter-shop, office building, warehouses, 4 engine-houses and 25 dwellings. Ore as mined is piled on large flat-topped heaps, which are irrigated regularly, the resulting liquors being passed over iron for precipitation. There are 2 fresh-water dams and 4 leaching dams, of masonry. Precipitate ranges 70 to 80% copper, and is shipped to company's smelters at Hebburn-on-Tyne for reduction. Cost of copper, in precipitate, on board steamer, averages about £50 per long ton, including royalties, development charges and general expenses. Ore in leach-heaps is charged to general production, company's balance sheet concealing rather than padding actual assets. Production of Spanish mines, 1907, was 1,276,800 lbs. fine copper, secured with a force of circa 300 men.

The Killingdal mine, north of Röros, Norway, is operated under lease from Norwegian owners. Ore is cupriferous pyrite, averaging about 1.5% copper and 45% sulphur. Production, 1905, with an average force of 100 men, was 11,600 tons of ore, yielding 512,960 lbs. fine copper. A continuation of the main lode, discovered 1905, materially improves the prospects of the mine. Company is conservatively and successfully managed.

BEECHWORTH GOLD MINING SYNDICATE. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Lands, sundry claims 6 miles north of the Queen Bee mine, carrying a promising gossan containing gold, silver and copper values, opened by a 200' shaft showing auriferous and argentiferous copper and lead ores.

BELCHER MINING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Republic, Ferry Co., Wash. Jos. A. Anderson, president. Mine is opened by three tunnels, of which No. 3, the 1,000' main tunnel, shows a large body of medium-grade ore carrying a 2' footwall paystreak of high-grade chalcopyrite. Has a 1,000' aerial tram connecting 3 main adits with railroad bins. Water, brought 2,000' from Lambert Creek, through a steel pipe, generates electric power, and gasoline power is used also. Has 8 power drills. Property is considered promising.

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BELCHER MOUNTAIN GOLD & COPPER CO. **MONTANA.**

Mine office: Republic, Ferry Co., Wash. Is said to plan building a 500-ton smelter.

BELENE COPPER CO. **MEXICO.**

Office: 733-145 South Spring St., Los Angeles, Cal. Mine office: El Copete, Carbó, Ures, Sonora, Mex. J. J. Hardwick, president and general manager; S. E. Hostetter, vice-president; Harry R. Hay, secretary and treasurer; preceding officers, W. L. Hardwick and G. A. Willcox, directors. Organized Nov. 25, 1901, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Registered and protocolized June, 1902, under laws of Mexico.

Lands, 162 hectares, circa 24 miles from Carbó, the nearest railroad station, lying west and north of the Copete mine and near the Sultana mine of the Giroux Consolidated. Mine has shaft of 310′, 256′, 185′, 90′, and several tunnels, with circa one-half mile of workings, on 2 large sulphide ore bodies, claimed to give average assays of 12% copper, 8 oz. silver and $10 gold per ton. Has steam and electric power. Idle since circa 1903, except for shipment, May, 1907, of 70 tons of ore to El Paso smelter, which returned nearly $2,250.

BELEN MINING CO. **MEXICO.**

Office: 12 Chamber of Commerce Bldg., Minneapolis, Minn. Mine office: Cumpas, Moctezuma, Sonora, Mex. Chas. E. Wenzel, president; John E. Stair, vice-president; Ace P. Abell, secretary and treasurer; preceding officers, Chas. W. Sexton and Lyman W. Dickerson, directors; R. L. Van Dusen, superintendent; T. F. Janes, mine superintendent. Organized May 20, 1901, under laws of South Dakota, with capitalization $1,200,000, shares $10 par.

Lands, 190 hectares, also 14,000 acres of ranch and timber lands. Property shows 8 ore bodies, of which 5 have been more or less developed by 5 shafts and 3 tunnels, showing a vein of about 90′ width, with a 2′ paystreak of high grade ore averaging circa 8% copper, 20 to 30 oz. silver and 0.09 to 0.5 oz. gold per ton, from chalcocite, bornite, chalcopyrite and tetrahedrite, ores being bismuthiferous.

Equipment includes a steam and electric power plant, with 2 electric hoists and electric lights. There are about 10 buildings, including necessary shops. Transportation is by wagon road from Dos Cabezos mine to Cumpas, via the Transvaal mine.

Smelter has a rotary calciner and 30-ton Medberry revolving reverberatory furnace, but this plant, blown in 1908, did not give satisfactory results, for some reason, and was closed down after a short run. Some copper ore has been shipped to the Copper Queen and El Paso smelters, and 8 carloads of bismuthiferous ore have been shipped to England.

SOCIÉTÉ ANONYME BELGE POUR LA RECHERCHE ET L'EXPLORATION DES MINERAIS. **ITALY.**

Mine office: Massa Marittima, Grosseto, Tuscany, Italy. Is a Belgian company, operating a mine of slightly cupriferous iron pyrites.

COMPAGNIE DES CUIVRES DE BELGIQUE. **BELGIUM.**

Office: 17 Quay Napoleon, Antwerp, Belgium. Works office: Duffel, Belgium. Employs circa 60 men. Marquis de St. Seine, chairman; Louis J. Burkard, commercial director; H. de Montagu, metallurgical director; Herman G. C. Thöfehrn, consulting engineer. Organized April, 1905, under laws of Belgium, with capitalization 500,000 francs, shares 500 f. par. The smelter, at Duffel, a suburb of Antwerp, and connected therewith by water, has a 250-ton blast furnace and five 100-ton reverberatory furnaces.

BELLA COOLA COPPER CO. **BRITISH COLUMBIA.**

Office: 606 First Ave., Spokane, Wash. Provincial office: Bella Coola,

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Cassiar district, B. C. V. M. Scribner, president; S. S. West, vice-president; R. R. Swim, treasurer. Organized August, 1906, under laws of Washington, with capitalization $2,000,000, shares $1 par, and registered, 1907, under laws of British Columbia, as an extra-provincial company. Lands, 9 claims, area 450 acres, at tidewater, on the Burke channel, on Bella Coola Mountain, circa 400 miles north of Vancouver. The Burke mine has been developed slightly by trenching.

MINA BELLAVISTA. **MEXICO.**

Office: care of Henry L. Choistry, owner, Guadalajara, Jal., Mex. Mine office: Etzatlán, Jalisco, Mex. Lands, 14 pertenencias, just east of Etzatlán, showing 7 veins, two averaging 1 metre in width, slightly developed by about 95 metres of workings, showing argentiferous and auriferous copper ores. Property is an antigua, formerly known as the Picachos. Idle.

BELL-DOMINION COPPER MINING CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Organized August, 1904, with capitalization $250,000. Lands, 10 claims, known as the Scotch group, west of Pinal Creek. Had a 70′ shaft at last accounts. Presumably idle.

BELLE OF GRANITE MINE. **COLORADO.**

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, superintendent, at last accounts. Lands, sundry claims, developed by a 475′ shaft, bottomed in a very narrow but rich vein, claimed to average about 32% copper, 28 oz. silver and $120 gold per ton.

BELL MARE COPPER MINING & SMELTING CO. **NEVADA.**

Dead. Merged, 1902, in the Nevada Bell Copper Mining & Reduction Co. Formerly at Lovelock, Humboldt Co., Nev.

MINA BELL. **MEXICO.**

Office: care of Robert Tate, manager, Bisbee, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mex. Lands, sundry claims, circa 18 miles west of Fronteras, showing rich auriferous and argentiferous copper ores. Presumably idle.

BELL MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

BELMONT MINE. **MONTANA.**

Owned by Butte Coalition Mining Co.

BELLONA MINE. **MONTANA.**

Owned by Parrot Silver & Copper Co.

BELMONT-CHEMUNG MINING CO. **COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

BELMONT MINING CO. **COLORADO.**

Mine office: Winfield, Chaffee Co., Colo. Has gold-silver-copper ores, opened by tunnel. Presumably idle.

BELMONT MINING CO. **MONTANA.**

Dead. Property sold, 1906, to Butte Coalition Mining Co. Formerly at Butte, Silver Bow Co., Mont.

BEN BUTLER MINING & MILLING CO. **UTAH.**

Dead. Was merged, 1903, in the Butler-Liberal Consolidated Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BENEDICTINE MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Cedar, Mohave Co., Ariz. Lands are known as the Cedar group. Suspended operations circa July, 1907, but is said to have been practically reorganized, and to plan resumption.

COMPAÑIA BENEFICIADORA DE MINERALES, S. A. **MEXICO.**

Is the Mexican incorporation of the National Smelting Co.

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BEN FRANKLIN GOLD MINING CO. **WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. Property is a prospect, showing auriferous copper ores. Idle.

BEN HARRISON GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Jeffersonville, Ind. Mine office: Chesaw, Okanogan Co., Wash. Geo. H. Holzboy, president; Basil Doerhoefer, vice-president; C. J. Weivel, secretary: Geo. F. Edgington, treasurer and general manager; preceding officers, W. A. Robeson and John Sidler, directors; Jas. P. Blaine, superintendent. Organized April, 1903, under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, area 120 acres, in the Myers Creek district, opened by a 140′ shaft and 1,100′ tunnel, showing mainly auriferous silver-lead ore. Has a 12-h. p. gasoline hoist, 25-ton concentrator and several mine buildings.

BEN HARRISON GOLD & COPPER MINING & MILLING CO. **UTAH.**

Dead. Merged, 1904, in Beaver-Harrison Mining Co. Formerly at Milford, Beaver Co., Utah.

BEN HUR COPPER MINING CO. **WYOMING.**

Office: 710-34 South Clark St., Chicago, Ills. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Chas. G. Mason, president; R. B. Short, vice-president; Clifford M. Miller, secretary and treasurer. Organized November, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, 3 patented, area 80 acres, in the Battle Lake district, opened by a 350′ tunnel, planned to cut a sulphide ore vein outcropping on surface. Presumably idle.

BEN HUR GOLD MINING CO. **WASHINGTON.**

Dead. Reorganized, 1906, to raise new capital, as Ben Hur Mining & Milling Co. Formerly at Republic, Ferry Co., Wash.

BEN HUR MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Geo. H. Keep, president; Frank Bell, vice-president and general manager; F. H. Bell, secretary; Chas. Keating, treasurer; Richard Daxon, manager; preceding officers and Geo. Trask, directors. Property is said to have a 25′ vein, in quartzite, carrying gray copper and lead ores containing fair gold values.

BEN HUR MINING & MILLING CO. **WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. S. P. Domer, manager. Organized 1906, with capitalization $1,000,000, shares $1 par, as a reconstruction of the Ben Hur Gold Mining Co. Mine, opened by shaft, shows ore values mainly in gold and silver, with a little copper. Has steam power. Late 1905 was shipping circa 25 tons of ore daily.

COMPAÑIA MINERA BENITO JUÁREZ. **MEXICO.**

Mine office: Peñón Blanco, Cuencamé, Durango, Mex. Has argentiferous and auriferous copper ores, employing about 40 men at last accounts.

CHARLES BENTON. **MEXICO.**

Mine office: Culiacán, Sinaloa, Mex. Has ores carrying gold, silver and copper, employing 20 men at last accounts.

BEREHAVEN COPPER MINES, LTD. **IRELAND.**

Dead. Formerly at Allihes, County Cork, Ireland. Described Vol. VI.

BERGBAU UND EISENHÜTTEN GEWERKSCHAFT. **AUSTRIA.**

Works office: Witkowitz, Austria. Has a small reduction plant, with electrolytic refinery having 72 tanks, with electrodes arranged on the multiple plan, with daily capacity of about 600 pounds of finished copper.

BERKELEY MINE. **MONTANA.**

Owned by Butte & Boston Consolidated Mining Co.

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BERLIN MINE. **MONTANA.**

Owned by North Butte Mining Co.

BERLIN MINING & DEVELOPMENT CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Wm. D. Thornton, Jas. D. Slemons and Jas. T. Steele, directors. Organized Apr. 10, 1905, under laws of Montana, with capitalization $200,000, shares $10 par. Out of business, and will be wound up as soon as money now in litigation, paid for Berlin claim by North Butte, can be distributed.

JOSÉ BERNARDINO. **MEXICO.**

Office and mine: Nombre de Dios, Durango, Mex. Was a very small copper producer at last accounts.

BERNICE & RED ROCK MINING CO. **MONTANA.**

Office: 15 Bee Hive Blk., Butte, Mont. Lands, 12 claims, a millsite and water right, on Red Rock Creek, circa 3 miles north of Bernice, Jefferson County, Montana, which is not a postoffice. Mine has several tunnels, of 400′ aggregate length, showing a 15′ vein with 4′ paystreak, from which selected samples gave average assays of 4.4% copper, 21.2% lead, 9.8 oz. silver and 40 cents gold per ton. Leasers, circa 1902, shipped a little ore.

BERNOUDY MINING & MILLING CO. **ARIZONA.**

Office and mine: Paradise, Cochise Co., Ariz. Wm. P. Wright, president; Fred G. Bernoudy, vice-president and general manager; Geo. A. Walker, secretary; Henry C. Chamberlain, treasurer; preceding officers are the directors. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, one-half mile northeast of Paradise, opened by tunnel. A smelter shipment, 1906, gave returns of 4% copper, 151 oz. silver and 1.92 oz. gold per ton.

BERSBO KOPPARVERK. **SWEDEN.**

Is the smelting plant of the Aktiebolaget Atvidabergs Kopparverk.

SUCESIÓN NOEL BERTHÍN. **BOLIVIA.**

Office: 74 Rue de Rennes, Paris, France. Mine office: Coro Coro, La Paz, Bolivia. Ange Berthin, agent. Employs circa 450 men. Property is the Guallateri mine, 2 kilometers from the city, having a separate mining location with about 2,000 population. Property carries cupriferous conglomerates, copper occurring native. Main shaft is 1,100′ deep and mine has been opened for length of circa 1,300 meters, with machinery plant midway. Property has a reduction plant, known as the Acourni, near the mine, and is the second largest copper producer of Bolivia, the Bolivian government estimating the cost, per quintal of barilla de cobre, of 80% copper tenor, at 6.5 bolivars. Production, 1903, was 2,028,232 lbs. fine copper.

BERTRAND COPPER CO. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Idle.

BESA y CA. **CHILE.**

Dead. Property sold, November, 1906, to Société des Mines et Usines de Cuivre de Chañaral. Described Vol. VI.

BESSEMER COPPER MINES CO. **NEW MEXICO.**

Mine office: Fierro, Grant Co., N. M. Lands include the Continental, Iron Head and Anson S. mines, latter said to produce ore of 7% copper tenor, opened by a 200′ shaft. Property was worked formerly for iron ore, having been leased by the Bessemer Iron Association and Colorado Fuel & Iron Co. Extraction of copper by latter was stopped, by injunction, lease calling for mining of iron ore only. Company is said to plan a 100-ton smelter.

BESSEMER IRON ASSOCIATION. **NEW MEXICO.**

Office: Hanover, Grant Co., N. M. Mine office: Fierro, Grant Co., N. M. Copper properties are leased to the Bessemer Copper Mines Co.

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BESSHI MINE. **JAPAN.**

Owned by Sumitomo Copper Co.

BETTS COVE SULPHUR, COPPER & IRON CO. **NEWFOUNDLAND.**

Office: 1702-43 Exchange Place, New York. Apparently company has lost or sold its mine at Betts Cove, Newfoundland.

BETTS GAP MINE. **NORTH CAROLINA.**

Mine office: Care of Winfield Scott Adams, Savanna Creek, Jackson Co., N. C. Lands, 1,300 acres, in the Blue Ridge Mountains, carrying two veins, apparently averaging about 50′ width and prospected for about 1,500′ in length. Upper vein carries mainy disseminated chalcopyrite; lower vein mainly pyrrhotite, with prospect that these veins join at depth. Has 4 short tunnels, 2 shallow shafts and 20 drill-holes, with indications favoring possession of a large amount of low to medium grade ore. Assays average about 4.5% copper and $1.60 gold per ton from chalcopyrite, the pyrrhotite showing nickel and traces of platinum. Presumably idle.

BEULAH COPPER CO. **WYOMING.**

Dead. Supposedly absorbed by United Exploration Co. Formerly at Battle, Carbon Co., Wyo.

MINA BIBIANA. **MEXICO.**

Office and mine: Charcas, Moctezuma, San Luis Potosí, Mex. Aurelio Hiriarte, owner and manager. Mine has silver-copper ores, employing about 35 men at last accounts.

BICKERTON COPPER MINES SYNDICATE, LTD. **ENGLAND.**

Office: care of Allen, Edwards & Oldfield, 16 Eastcheap, London, E. C., Eng. Organized Oct. 9, 1907, under laws of Great Britain, with capitalization £750, shares £1 par, to acquire a lease on the Bickerton copper mines, in Cheshire, England.

BIG BONANZA MINE. **ALASKA.**

Owned by Latouche Mining Co.

BIG BUG GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Succeeded, 1906, by Pocahontas Copper Queen Mining Co.

BIG BUTTE COPPER CO. **WYOMING.**

Office: 95 Washington St., Chicago, Ills. Mine office: Rudefeha, Carbon Co., Wyo. C. B. Bergquist, president. Organized circa November, 1907. Presumably idle.

BIG CHIEF COPPER CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. T. L. Knudtson, general manager. Lands, west of Encampment, include the Silver Lake mine, developing by tunnel. Plans utilizing Cow Creek for hydro-electric power plant.

BIG COLORADO MINING AND MILLING CO. **COLORADO.**

Mine office: Gladstone, San Juan Co., Colo. C. W. Bloodgood, manager, at last accounts. Ores carry gold, silver, copper and lead. Has electric and gasoline power. Idle.

BIG COTTONWOOD COPPER & GOLD MINING CO. **UTAH.**

Office: 521 Atlas Block, Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. Nicholas Treweek, president and general manager; W. Mont. Ferry, vice-president; J. Leonard Burch, secretary and treasurer; preceding officers, J. E. Galligher and John S. Bransford, directors. Organized under laws of Utah, with capitalization $1,500,000, increased, 1906, to $3,750,000, shares $5 par. Lands, circa 200 acres, opened by a 500′ tunnel showing carbonate and sulphide ores assaying 4 to 10% copper and up to $3 per ton in combined gold and silver values. Property considered promising.

BIG CREEK COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

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BIGELOW GOLD & COPPER MINING CO. **NEW MEXICO.**

Dead. Was organized by same people as the Victoria Chief. Formerly at Hillsboro, Sierra Co., N. M.

BIG HORN MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Wendendale, Yuma Co., Ariz. Was prospecting, late in 1907, and was said to have found some good ore at shallow depth.

BIG HORN MINING CO. **COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Has a 50′ shaft, on the Copper Queen group, bottomed in a 5′ vein claimed to assay 20% copper. Idle.

BIG INDEX GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 419 Pioneer Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Wm. Frankfurt, president; J. C. Rathbun, secretary; Ed. E. Aegerter, superintendent. Organized 1902, under laws of Washington, with capitalization $2,500,000, shares $1 par. Lands, 15 claims, area 300 acres, 4 miles from a railroad, in the Washington district, opened by a 350′ tunnel, showing ores giving average assay values of $26 per ton, in copper and gold, principally latter. Idle.

BIG INTERIOR MINE. **BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Isld., B. C. Lands, 7 claims, area 350 acres, at the head of Great Central Lake, 12 miles from Alberni, at an elevation of 5,000′ above sea-level. Property shows a brecciated zone with considerable impregnation of copper carbonates, low in grade, but with ore in immense quantities, and apparently available for concentration, if given transportation facilities, mine being very difficult to reach by present trail. Only development is a 31′ tunnel. Idle.

BIG LEAD MINING & SMELTING CO. **ARIZONA.**

Dead. Merged, circa July, 1907, in Kelvin-Calumet Copper Mining Co. Formerly at Kelvin, Pinal Co., Ariz. Described Vol. VI.

BIG SHOW SILVER & COPPER MINING CO. **MONTANA.**

Mine office: Twin Bridges, Madison Co., Mont. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 4 claims, showing auriferous and argentiferous copper ores. Presumably idle.

BIG SPRINGS MINING CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. C. W. McCoy, manager. Organized 1907. Lands, variously reported as 7 or 11 claims, are known as the Claire group, near Wood Cañon. Shipped a little ore before present ownership. Vein has a 2′ paystreak, carrying mainly silver-lead ore, with a little argentiferous copper ore, all more or less auriferous, opened by a 165′ tunnel. Silver-lead ores are shipped to El Paso smelter, and copper ores to the Douglas smelter. Employs 10 men.

BIG YANK MINING & MILLING CO. **OREGON.**

Office: 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. J. C. Mattison, superintendent, at last accounts. Has auriferous and argentiferous copper ores. Idle.

MINAS BILBAINAS. **SPAIN.**

Office: care of Aznar y Cà., owners, Bilbao, Spain. Mine office: Paimogo, Huelva, Spain. Property is the eastward extension of La Romanera group, with a promising showing of ore. Presumably idle.

COMPAÑIA MINERA BILBAINO ASTURIANO. **SPAIN.**

Office: Bilbao, Spain. Is controlled, through stock ownership, by Don Fulano Copper Mines, Ltd. Lands, 214 acres, in the province of Asturias, Spain, including 5 copper and 3 zinc properties.

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BILLION DOLLAR QUEEN MINING CO.

Dead. A stock-jobbing scheme, promoted by a petticoat grafter called Mrs. Van Arsdale, née Estella Trunnel, alias Mrs. Estella True-Nell.

BI-METALLIC GOLD & COPPER MINING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Loomis, Okanogan Co., Wash. Lands, sundry claims, slightly developed by tunnel.

BINGHAM AMALGAMATED COPPER CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Jos. Edmunds, general manager. Property includes the Illinois and Copper Glance groups, former having a vein of about 9′ width, carrying a 2′ paystreak of 5% copper ore, some ore assaying up to 40% copper. The average of 50 assays, for the entire vein, gave 2.8% copper, 6 oz. silver and $2 gold per ton. The Copper Glance group has an 1,800′ tunnel, in McGuire Gulch. The Amalgamated group is said to show, on the 300′ level, an ore chute of 60′ width, averaging 4.5% copper and $1.20 gold per ton. Equipment includes an electric plant. Some ore has been shipped. Property considered promising.

BINGHAM ARGENTINE COPPER CO. **UTAH.**

Office: 1401-56 Broadway, New York, N. Y. Mine office: Bingham Canyon, Salt Lake Co., Utah. A. T. Wright, president; John Dern, vice-president; Wm. H. Iglehart, secretary; P. T. Farnsworth, treasurer. Organized 1907, under laws of Utah, with capitalization $1,000,000, shares $1 par. Lands, circa 150 acres, on Sheep Mountain, near the Utah Consolidated and Bingham-New Haven.

BINGHAM-BAY STATE COPPER CO. **UTAH.**

Office: 161 Devonshire St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. E. Harding Dickinson, president; W. G. Brown, secretary and treasurer; John E. Cotter, general manager; Jos. Kauffman, director; Fredk. G. Tibbitts, financial agent. Organized under laws of Utah, with capitalization $1,000,000, shares $1 par. Lands, 18 claims, at the head of Butterfield Cañon, formerly known as the Mt. Aetna group, adjoining the Last Chance mine of the Nevada-Utah. Mine has 3 tunnels, No. 1 being 600′, No. 2 about 300′ and No. 3 being 290′ in length, latter planned to cut vein at depth of about 1,200′. No. 1 tunnel has a Fairbanks & Morse engine and air-compressor. Has secured ore assaying 15% lead, 3.4 oz. silver and $10.40 gold per ton, with occasional copper values. Officers stand well and developments have been pushed systematically and vigorously.

BINGHAM-BUTTE COPPER MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. John T. Cowan, president and general manager; Geo. A. Bellinger, superintendent. Organized circa 1907, with capitalization $5,000,000, shares $5 par, as successor of Copper Hill Mining Co. Lands, 240 acres, including the Copper Hill group, opened by 2 tunnels, on the Caledonia fissure, upper tunnel giving ore assaying up to 25% copper, 35% lead, 26 oz. silver and $5 to $9 gold per ton. Also has a 2′ vein of ore said to assay 5% lead, 55 oz. silver and $11 gold per ton. Has shipping-bins at mouth of lower tunnel, at the railroad track.

BINGHAM CENTRAL MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Samuel Newhouse, president; H. P. Clark, treasurer; D. C. Jackling, managing director. Capitalization $5,000,000, shares $5 par. Has a bond issue of $250,000, apparently convertible into stock at $2 per share. Is controlled, through ownership of practically entire stock issue, by Bingham Central-Standard Copper Co.

Lands, 190 acres, patented, developed by 2 tunnels, these being known as the upper or Whiteley tunnel, of about 2,000′ length, showing mainly silver-lead ore, and the lower or Jeff Davis tunnel, of circa 1,000′ length, cutting a

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large body of low grade sulphide ore. In 1908 opened 2 new ledges, one of 3' to 4' width giving assays of 12% copper, the other being a vein of silver-lead ore of good average tenor. Mine has about 9,000' of workings and is considered promising.

BINGHAM CENTRAL-STANDARD COPPER CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Samuel Newhouse, president; D. C. Jackling, vice-president and general manager; Wm. M. Bradley, secretary; H. P. Clark, treasurer. Organized 1907, with capitalization $5,000,000, shares $5 par. Is a holding company, controlling, through ownership of practically entire stock issues, the Bingham Central Mining Co. and the Bingham Standard Copper Co., which are separately described.

BINGHAM-COCHISE COPPER MINING CO. **UTAH.**

Office and mine: Bingham Canyon, Salt Lake Co., Utah. Elmer Hill, manager. Organized January, 1906, under laws of Utah, with capitalization $500,000, shares $1 par. Lands include the Cochise and Brooks claims, in the Bingham district. Apparently a stock-jobbing enterprise.

BINGHAM CONSOLIDATED MINING & SMELTING CO. **UTAH.**

Office: 60 State St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Edward L. White, president; W. S. McCornick, vice-president; C. E. Davis, secretary; H. N. Sweet, treasurer; Duncan McVichie, managing director; preceding officers, W. F. Hammond, J. A. Coram, W. J. Freeman, L. T. Trull and O. E. Weller, directors. Organized Apr. 24, 1901, under laws of Maine, as a reconstruction of the Bingham Copper & Gold Mining Co., with capitalization $10,000,000, shares $50 par. Bonds, $1,000,000 authorized, at 6%; outstanding, $903,000. Annual meeting, third Wednesday in April. Owns an interest of 190,000 shares out of capitalization of 250,000 of Eagle & Bluebell Mining Co., and 231,500 shares in the Tesora mine of the Tintic district.

Lands, circa 300 acres, in the Bingham or West Mountain district, including the Dalton & Lark, Antelope, Brooklyn, Commercial, Miner's Dream, Sampson, Old Hickory, Vernard, Bingham and sundry other mines and claims.

In 1907 the company lost, on operations, $277,442.43, ending the year with quick assets of $244,697.70 and direct liabilities of $770,186.35, showing that operations were conducted at a loss for some time preceding the 1907 break in the copper market. An involuntary petition in bankruptcy was filed June, 1908. A reorganization is being effected, under the title of Bingham Mines Co., and the property formerly held by the Bingham Consolidated Mining & Smelting Co. will be found described under latter title. Production, 1906, was 11,475,863 lbs. fine copper, of which amount only 6,124,333 lbs. were produced from ore taken from the company's own mines.

BINGHAM COPPER CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co, Utah. Edw. Home, president; W. E. Hubbard, vice-president; F. E. McGurrin, treasurer; Edward McGurrin, secretary. Capitalization $800,000, shares $1 par. Lands, circa 120 acres, lying north of the Utah Apex and west of the Butler-Liberal, having 2 tunnels and 2 shafts on the Venice claim, at the head of Cottonwood Gulch, and produced a little high grade ore in early days.

BINGHAM COPPER BOY MINING CO. **UTAH.**

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Abram Hanauer, Jr., president; J. P. Spalding, vice-president; J. H. Hurd, secretary; J. A. Cook, treasurer and general manager; J. B. Taylor, superintendent. Organized Feb. 19, 1901, under laws of Utah, with capitalization $1,500,000, shares $1 par. Annual meeting, first Monday in March.

Lands, 12 claims, 11 patented, area 142 acres, also an 11-acre millsite, in

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Carr Fork Cañon, in the western part of the Bingham camp, somewhat out of the developed district, lying west of the Highland Boy mine of the Utah Consolidated and apparently carrying a continuation of the Utah-Apex ore bodies. Property shows 3 veins, of 20′ to 40′ reported width, giving estimated average assays of 6% copper, 20% lead, 1.5% zinc, 18 oz. silver and $2.50 gold per ton, these figures being in themselves evidence of gross exaggeration. Ore on the dump shows 2 to 4.5% copper. Mine has an 800′ crosscut tunnel and a 2,000′ lower tunnel, with circa 6,500′ of workings, claimed by company to put 1,500,000 tons of ore in sight, which figures are excessive. Equipment includes an electric air-compressor. Company is out of funds and property idle, with poor prospects, though property is not devoid of promise.

BINGHAM COPPER GLANCE MINING CO. **UTAH.**

Dead. Merged, 1907, in Bingham Amalgamated Copper Co. Was successor of the Copper Glance Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BINGHAM COPPER & GOLD MINING CO. **UTAH.**

Offices: 60 State St., Boston, Mass., and 700 McCornick Bldg., Salt Lake City, Utah. Is the parent corporation of the Bingham Consolidated Mining & Smelting Co.

BINGHAM-COPPER HILL MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Henry P. Clark, president; Wm. M. Bradley, vice-president; Abram Hanauer, Jr., secretary and treasurer; preceding officers, C. E. Allen and A. P. Mayberry, directors; G. L. Bemis, general manager. Organized Dec. 18, 1905, under laws of Utah, with capitalization $1,500,000, shares $5 par. Lands, 5 claims, patented, area 100 acres, known as the Copper Hill group, adjoining the Conger and having a 500′ tunnel, also a number of other short tunnels and shallow shafts.

BINGHAM COPPER MINING CO. **UTAH.**

Dead. Succeeded, circa 1906, by Bingham Mary Copper Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BINGHAM & EASTERN COPPER MINING CO. **UTAH.**

Dead. Reorganized, 1903, as Bingham & Eastern Mines Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BINGHAM & EASTERN MINES CO. **UTAH.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah. Described Vol. IV.

BINGHAM GREAT WESTERN MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1908, to operate in the West Mountain district.

BINGHAM GROUP MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. R. L. Boothe, superintendent. Lands include the Croesus claim and the Greeley-Sacred group, opened by tunnel. Idle.

BINGHAM MARY COPPER CO. **UTAH.**

Office: care of Simon Bamberger, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. W. H. Dickson, vice-president; W. F. Adams, treasurer; J. B. Bean, secretary; Jas. Start, superintendent. Organized 1905, under laws of Utah, with capitalization $2,500,000, shares $5 par. Register & Transfer Company of Jersey City, transfer agent. Lands, 2 claims, patented, area 40 acres, in Carr Fork, near the Utah Apex. Mine has a 571′ shaft, showing ore assaying 4.7% copper, up to 12 oz. silver and $1 to $3 gold per ton. Has an electric hoist, good for 1,500′. Has sundry small but adequate mine buildings, and a tramway to the Rio Grande Western Railroad.

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Has but little ore developed and probably will have to go to considerably greater depth to find commercial ore bodies.

BINGHAM MARY MINING CO. **UTAH.**

Dead. Apparently succeeded, circa 1906, by Bingham Mary Copper Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BINGHAM METAL MINING CO. **UTAH.**

Offices: 161 Devonshire St., Boston, Mass., and 616 McCornick Bldg., Salt Lake City, Utah. Mine office: Tooele, Tooele Co., Utah. Clarence K. McCornick, president; Fred C. Smith, vice-president and general manager; Walter B. Farmer, treasurer; preceding officers, Cabot J. Morse and H. A. Smith, directors. Organized under laws of Maine. Capitalization, issued, $3,380,000. Apparently was to have been succeeded, 1907, by Bingham Metals Co., but doubtful if change was made. Lands, circa 1,300 acres, in Middle Cañon, fairly timbered and having a sawmill. Mine has 5 tunnels, No. 1 being 1,400', No. 4 being 1,700', and No. 5 being 500' in length. It is thought that the cupriferous porphyries of Bingham Canyon may extend to this company's property, development being from the Tooele side. Has water and electric power.

BINGHAM METALS CO. **UTAH.**

Office: care of Clarence K. McCornick, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Fred C. Smith, vice-president and general manager. Organized 1907, under laws of Utah, with capitalization $5,000,000, shares $5 par. Apparently is related to Bingham Metal Mining Co.

BINGHAM MINES CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. John Dern, president; C. W. Whiteley, vice-president; Frank Knox, treasurer; D. B. Locker, secretary; preceding officers, D. C. Jackling, Samuel Newhouse and H. C. Edwards, directors. Organized 1906, under laws of Utah, with capitalization $650,000, shares $1 par. Lands, 13 claims, area circa 250 acres, between the United States and Bingham Metals Mining Co., having a 130' tunnel. Has surface ores of low grade. Has no connection with other company of same name.

BINGHAM MINES CO. **UTAH.**

Office: 60 State St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Works office: Murray, Salt Lake Co., Utah. Jas. P. Graves, president. Organized 1908, under laws of Maine, with capitalization $1,500,000, shares $10 par, as a reconstruction of the Bingham Consolidated Mining & Smelting Co. Plans a $600,000 second-mortgage collateral 5-year 6% trust bond issue, convertible into stock at par. Exchanged 1 share new stock for 1 share old stock of Bingham Consolidated, plus $3.50 cash, payable in five 50-cent installments. Control of the Bingham Consolidated should carry control of the Eagle & Blue Bell Mining Co. at Eureka, Juab Co., Utah.

Lands are circa 500 acres, including the Dalton & Lark and Commercial mines, on the west side of Bingham Cañon, and the Mascotte mine, these being the principal properties, also the Antelope, Brooklyn, Miner's Dream, Sampson, Old Hickory, Bingham, Vernard and sundry other mines and claims. These properties have a considerable variety of ores, principally sulphides, carrying fair gold and silver-lead values at and near surface, changing at depth to auriferous and argentiferous chalcopyrite, of low average grade, estimated, probably too high, at 2.5% copper, with combined gold and silver values of about $2 per ton. Some of the ores are high in iron, hence desirable for fluxing, as the ores of the district are highly silicious, as a rule.

The Dalton & Lark mine, area 240 acres, has shafts of 850' and 1,150', with 4 tunnels, one having an electric haulage plant, extraction being exclusively by tunnel. The Dalton & Lark vein on the 11th level averages about 6'

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width, carrying about 2% copper, 6 oz. silver and $1.50 gold per ton. The Bingham vein, of about 8′ width, is said to average 6% copper and $2 to $6 combined gold and silver values, which probably is too high. The lead ores of the Dalton & Lark are richer than the copper ores, as a rule. The mine is claimed to have about 250,000 tons of medium grade and 500,000 tons of low grade ore in sight.

The Commercial mine, area 26 acres, has 2 ore bodies and is perhaps the best mine of the company, being estimated to show reserves of about 500,000 tons of ore averaging about 2% copper and $2.50 per ton in combined gold and silver values, ore having an excess of iron.

The Mascotte mine, area 160 acres, has the Mascotte tunnel of circa 7,000′ length, which drains the Dalton & Lark, Brooklyn and Miner's Dream mines, providing extraction also. Cost of tunnel was about $225,000, and it is planned to be driven, eventually, to the Ohio mine, with a total length of circa 8,000′. The Mascotte shows a fair vein of silver-lead ore, and the "Lead Mine vein," said to be circa 150′ wide, carries an average of 1.25 to 1.50% copper and 6 to 9 oz. silver per ton, with small gold values.

The Brooklyn mine, 1,600′ deep, has a 20′ vein in the bottom levels, showing a large tonnage of low-grade ore.

The Miner's Dream mine has been drained by the Mascotte tunnel, and can be operated through that tunnel, which taps the ore bodies 600′ below the old workings.

The Sampson mine carries auriferous and argentiferous chalcopyrite and auriferous galena.

The mine of the Fortune Mining & Milling Co. at Bingham is held under lease. The Tesora and Eagle & Blue Bell properties are described separately, under the names of the respective companies holding direct title.

The smelter, 13 miles from the mine, blown in 1901, is 150x400′ in size, of steel frame on stone foundations, having steel and cement floors and iron sides and roof, the only wood in the structure being the ore-bin partitions. Plant is terraced throughout, permitting handling of material by gravity. Equipment includes five 200-ton water-jacket blast-furnaces, 42x72″ at the tuyeres, calcining furnaces, a large reverberatory furnace, and a briquetting plant, capacity of the works being about 1,000 tons daily. Works have both steam and electric power, with a 1,000-h. p. Rarig blowing machine, Stirling boilers and automatic stokers. Smelter has a 375′ dust-chamber and a 200′ steel smokestack, of 12′ diameter. The converter plant has 2 stands, with six 12-ton shells, each 24x126″. Owing to trouble from smelter fumes, works were closed down, by injunction, late 1907, this proving the finishing stroke in bankrupting the Bingham Consolidated.

The Bingham Mines Co. has some serious financial and metallurgical problems to work out, but the mines, while low in grade, are by no means devoid of promise.

BINGHAM MONITOR MINING CO. **UTAH.**

Office: care of E. J. Wilkinson, secretary, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. G. R. Cleaveland, president; Robt. Palmer, vice-president. Organized 1906. Lands include the Ruth and Monitor groups. Presumably idle.

BINGHAM NEVADA MINING CO. **NEVADA.**

Office: Bingham Canyon, Utah. Mine office: Goodsprings, Lincoln Co., Nev. R. D. Kennedy, secretary; W. T. Simons, treasurer; J. M. Richards, superintendent. Lands, 10 claims, including the Payday group of 3 claims, said to have a 2′ vein of 40% zinc ore, and the Paymaster group of 3 claims.

BINGHAM-NEW HAVEN COPPER & GOLD MINING CO. **UTAH.**

Office: P. O. Box 84, New Haven, Conn. Operating office: 508 McCor-

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nick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake City, Utah. L. E. Stoddard, president; E. B. Critchlow, vice-president; T. W. Farnam, secretary and treasurer; preceding officers, E. G. G. Stoddard and F. S. Brusler, directors; C. H. Doolittle, general manager; H. J. Turley, mine superintendent. Organized Oct. 12, 1902, under laws of Utah, with capitalization $2,000,000, shares $5 par; issued, $1,150,000. Bonds, $200,000 authorized, at 6%; $78,250 issued and $46,000 outstanding, due June 1, 1909. Paid a 20% dividend 1906, and 10% dividend 1907. Annual meeting, second Tuesday in October. Union Trust Co., New Haven, registrar.

Lands, 26 claims, area 500 acres, including the Zelnora mine, near the head of Carr Fork, above the Highland Boy mine of the Utah Consolidated, property showing 3 fault fissures in porphyry and a contact deposit between quartz-porphyry and limestone. The latter, of 3′ to 8′ width, carries 2 to 6% copper, 10 to 22% lead, 7 to 12% zinc, 2 to 8 oz. silver and 40 to 80 cents gold per ton, ores being chalcopyrite, galena and sphalerite. Mine is opened by tunnels, with a blind shaft starting 900′ from the portal of the lowest tunnel, there being a vertical distance of 1,200′ between the highest and lowest workings. The new lower tunnel, of 1,030′ length, has cut a very wide fissure vein, giving assays of about 3% copper, 2.3 oz. silver and $2.50 gold per ton. Terminal at the upper tunnel is to be moved to the lower tunnel, and mine operated through latter in the future. Mine has about 3 miles of workings, with an aerial tram connecting with loading bins on the Copper Belt railroad, tram having been removed to opposite side of the cañon. Equipment includes electric power and air-compressor. Property has produced about $500,000 in ore to end of 1906, and is considered promising.

BINGHAM & SALT LAKE MINING CO. **UTAH.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BINGHAM STANDARD COPPER CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1906, with capitalization $5,000,000, shares $5 par, as successor of the Standard Copper Co. Is controlled, through stock ownership, by the Bingham Central-Standard Copper Co. Lands, 320 acres, partly patented, developed by the Saginaw tunnel. Mine is said to have produced $600,000 worth of ore under former management. Property has a considerable number of buildings, and shipped some ore, 1907.

BINGHAM WEST DIP TUNNEL CO. **UTAH.**

Office: 1505-277 Broadway, New York, N. Y. Mine office: Tooele, Tooele Co., Utah. F. M. Lyman, president; Milando Pratt, secretary; F. M. Bishop, treasurer. Capitalization $100,000, shares 1 cent par. Lands, circa 520 acres, unpatented, developed by an 850′ tunnel, planned to be driven 4 miles, from the Tooele side, through the Oquirrh range, to drain the entire West Mountain district, develop mineral bodies and provide water for the Tooele lands. Tunnel has cut several small ore bodies. Is not regarded favorably. Idle.

BIO-BIO (CHILE) COPPER SYNDICATE, LTD. **CHILE.**

Office: 43 London Wall, London, E. C., Eng. J. Sargent, secretary. Organized July 27, 1906, under laws of Great Britain, with capitalization £30,000, shares £1 par, to acquire copper mines in Chile. Location of property, if any, unknown.

BISBEE-ARIZONA DEVELOPMENT CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Moribund. Described Vol. VI.

BISBEE-ARIZONA GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Supposedly succeeded, circa 1905, by Bisbee-Arizona Development Co. Described Vol. V.

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BISBEE BELLE COPPER CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz., and at Wickenburg, Maricopa Co., Ariz. Described Vol. V.

BISBEE CONSOLIDATED COPPER CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. W. J. Lewis, president and general manager; Emil Marks, vice-president; F. A. Hess, secretary. Organized 1902, under laws of Arizona, with capitalization $1,000,000, shares $5 par. Lands, 21 claims, area circa 400 acres, northwest of the Copper Glance, showing a heavy conglomerate capping over limestone, opened by a 208′ shaft. Has steam power and a 54-h. p. hoist, good for depth of 1,500′. Out of funds and idle some years.

BISBEE COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. Organized under laws of Arizona, with capitalization $1,500,000, shares $5 par. Company endeavored, September, 1907, to place shares at par, in London, claiming lands were near the Copper Queen and Calumet & Arizona, but no such lands have been found. Company also claimed that the manager of the Copper Queen was president, but this was not true, and apparently none of the Copper Queen officials are connected with this company, which, on the face of matters, bears the appearance of a swindle.

BISBEE COPPER DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. V.

BISBEE-DULUTH COPPER CO. **ARIZONA.**

Office and mine: Drawer 1196, Bisbee, Cochise Co., Ariz. Christian T. Kolstad, president; Harris Bennett, vice-president; Walter W. Carley, treasurer; E. L. Williams, secretary; preceding officers, Raymond A. Sauer, Newton Trenham, Carl M. Kolstad and Walter H. Rankin, directors. Organized 1907, with capitalization $900,000, shares $10 par; $4 paid in; issued, $500,000. Lands, 27 claims, area 500 acres, including the Corning & Pinyan group of 8 claims, adjoining the Warren Realty & Development Co. Also holds the Copper Range group and Red Metal groups. A 70′ shaft on the Little Squaw claim of the Corning & Pinyan group shows auriferous and argentiferous copper ore.

BISBEE & DULUTH MINING & DEVELOPMENT CO. **ARIZONA.**

Mine office: Bisbee, Cochise Co., Ariz. Is controlled, through ownership of 60% of stock issue, by Bisbee-Sonora Development Co.

BISBEE EXTENSION DEVELOPMENT CO. **ARIZONA.**

Office and mine: P. O. Box 829, Bisbee, Cochise Co., Ariz. F. L. Harrington, president; John B. Rice, vice-president; Wm. M. Clute, secretary and general manager; J. T. Hood, treasurer; preceding officers, R. C. Starford and Frank R. Harrington, directors. Organized March, 1907, under laws of Arizona, with capitalization $400,000, shares $5 par, as successor of the Great Eagle. Lands, 25 claims, area 500 acres, in Tombstone Cañon, 8 miles northwest of Bisbee, on the porphyry side, showing fissure veins in porphyry carrying cuprite, azurite and malachite. Has 5 shafts, deepest 385′, latter said to be sunk in Carboniferous limestone. Equipment includes a 25-h. p. Fairbanks & Morse hoist, good for 800′ depth, with 7 mine buildings. Idle since September, 1907, owing to lack of funds, but plans early resumption. Company hopes to cut ore bodies at depth of about 350′, in the Escobrosa limestone, supposed to correspond with the horizon of the best ore bodies in Bisbee.

BISBEE GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Succeeded, Dec. 27, 1902, by Bisbee-Arizona Gold & Copper Mining Co. Formerly at Bisbee, Cochise Co., Ariz.

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BISBEE MINING CO. **ARIZONA.**

Dead. Dissolved, 1904, with all debts paid. Formerly at Bisbee, Cochise Co., Ariz.

BISBEE QUEEN DEVELOPING CO. **ARIZONA.**

Office: care of E. E. Dennis, president, Grand Rapids, Mich. Mine office: care of Hoval A. Smith, managing director, Bisbee, Cochise Co., Ariz. Organized Apr. 20, 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 27 claims, lying between the Portage Lake & Bisbee and Pittsburg & Hecla. Was reorganized, 1905, through purchase, by Hoval A. Smith and associates, who are allowing the land to lie idle, pending developments on adjacent properties.

BISBEE-QUINCY COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. VI.

BISBEE-SONORA DEVELOPMENT CO. **MEXICO & ARIZONA.**

Office: Douglas, Ariz. Mine office: Paradise, Cochise Co., Ariz. B. J. Ames, president. Organized February, 1907, under laws of Arizona, with capitalization $2,500,000, shares $2 par, as successor of Paradise Development Co. Is a holding corporation, controlling, through ownership of 60% of stock issue each, 5 subsidiary companies, these being the Badger-Hall Mining Co. and Paradise Mining Co. near Paradise; Ohio Mining Co. and Bisbee & Duluth Mining & Development Co. near Bisbee, and the Dispatch Mining Co. in northern Sonora. Subsidiary corporations are separately described.

BISBEE & SUPERIOR DEVELOPMENT CO. **ARIZONA.**

Dead. Dissolved, 1904, with all debts paid. Formerly at Bisbee, Cochise Co., Ariz.

BISBEE-WEST COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. VI.

KUPFERERZ GEWERKSCHAFT BISMARCK. **GERMANY.**

Office and mine: Hanover, Braunschweig, Germany. Organized Nov. 20, 1899. Property is various copper and iron mines, former including the Morgenrothe in Brunswick, and the Rothbart in Prussia, carrying malachite and other copper ores, the iron ore mines being near Ruhla, Saxe-Weimar.

BISMARCK-NUGGET GULCH CONSOLIDATED MINING CO. **MONTANA.**

Dead. Bankrupt and property sold by sheriff, 1905. Apparently was succeeded, 1907, by Bismark Copper Co., which in turn was succeeded by Montana-Illinois Copper Mining Co. Formerly at Brandon, Madison Co., Mont.

BISMARK COPPER CO. **MONTANA.**

Dead. Succeeded the Bismarck-Nugget Gulch Consolidated Mining Co., and was succeeded, circa 1907, by Montana-Illinois Copper Mining Co. Formerly at Brandon, Madison Co., Mont.

BISMARK COPPER MINING CO.

Letter returned unclaimed from former office, Butte, Mont. Organized Oct. 24, 1905, under laws of South Dakota, with capitalization $500,000, shares $25 par, by J. R. Sievers, Alexander Mackey, J. W. Mahoney, B. W. Wilson, R. F. Kerr and Mathew W. Murphy. Location of lands, if any, unknown.

BISON MOUNTAIN MINING CO. **MONTANA.**

Mine office: Elliston, Powell Co., Mont. Ores carry gold, silver, copper and lead. Has steam power. Idle.

BITTER MOUNTAIN MINING CO.

Dead. Started as a copper mining company, but found no copper.

BITTER ROOT COPPER MINING CO. **MONTANA.**

Dead. Lost its lands, circa 1904, through inability to meet bond payments. Formerly at Saltese, Missoula Co., Mont.

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BLACK BAY MINING CO. **ONTARIO.**

Office: Willmar, Minn. G. P. Carwand, president; N. B. Carlson, secretary. Organized Nov. 5, 1901, under laws of Arizona, with capitalization $1,000,000. Lands, 3 crown-granted claims, area 266 acres, also 13 acres miscellaneous lands, all heavily timbered, on Black Bay, in the Thunder Bay district of Ontario. Country rock is trap, showing 7 cupriferous amygdaloidal beds, claimed by company to average 2% native copper, 1.25 oz. silver and $2 gold per ton. Idle for several years.

BLACK BEAUTY COPPER CO. **CALIFORNIA.**

Office: Los Angeles, Cal. Mine office: Cima, San Bernardino Co., Cal. W. B. Chapman, superintendent. Lands, 19 claims, on the southern side of Black Mountain, circa 25 miles north of Cima, said to show a mineralized zone of 100′ to 400′ width, traceable 8,000′, opened by 8 pits and shafts of 15′ to 60′ depth, on veins of 1′ to 4′ width, showing malaconite and malachite.

BLACKBIRD COPPER & GOLD MINING CO. **IDAHO & UTAH.**

Office: 745 Ellicott Sq., Buffalo, N. Y. Mine offices: Newhouse, Beaver Co., Utah, and Salmon, Lemhi Co., Idaho. John E. DuBois, president; Chas. J. North, vice-president; L. A. Amsden, secretary and treasurer; Dr. P. A. H. Franklin, manager; Geo. S. Fitzwater, superintendent in Idaho; Peter M. McCrea, superintendent in Utah. Capitalization, $2,000,000; bonded debt, $500,000; indebtedness, 1907, was $745,379.

Lands are 33 patented claims, area 482 acres, in the Blackbird district of Lemhi county, Idaho, from which small smelter shipments have returned 17% copper and circa $8 gold per ton.

Utah lands are 84 patented claims, area 1,437 acres, adjoining the Cactus mine of the Newhouse Mines & Smelters, on which a large shaft was started, some years ago. Considerable development has been secured, only compulsory assessment work has been done since 1903. Property is considered promising.

BLACK BIRD MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Frank H. Cooney, manager. Is a leasing company, operating ground leased from the East Butte Extension Mining Co., and is composed mainly of officers of latter.

BLACK BUTTE MINING & REDUCTION CO. **ARIZONA.**

Office: Phoenix, Ariz. Letter returned unclaimed from former mine office, Hot Springs, Yavapai Co., Ariz. T. Connell, president and treasurer; M. Thompson, secretary; J. C. Dobbins, general manager. Organized under laws of Arizona, with capitalization $750,000, shares $1 par. Lands, 5 claims, area 100 acres, in the Castle Creek district, 26 miles from Santa Fé, Prescott & Phoenix railway, showing 3 fissure veins in shale averaging 8′ width, carrying cuprite, azurite, malachite, chalcocite and atacamite, opened by a 220′ tunnel and 170′ shaft. Has steam power and necessary mine buildings. Development as yet is within the leached zone, atacamite being the predominant ore, this occurring in a paystreak of 12″ to 18″ along the footwall and giving average assays of 34% copper. Idle.

BLACK CANYON COPPER CO., LTD. **ARIZONA.**

Dead. Was a bad outfit. Lands sold to Copper Canyon Mining Co.

BLACK COPPER CO. **NEW MEXICO.**

Mine office: Elizabethtown, Colfax Co., N. M. Is a gold producer only.

BLACK DIAMOND COPPER MINING CO. **ARIZONA.**

Office: care of E. D. Kennedy, treasurer and general manager, Warren, Ohio. Mine office: Pearce, Cochise Co., Ariz. J. G. Hearne, president; H. C. Christie, vice-president; Dr. T. M. Sabin, secretary; W. G. Barney, superintendent; F. H. Mitchell, smelter superintendent. Organized 1898, under laws

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of West Virginia, with capitalization $2,000,000, shares $5 par. Bonds, $480,000.

Lands, 35 claims, area circa 500 acres, 6 miles from Pearce, in the Cochise Mountains. Ores occur as contact deposits between limestone and porphyry, with parallel dykes of sandstone and quartzite, having a heavy gossan capping, in places 150′ wide. Ores are almost exclusively sulphide, being mainly chalcopyrite and bornite, with iron and silica gangue, estimated to average better than 6% copper, 10 oz. silver and $1.40 gold per ton, with about 38% silica. Property was opened originally for silver. Development is by a 115′ shaft and 4 tunnels, lowest 600′ below crest of the hill, tunnels being connected by winzes. Mine is connected with smelter by a 1½-mile Leschen aerial tramway, having a drop of 800′, with 600 tons daily capacity. Has a pumping plant with 4″ pipeline, installed at Pearce, this having capacity to raise 100,000 gallons daily against a head of 804′ in 6 miles, with a 350,000-gallon storage reservoir at the mine. Property has a good steam equipment, including 2 air-compressors with 15-drill capacity, petroleum being used for fuel. Miscellaneous improvements include a 20-room hotel, store, schoolhouse and a considerable number of dwellings.

A 200-ton smelter, built 1902, has a 44x120″ Allis-Chalmers rectangular water-jacket blast-furnace, a 38″ auxiliary cupola and a 24x36′ circular roaster, and made a matte carrying about 65% copper, and 150 oz. to 300 oz. silver per ton, with small gold values. Ores are self-fluxing, and easily smelted, and furnace is claimed to have shown slag losses of only 0.3% copper. Company came to grief financially, and was practically reorganized and management changed. Work was resumed in fall of 1905. Smelter was blown in 1906 but was idle 1907. Apparently the large ore bodies claimed cannot feed a smelter.

BLACK DIAMOND MINING & DEVELOPMENT CO. **WYOMING.**

Dead. Said to have been liquidated circa 1905.

BLACK DIAMOND TUNNEL CO. **BRITISH COLUMBIA.**

Office: 604 Land Title Bldg., Philadelphia, Pa. Mine office: Ainsworth, Kootenay district, B. C. Maxwell Stevenson, president; Henry M. Stevenson, secretary. The Highlander tunnel, having a total length of about 3,000′, has cut three veins of 4′ to 13′ width, giving fair assays in silver, lead, copper and gold. Although the officers of the company were claimed to stand well locally, the company was a mere stock-jobbing scheme. Moribund.

BLACK EAGLE MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. G. A. Mowatt, manager. Lands, 160 acres, 2 miles west of Chewelah, having a 300′ tunnel showing copper ore and free gold.

BLACK EAGLE MINING & MILLING CO. **OREGON.**

Office and mine: Gates, Marion Co., Ore. R. F. Shier, president and manager; H. F. Gerspach, vice-president; S. C. Sorensen, secretary, treasurer and superintendent; preceding officers, D. C. Smith and L. P. Larsen, directors; W. L. Shier, mine superintendent. Organized 1907, under laws of Oregon, with capitalization $1,000,000, shares $1 par. Annual meeting, first Monday in February. Lands, 8 claims, area 160 acres, also 40 acres miscellaneous lands, well watered and timbered, 14 miles from Gates, in the Gold Creek district, on Horn Creek, a tributary of the Little North Fork river, which is a tributary of the Santiam river. Property shows a wide contact vein between greenstone and dolomite, traceable circa 1 mile, opened by a 100′ shaft and by several short tunnels, longest 250′, with 500′ of workings, showing oxidized ores, mainly malachite, averaging about 10% copper and 6 to 22 oz. silver per ton. Has a hoist and 4 mine buildings. Company plans continuing development and probably will plat a townsite.

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BLACKFOOT COPPER CO. **MONTANA.**

Dead. Succeeded, 1901, by Imperial Montana Copper Mining, Smelting & Water Power Co. Apparently should have been called the Blackleg instead of the Blackfoot. Formerly at Blackfoot, Teton Co., Mont.

BLACKFOOT MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Battle, Carbon Co., Wyo.

BLACK HAWK MINE. **ARIZONA.**

Owned by Arizona Commercial Copper Co.

BLACK HILLS CONSOLIDATED COPPER CO. **SOUTH DAKOTA.**

Mine office: Keystone, Pennington Co., S. D. Lands, in the Pactola district, have a 118′ shaft.

BLACK HILLS COPPER CO. **SOUTH DAKOTA.**

Office: Benton Harbor, Mich. Mine office: Rochford, Pennington Co., S. D. John E. Barnes, president; George M. Thresher, secretary; John Robinson, treasurer. Organized June 2, 1900, under laws of South Dakota, with capitalization $2,000,000, shares $1 par. Lands, 27 claims, area 510 acres, in the Hornblende district, showing fissure veins in slate, with heavy gossan capping, carrying carbonate and oxide ores. Ore body under development is said by company to average 20′ width, and to be more than a mile in length, opened by incline shafts of 800′, 40′ and 75′, with crosscut tunnels of 65′ and 300′, giving a total of about 1,200′ of underground openings. Ores average 1.5 to 3% copper, with small values in gold, silver and nickel, and a carload shipment of carbonate ore gave smelter returns of 16.31% copper. Has steam power, with 60-h. p. hoist, good for 1,500′, and 4 power drills. Idle several years.

BLACK HILLS COPPER CO., LTD. **ARIZONA.**

Office: 232 Fifth Ave., Pittsburg, Pa. Mine office: Jerome, Yavapai Co., Ariz. R. A. Thomas, president; Peter Boyd, vice-president; F. J. LeMoyne, secretary and treasurer. Organized July, 1899, and reorganized May 20, 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Union Trust Co., Pittsburg, registrar; Colonial Trust Co., Pittsburg, transfer agent.

Lands, 15 claims, 6 patented, area 280 acres, in the Verde district, between the United Verde and Equator mines, opened by shafts of 212′ and 550′, with tunnels of 60′ and 90′, with about 2,500′ of openings. Main shaft, at 382′, cut a stringer of ore assaying up to 13% copper and 3 oz. silver. Has a 280-h. p. steam plant, with 125-h. p. tubular high-pressure boiler, duplex pump, hoist and power drills. Resumed work August, 1905; suspended 2 years later. Said to be in debt.

BLACK HILLS & DULUTH COPPER MINING CO. **SOUTH DAKOTA.**

Mine office: Custer, Custer Co., S. D. F. A. Towner, president; M. J. Bailey, secretary; W. F. Hanley, treasurer; W. A. Nelson, superintendent. Capitalization $3,000,000, shares $1 par. Lands, 340 acres, 8 miles northwest of Custer, adjoining the Central Black Hills Copper Co., showing promising outcrops of argentiferous and auriferous copper ores assaying up to 20% copper, slightly developed by 2 shafts. Has water power. Idle for several years.

BLACK HILLS GOLD & COPPER MINING CO. **ARIZONA.**

Office and mine: care of R. H. Burmister, general manager, Prescott, Yavapai Co., Ariz. Apparently moribund.

BLACK JACK CONSOLIDATED MINING CO. **UTAH.**

Office: Provo, Utah. Letter returned unclaimed from former mine office, Park City, Summit Co., Utah. Jesse Knight, president; J. Wm. Knight, vice-president; R. E. Allen, secretary and treasurer; preceding officers, W. Lester Mangum and Amanda M. Knight, directors. Organized 1907, under laws of Utah, with capitalization $100,000, shares 10 cents par, as a merger of the Black Jack Mining Co. and Star Consolidated Mining Co. Mine has consider-

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able development, showing horn silver and ore up to 6% in copper tenor, values as developed being mainly in silver.

BLACK JACK COPPER CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Greenwater, Inyo Co., Cal. T. J. McDonald, superintendent. Was sinking two shafts, showing copper ore, with a force of 8 men in the spring of 1907. Idle.

BLACK JACK COPPER MINING CO. **MONTANA.**

Office: care of Martin Mulvahill, Helena, Mont. Mine office: Clancey, Jefferson Co., Mont. Organized circa June, 1907, with capitalization $400,000, to develop sundry copper claims in the Corbin district.

BLACK JACK MINING CO. **UTAH.**

Dead. Merged, 1907, in Black Jack Consolidated Mining Co. Formerly at Park City, Summit Co., Utah.

BLACK PEAK GOLD & COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Engel, Sierra Co., N. M.

BLACK PRINCE COPPER CO. **ARIZONA.**

Office: 635 Symes Bldg., Denver, Colo. Mine office: Johnson, Cochise Co., Ariz. Robt. N. Bell, president; Dr. John C. Thompson, vice-president and general manager; J. B. Wright, secretary and treasurer; preceding officers, Robt. Temple and Hon. D. S. Tullar, directors; Richard Harris, superintendent; N. E. Boggs, mine superintendent. Organized May 10, 1901, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, $1,046,000. Annual meeting, last Wednesday in May.

Lands, 8 claims, patented, area 147 acres, showing contact deposits in limestone, near a porphyry contact. Mine has a 233′ shaft, with circa 2,000′ of workings, showing oxides, carbonates, bornite and chalcopyrite. Four carloads of ore shipped to El Paso smelter gave returns of 12% copper and 20 to 30 oz. silver per ton. Has a 15-h. p. hoist and 3 mine buildings. Company is free from debt and plans steady development.

BLACK PRINCE COPPER MINING CO. **IDAHO.**

Office: Fairmont, West. Va. Mine office: Coeur d'Alene, Kootenai Co., Idaho. Capitalization $3,000,000. Lands, 8 claims, circa 20 miles above head of navigation on the St. Joe river, showing auriferous copper ore.

BLACK RANGE COPPER MINING CO. **NEW MEXICO.**

Office and mine: Fairview, Sierra Co., N. M. B. S. Phillips, general manager; preceding officer, F. E. Green, L. H. Armstrong, E. D. Thayer and Gladys Allen, directors. Organized January, 1906, with capitalization $1,250,000, shares $1 par. Idle and apparently has done no work.

BLACK ROCK COPPER CO. **UTAH.**

Mine office: Frisco, Beaver Co., Utah. Lands are sundry claims in the Beaver Lake district of Beaver county, Utah, on which work, begun 1904, has shown ore assaying up to 36% copper, with small gold and silver values.

BLACK ROCK GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Jerome, Yavapai Co., Ariz. Fully described Vol. VI.

BLACK ROCK MINING CO. **ARIZONA.**

Office: care of R. C. Vincent, president and manager, Superior, Wis. Mine office: Wickenburg, Maricopa Co., Ariz. Lands, 9 claims, area 180 acres, in the Bradshaw Mountains, 17 miles from rail connection at Wickenburg. Country rocks are granite and syenite, showing 4 fissure veins, averaging about 30″ width, carrying copper, lead, gold and silver, with quartz gangue, and also showing porphyritic dykes carrying low-grade ores. Development is by several shallow shafts and short tunnels. Has gasoline power. Idle and apparently moribund.

BLACK ROCK MINE. **MONTANA.**

Owned by Butte & Superior Copper Co.

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BLACK ROCK MINING CO. **MONTANA.**

Dead. Lost leased lands. Formerly at Butte, Silver Bow Co., Mont.

BLACK TIGER COPPER MINING CO. **WYOMING.**

Dead. Property lost Jan. 1, 1905. Formerly at Encampment, Carbon Co., Wyo.

BLACK TRAVELER COPPER MINING CO. **MONTANA.**

Office: Mullan, Idaho. Mine office: Saltese, Missoula Co., Mont. Jas. Conners, manager. Lands, 6 claims, 7 miles northeast of Saltese, showing a vein of about 6′ width, carrying 8% copper ore. Has a 560′ tunnel, planned to be driven circa 1,400′, on Black Traveler lands, to run into the property of the Marie Mining Co. Property shows some ore of 12 to 14% copper tenor in shallow workings.

BLACK WARRIOR COPPER COMPANY, AMALGAMATED. **ARIZONA.**

Dead. Reorganized, 1905, as Warrior Copper Co. Formerly at Black Warrior, Gila Co., Ariz.

BLAKE MINING, MILLING & INVESTMENT CO. **NEW MEXICO.**

Office and mine: Las Vegas, Lincoln Co., N. M. Mill office: Chapelle, San Miguel Co., N. M. H. E. Blake, president and general manager; S. B. Davis, Jr., vice-president; B. C. Pittenger, secretary; C. P. Hammond, treasurer; preceding officers and Jos. L. Matt, directors. Capitalization $200,000. Lands, 140 acres, in the Mineral Hill district, circa 12 miles from Las Vegas, slightly developed by shafts and tunnels. A 14-ton sample ore shipment yielded 2.1% copper. The reduction plant, 7 miles from the mine, doing a general custom business, includes a mill and 50-ton Gardiner process leaching plant.

BLANCA COPPER MINING CO. **NEW MEXICO.**

Office: 514 Cooper Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Silver City, Grant Co., N. M. Henry Izard, president; L. E. Hannen, vice-president; E. Sanders, secretary. Lands, 3 claims, area 60 acres, in the Bear Mountain district, 8 miles from Silver City, claimed to have old workings, and said to be reopening by a tunnel claimed to show auriferous and argentiferous copper ore of good assay value. This is one of the promotions of the Financial Security & Trust Co., of Denver, and probably is absolutely fraudulent, as this same company was the promoter of the Spanish Lost Bullion Mines, Geronimo Copper Mining Co. and Pizarro Copper Mining Co., all of which claimed to have old Spanish workings. The Spanish Lost Bullion was proven in court to be an outright swindle, and presumably other promotions of the company are no better.

COMPAÑIA MINERA BLANCA TORRE DE COLLAHUASI. **CHILE.**

Office: Varparaiso, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized June 23, 1906, under laws of Chile, with capitalization £120,000, shares £1 par.

BLANCHE COPPER MINING CO. **WYOMING.**

Office: 432 Omaha National Bank Bldg., Omaha, Neb. Mine office: Encampment, Carbon Co., Wyo. H. E. Owen, president; Jas. H. Kyner, secretary; Arthur H. Crow, general manager. Organized Apr. 2, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, near the New Rambler, showing 2 veins, one of which, 3′ to 5′ wide, is claimed to show auriferous oxide, carbonate and sulphide ores in a 160′ shaft. Idle several years.

BLAND MINE. **ARIZONA.**

Office: Patagonia, Santa Cruz Co., Ariz. Wm. T. Powers, owner and manager. Mine has a 500′ tunnel, with about 2,000′ of workings, showing a main vein and 2 blind ledges, carrying mainly copper, with some silver-lead.

BLAYNEY COPPER MINES & SMELTERS, LTD. **AUSTRALIA.**

Mine and works office: Blayney, Bathurst Co., N. S. W., Australia. S.

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Remfry, manager. Organized 1906, under laws of New South Wales, with capitalization £25,000. Plans doubling capitalization to complete smelter. Lands, sundry freehold claims include the mine variously known as the Blayney, Great Blayney and Annandale, reopened 1897, having a 390′ shaft developing a 40′ vein carrying chalcopyrite disseminated in andesite. Has a 50-ton smelter with water-jacket blast furnace, large reverberatory furnace and Edwards calciner, doing a general custom business. Machinery and smelter were thoroughly overhauled and mine reopened, 1907, and smelter blown in, 1908. Production of mine, 1901, was 418 long tons of copper from 18,666 tons of ore smelted.

BLAYNEY MINING & SMELTING CO. **AUSTRALIA.**

Dead. Succeeded, 1906, by Blayney Copper Mines & Smelters, Ltd. Formerly at Blayney, N. S. W., Australia. Described Vol. VI.

BLEW BUR COPPER CO. **CALIFORNIA.**

Office: 25 Broad St., New York, N. Y. Andrew F. Burleigh, president and treasurer; Edw. Blewett, vice-president; M. E. Milles, secretary; Ralph E. Blewett, general manager. Organized October, 1906, under laws of Arizona, with capitalization $30,000,000, shares $100 par. Lands, 120 claims, area 2,400 acres, in the Ironwood district of Riverside county, California, on McCoy and Palen Mountains, circa 65 miles north of Salton. Company claims to have about 45 different veins on its lands, of which 1 is reported as 6′ to 200′ in width, opened by 4 shafts of 30′ to 52′ depth, carrying cuprite, azurite, malachite, chalcocite and chalcopyrite, estimated by company to average 20% copper, 7 oz. silver and $18 gold per ton. Company estimates 1,000,000 tons of ore in sight, which is entirely too high. Transportation facilities are poor, but the Arizona & California railroad should reach vicinity of the mine in 1909. A sample carload of selected ore, weighing 29,000 lbs., shipped, 1907, to El Paso, netted $1,382.

BLINMAN COPPER MINING CO. **AUSTRALIA.**

Dead. Property sold, 1902, to Tasmanian Copper Co., Ltd.

BLOODY ROSE COPPER CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Chas. F. Hoff, president and general manager. Capitalization $3,000,000, shares $1 par. Lands, 5 claims, area 100 acres, 3 miles west of Tucson, near the Old Pueblo mine, in the Amole district, practically undeveloped but showing good surface indications.

BLUE ACRE COPPER CO. **UTAH.**

Office: 409 Dooly Blk., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Blue Acre, Beaver Co., Utah. Henry M. Crowther, president and general manager; Wallace W. Wait, vice-president, secretary and treasurer. Capitalization $600,000, shares $1 par. Lands, 17 claims, area 320 acres, in the Beaver Lake district, showing 5 contact and fissure veins, of which three, of good average width, are being developed, these carrying values estimated by management at 6% copper, 5 oz. silver and $4 gold per ton, from oxide, carbonate and sulphide ores, opened by 4 shallow shafts. Property regarded as promising, though but slightly developed, but company apparently very feeble.

BLUE BELL-BELCHER MINING CO. **WASHINGTON.**

Office: care of C. E. Mitchell, Spokane, Wash. Mine office: Republic, Ferry Co., Wash. Wm. Woodward, superintendent. Organized 1906, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, sundry claims, known as the Blue Bell group, carrying 3,000′ of the northwest extension of the Belcher vein. Development is by tunnel, showing slightly cupriferous gold ore.

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BLUE BELL COPPER MINING CO.

Office: 36 Swiss St., Cleveland, Ohio. West Virginia charter forfeited 1902. Moribund.

BLUE BELL COPPER MINING SYNDICATE, LTD. **AUSTRALIA.**

Office: Queen St., Brisbane, Australia. Mine office: Gympie, Queensland, Australia. Organized Sept. 18, 1906, under laws of Queensland, with capitalization £60,000, shares £1 par. In liquidation, early 1908. Lands are 13 miles south of Gympie, on the southern branch of Ammon creek. Property has a 60′ shaft, opening a 2′ vein with 2 parallel veins about 300′ distant. Has shipped some ore returning 15 to 28% copper and 19 to 31 oz. silver per long ton.

BLUE BELL MINING CO. **CALIFORNIA.**

Office and mine: care of J. J. Sullivan, superintendent, Quincy, Plumas Co., Cal. Lands, sundry claims near Hosslekuss's. Idle for several years.

BLUE BIRD CO., LTD. **MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Fred J. Rowlands, manager. Lands, sundry claims three miles west of Butte. Formerly was operated as a gold mine, and once had a 90-stamp mill. Main shaft 500′. Idle for some years.

BLUE BIRD COPPER-GOLD MINING CO. **UTAH.**

Dead. Succeeded, circa 1907, by New York & Utah Gold & Copper Mining & Milling Co. Formerly at Milford, Beaver Co., Utah. Described Vol. VI.

BLUE BIRD MINING & SMELTING CO. **WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Idle.

BLUE CAP MINING & MILLING CO. **WYOMING.**

Office and mine: Casper, Natrona Co., Wyo. Theo. Becker, president; Donald Mitchie, vice-president; E. Percy Palmer, secretary and treasurer; Wm. S. Cook, superintendent. Capitalization $5,000,000, shares $1 par. Lands, in the Casper Mountains, are opened by a shaft, from which rich copper specimens have been secured.

BLUE CREEK COPPER MINING CO. **WASHINGTON.**

Dead. Formerly in Stevens county, Washington. Described Vol. III.

BLUE JACKET CONSOLIDATED COPPER CO. **IDAHO.**

Office: 20 Broad St., New York. Letter returned unclaimed from former mine office, Decorah, Washington Co., Idaho. Lands, 295 acres, opened by a 250′ shaft. Is said to have produced $200,000 in copper, with smelter returns up to 47% copper. Property was bonded to Col. Geo. W. E. Dorsey, who failed to pay his men, and came to grief. Idle.

BLUE JACKET MINE. **IDAHO.**

Mine office: Grangeville, Idaho Co., Idaho. Lands, 4 unpatented claims, area 75 acres, showing 2 contact veins, of good width, assaying 4% copper, 7 oz. silver and $4 gold per ton. Ores are oxides near surface and sulphides at depth. Shafts, 100′ to 300′ deep, with 1,000′ of underground workings. Has gasoline power.

BLUE JAY EXTENSION MINING CO. **UTAH.**

Office: 308 Templeton Bldg., Salt Lake City, Utah. R. E. Fowler, president; L. H. Gray, secretary and treasurer. Capitalization $500,000, shares $1 par. Lands, sundry claims in the Washington district of Beaver county, Utah, slightly developed. Presumably idle.

BLUE JAY MINE. **MONTANA.**

Owned by Butte & Boston Consolidated Mining Co.

BLUE JAY MINE. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. A. Pugh, superintendent, at last accounts. Is slightly developed by shaft and tunnel. Has steam power.

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BLUE JAY MINING CO. **CALIFORNIA.**

Mine office: Letcher, Fresno Co., Cal. Idle for several years.

BLUE JIM MINING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Ione, Stevens Co., Wash. Lands, on the Pend d'Oreille river, near Ione, are said to show a 10′ copper vein.

BLUE LAKE GOLD & COPPER MINING, SMELTING & POWER CO. **WASHINGTON.**

Office: 302-82 Wisconsin St., Milwaukee, Wis. Letter returned unclaimed from former mine office, Conconully, Okanogan Co., Wash. C. T. McElroy, secretary and general manager. Organized circa 1902, with capitalization $3,000,000, shares $1 par. Claims to have 6 veins, of 1′ to 3′ width, giving assays of 3 to 49% copper and $3 to $11 gold per ton. Lied atrociously in its prospectus. Moribund.

BLUE LEDGE COPPER CO. **CALIFORNIA.**

Dead. Succeeded, circa 1907, by Blue Ledge Mining Co. Formerly at Hutton, Siskiyou Co., Cal.

BLUE LEDGE MINING CO. **CALIFORNIA.**

Office: 82 Beaver St., New York, N. Y. Mine office: Hutton, Siskiyou Co., Cal. Robert S. Towne, general manager; Frank H. Carnahan, general superintendent. Lands, 24 claims, area circa 440 acres, well timbered, at the head of Joe Creek, circa 4 miles south of the Oregon line; also a large smelter-site on Applegate River, at Seattle Bar.

Claims were located 1889, and more or less work of a desultory nature was done before coming under management of present owners. Mine has about one-half mile of workings, mainly tunnels, with a considerable amount of ore blocked out, and about 7,000′ of diamond drilling, showing various ore bodies giving average assays of about 5% copper, 2.5 oz. silver and $2.50 gold per ton. Country rock is mica-schist, showing a contact vein, between black and white schists, traceable circa 8,000′ by a prominent outcrop of 5′ to 50′ width. Ore is mainly chalcopyrite, with a little native copper. Has a hydro-electric power plant, taking water from Elliot Creek with a head of about 150′, and has a good machinery equipment. Has built a town, with waterworks, sewers and schoolhouse, and has constructed a good road between Hutton and Yreka. Property considered promising and management good.

BLUE LIGHT MINING CO. **NEVADA.**

Office: 410 Traction Bldg., Indianapolis, Ind. Mine office: Mina, Esmeralda Co., Nev. Paul E. Stormes, president; David S. Swain, vice-president; A. C. Kynett, secretary; W. C. Osborne, treasurer. Capitalization 2,000,000 shares, presumably $1 par. Has authorized a $125,000 bond issue. Lands, 17 claims, 12 miles from Mina, in the Gold Mountain district, having a 300′ two-compartment shaft showing a vein giving average assays of about 7% copper, with small gold and silver values, with an 18″ paystreak assaying 12 to 42% copper. Claims to have 85,000 tons of ore developed. Has a 45-h. p. gasoline hoist. Five carloads of ore, shipped circa 1907, gave returns of 15 to 23.2% copper, with small gold and silver values.

BLUE MOUNTAIN COPPER MINING CO. **COLORADO.**

Dead. Lands sold, circa 1906, to Michigan & Colorado Mining & Milling Co.

BLUE POINT COPPER MINING & MILLING CO. **UTAH.**

Office: care of E. J. Raddatz, president, Salt Lake City, Utah. John Frazier, vice-president; F. M. Davis, secretary and treasurer; preceding officers. Fred Hodges, Wm. Hanson, W. R. Warren and R. C. Hill, directors. Organized August, 1906, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, 9 claims, in the Bradshaw district of Beaver county, Utah.

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BLUE RIDGE COPPER CO., INC. **VIRGINIA.**

Office: 613-145 La Salle St., Chicago, Ills. Mine office: Stanley, Madison Co., Va. Jacob Lauth, president; Frank L. Race, secretary and treasurer; Geo. F. Brigham, Jr., general manager. Organized Apr. 2, 1904, under laws of Virginia, with capitalization $500,000, shares $5 par. Lands, circa 100 acres, on the eastern slope of the Blue Ridge Mountains, opened by old pits and a 200′ shaft, with about 500′ of workings. Ore is variously reported as a contact vein between granite and metamorphosed slate, and as an 8′ bed of greenstone, carrying native copper, cuprite, malachite and azurite. Has a 4′ Pelton wheel, using water under a head of 500′, generating circa 350 h. p. Has necessary mine buildings and a 50-ton Nissen mill.

BLUE RIDGE COPPER MINING CO. **NORTH CAROLINA.**

Dead. Formerly at Gap Creek, Ashe Co., N. C.

BLUE RIDGE REAL ESTATE & DEVELOPMENT CO. **MARYLAND.**

Office: care of I. N. Snively, president, Waynesboro, Pa. John C. Entrican, vice-president; Eric Krell, secretary and treasurer; preceding officers, Geo. P. School, Saml. Musser and Gideon Sibley, directors. Organized 1906, to develop a copper property on South Mountain, in Garrett county, Maryland.

BLUE STAR MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Mark Mitchell, manager. Lands, 6 claims, 3 miles from Chewelah, including the Eagle group of 4 claims, formerly owned by Eagle Consolidated Gold Mining & Milling Co. Development is by a 2-compartment 240′ shaft, and an 800′ tunnel, showing a 4′ vein of silver-lead ore, said to parallel the copper vein of the United Copper Co. at distance of circa 400′. Idle for several years.

BLUESTONE EXTENSION GOLD & COPPER MINING CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Organized 1906, to develop copper property in the vicinity of Yerington. Presumably idle.

BLUESTONE MINE. **NEVADA.**

Office: 43 Exchange Place, New York, N. Y. Mine office: Yerington, Lyon Co., Nev. Capt. J. R. De La Mar, owner; Chas. A. Weck, superintendent. Lands, 20 claims, 3 miles south of Yerington. Mine has about 6,500′ of workings, including a 1,200′ main haulage tunnel cutting an ore chute about 300′ wide and 500′ long at a point 300′ below the apex, carrying an 80′ paystreak of high grade sulphide ore said to range up to 20% in tenor, balance of ore being about 3% in copper tenor. Management estimates 1,600,000 tons of ore in sight, averaging 2.6% copper. Ore is mainly chalcopyrite, associated with considerable epidote, in a limestone gangue, there being practically no oxidized ores, even at the outcrop. Ore is garnetiferous, and uniform in character, and adapted to magnetic separation, the epidote gangue, which is nearly as heavy as chalcopyrite, causing difficulty in ordinary wet concentration. Equipment includes a 50-h. p. hoist and a 35-drill electric air-compressor.

The 100-ton mill pulverizes the ore in rolls to pass an 8-mesh screen, after which ore is slightly roasted in a tower-roaster, to magnetize the pyrite. The roasted ore is then passed through a Wetherill magnetic separator, which takes up the mineral and discharges the waste, giving a concentrate of about 15% estimated copper tenor. Magnetic separation is claimed to have given a 95% extraction, though 85% under working conditions should be satisfactory.

The smelter, installed 1901, has a 150-ton water-jacket blast-furnace, but is antiquated in design, and of small value. Mine employs circa 25 men. Management is thoroughly experienced and property is considered valuable.

BLUE VEIN COPPER MINING CO. **MONTANA.**

Letter returned unclaimel from former office and mine, Butte, Silver Bow Co., Mont. Organized June 21, 1906, under laws of Montana, with capitaliza-

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tion $1,000,000, shares $1 par, by F. L. Melcher, W. F. Noyes and others. Lands include the Soon placer claim, Valentine and Little Boulder lode claims and a half interest in the Columbia lode claim.

BLUE WING COPPER CO. NORTH CAROLINA.

Dead. Was succeeded by Boston & Carolina Copper Mining Co. Formerly at Baker City, Granville Co., N. C.

BLUE WING MINE. NORTH CAROLINA.

Mine office: Baker City, Granville Co., N. C. Was owned formerly by Blue Wing Copper Co., and later by Boston & Carolina Copper Co., but never successful, perhaps owing to poor management. Vein is narrow and ore chutes uncertain. Ore is highly silicious, and difficult of treatment without admixture of basic ores, which apparently are unobtainable in the district. Mine has several shafts of 100′ to 317′ depth, with 4 levels opened, showing considerable bodies of disseminated bornite having quartz and calcite gangue. Idle some years.

BLUFFTON GOLD & COPPER MINING & SMELTING CO. WASHINGTON.

Mine office: Chesaw, Okanogan Co., Wash. Lands, at Bolster, 4 miles from Chesaw, are said to show ore assaying $18 per ton in combined copper and gold values. Has a 218′ tunnel, planned to be driven 1,200′, and several shallow shafts.

GEWERKSCHAFT BOBERTHALER ERZBERGWERK. GERMANY.

Mine office: Kupferberg, Schlesien, Germany. Max Arendt, chairman; Dr. Bernhard Kossman, general manager. Organized Apr. 20, 1902, under laws of Prussia, with capitalization 1,000 shares, of no stated value. Lands, 437 hectares, showing country rock of Archean schists, with about 30 ore bodies, including fissure veins in amphibolite and diorite, and contact deposits between dolomite and porphyritic rocks. Fourteen ore bodies under development range 0.6 to 1.8 meters in width, and are traceable circa 1,200 meters, showing a great variety of ores, including the principal oxides and carbonates, chalcopyrite and tetrahedrite in connection with sphalerite. Has shafts of 84 and 135 meters depth, with about 3,000 meters of workings, estimated to show 120,000 metric tons of ore, with about 60,000 tons blocked out for stoping. Mine was discovered A. D. 1270, and, after various vicissitudes, was reopened, 1898, by present management. Has steam power and employs 42 men. Company plans a central electric plant and concentrator with magnetic separation. Production, 1902, was 176,368 lbs. fine copper.

BOB EVANS COPPER MINING CO.

Dead. West Virginia charter forfeited 1902. Formerly had an office at Toledo, Ohio.

BOBTAIL MINES CO. ARIZONA.

Dead. Lands now held by Big Lead Mining & Smelting Co. Formerly at Kelvin, Pinal Co., Ariz.

BOCA DEL COBRE MINING CO. MEXICO.

Office: 509-408 South Spring St., Los Angeles, Cal. Mine office: San Luis del Cordero, Nazas, Durango, Mex. Capt. C. Henry Thompson, president; J. D. Thompson, vice-president; Lane C. Gilliam, general manager; P. H. Mack, assistant manager; Pasadena National Bank, treasurer. Organized 1906. Property, said to have been bought for $300,000, is circa 40 miles from Pedricena, and includes El Rosario, San Nicholas, San Francisco and Santa Rita mines, all with considerable development, and said to have ore reserves valued at 12,000,000 pesos. The Santa Rita mine, 900′ depth, has a 75-h. p. hoist. Machinery equipment includes 2 hoists, a 12-drill air-compressor and an electric plant. Company was said, July, 1903, to have ordered a 100-ton

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water-jacket blast-furnace. During 1907 property shipped ore, of about 5% average copper tenor, with high silver values, said to have netted $170,000. Management excellent and property considered valuable.

BOCCHEGIANO MINE. **ITALY.**

Owned by Societa Anonima delle Miniere di Montecatini.

KÖNIGLICHE HÜTTENVERWALTUNG BODENMAIS. **GERMANY.**

Mine office: Bodenmais, Bavaria, Germany. Ores are iron and copper pyrites, and products are bluestone and copperas. Employs circa 75 men.

BOGAN RIVER COPPER MINING CO., N. L. **AUSTRALIA.**

Office: 10-114 Pitt St., Sidney, N. S. W., Australia. Mine office: Dandaloo, N. S. W., Australia. H. Ernest A. Miller, agent; Geo. Eason, C. Mooy, Jas. Wallace and A. H. Mellick, directors; Peter Neville, mine manager; J. M. Rees, legal manager. Organized January, 1906, under laws of New South Wales, with capitalization £6,250, shares 2s. 6d. par, in 25,000 fully paid shares and 25,000 contributing shares, latter 9d. paid. Property is 80 acres of crown lands, in the parish of Beaconsfield, Orange Plains district, 50 miles west of Dandoloo and 40 miles west of Frangie railway station, on the Great Western line, held at annual rental of 5s. per acre. Lands, which are well timbered, show a vein outcropping for about 300′. Has shafts of 57′, 66′ and 145′, in a vein of 30″ to 3′ width, showing exclusively oxidized ores, with considerable iron, about 2,000 tons of high grade ore being in sight. Returns from upwards of 100 tons shipped to the Waratah smelter were 35% copper, 2.5 oz. silver and 3 dwts. gold per long ton. Has a smelter with reverberatory furnace, completed 1907, and tanks for conservation of water. Production, 1906, was 124,440 lbs. fine copper. Employs 25 men.

SOCIÉTÉ MINIERE DE BOGOSLOVSK. **RUSSIA.**

Office: 18 Theatre Place, St. Petersburg, Russia. Mine office: Bogoslovsk, Verkhotsorsky, Perm, Russia. Employs circa 1,000 men. A. Hitrovo, chairman; N. I. Vladikin, general manager. Company has a bond issue of 14,111,183 roubles. Becoming embarrassed, corporation was placed in the hands of trustees, Nov. 3, 1905, since when finances have been greatly improved. A deficit of 2,309,820 roubles was shown Dec. 1, 1905. In 1906 the company made a profit of 226,980 roubles.

The principal business of the company is the manufacture of iron, of which about 75,000 tons of finished products are turned out annually. The property includes iron and steel foundries, a steel rolling mill, chemical works, quarries, coke-ovens, a flouring mill, a 130-verst railway and a fleet of steamers and barges, in addition to mines of copper, gold and iron.

The copper mines are in 4 groups, at a distance of 3 miles, lying on the Siberian side of the Urals, the copper deposits apparently running parallel with the mountains. The country rock adjoining the mine is limestone, of lower Devonian age, through which have erupted granite and porphyry, mingled with tuffs, these being overlaid by tentaculite slate, followed by an eruption of augite-garnet rock, the copper ores occurring along the contact of augite-garnet with other rock formations, lying mainly between the diorite and wollastonite and limestone, occurring in lenticular chutes. The ore is chiefly chalcopyrite, with occasional chalcocite, associated with pyrrhotite, having calcite, quartz and garnetiferous gangue. The rock in the mines is extremely hard. Mines include the Vasilevsky, 600′ deep; Bashmakovsky, 450′ deep; Prolovsky, 750′ deep, and Bogoslovsk, 680′ deep, these mines having been worked for upwards of a century. The Bogoslovsk ore body is about 650′ long, and there is another lense of about 15x50x180′. The main ore body produces ore averaging 2.5 to 3%, which is hand-sorted to an average copper

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tenor of 4.5%. The Vasilevsky was completely equipped with modern machinery, 1904, but proved an expensive failure.

Ore is hand-sorted at surface, and heap-roasted, after which it goes to the smelter, near the mine, having four 48" Pilz furnaces, of 28 tons capacity each; one 55-ton Raschette furnace, 42x144" at the tuyeres, and two 18-ton Raschette furnaces, 41x65" at the tuyeres, all furnaces being of brick, without water-jackets. Fuel is inferior charcoal, made from pine and fir. Product is a matte of 22 to 35% copper tenor, slags averaging 0.3%. Matte is bessemerized to 98% blister copper, and refined, in brick furnaces, to a tenor of 99.7%.

Costs of the Bogoslovsk average as follows, per ton of 2,000 lbs.: Mining, $8.09; hand-sorting, 31 cents; roasting, 17 cents; matte smelting, $2.12; bessemerizing, 89 cents; refining, 20 cents; management, 35 cents; administration and miscellaneous, 95 cents; total, per ton of ore, $13.08, equivalent to 13.78 cents per pound fine copper.

In addition to mining and smelting, the management of the Bogoslovsk lays out money liberally in a variety of ways, and for a variety of purposes other than of a business nature, these including expenditures for roads, schools, a mining college, geological museum, old people's home, charity, free medicines, hospital, etc.

The Bogoslovsk, which is the largest copper property in the Urals, is endeavoring to increase production to about 12,000,000 lbs. fine copper yearly. Production, 1905, was 3,163,190 lbs. fine copper, or nearly 4 times as great as in 1902, and for 1908 is estimated at 10,500,000 lbs.

BOHEMIAN RANGE COPPER CO. **MICHIGAN.**

Dead. Formerly at Mohawk, Keweenaw Co., Mich. Described Vol. VI.

BOLAÑOS MINING CO. **MEXICO.**

Office: care of M. M. Stephens, president, St. Louis, Mo. Mine office: Bolaños, Colatlán, Jalisco, Mex. W. C. Stith, vice-president; C. W. Simmons, treasurer; Juan B. Yzabal, general manager; Walter R. Hazel, superintendent. Organized circa 1904 as successor of Bolaños Mining & Milling Co., bankrupt. Property includes sundry mines that were considerable producers in the past, and water rights along the Bolaños River. The Santa Fé mine carries highly argentiferous copper ore, with about 60 to 80 oz. silver per ton. Has a 50-ton stamp-mill and a concentrator, and plans a hydro-electric power installation. Employed circa 50 men at last accounts.

BOLAÑOS MINING & MILLING CO. **MEXICO.**

Dead. Reorganized, circa 1904, as Bolaños Mining Co. Formerly at Bolaños, Colatlán, Jalisco, Mex.

COMPAGNIE DU BOLEO. **MEXICO.**

Office: 56 Rue de Provence, Paris, France. American office: 614 Sansome St., San Francisco, Cal. Mine office: Santa Rosalia, Sur, Baja California, Mex. Paul Miraband, chairman; Ernest Michot, director general; M. Demorest, secretary; C. H. Mabant, smelter superintendent; H. Boisse, mining engineer; J. Thiere, railway superintendent; G. Boutillier, auditor; J. Jeffroy, mechanical engineer; A. Santillier, purchasing agent.

Organized May 16, 1885, under laws of France, with capitalization f12,000,000, shares f500 par; debentures, f1,782,000, in bonds of f500 at 4.5%. Dividends were f62, 50 centimes each, for 1901 and 1902; f104, 16 centimes, in 1903; f135, 4 centimes, in 1904; f200 in 1905; f212 in 1906; and f200 in 1907. Is supposed to be controlled by the French house of Rothschild. Owns a considerable share interest in the Compagnie d'Inguaran. Is exempt, until Dec. 17, 1912, from all federal and local taxes, except stamp taxes; is exempt from custom duties and local dues until 1942; is exempt until 1942 from export and

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import duties on fuel consumed; employes are exempt from military and civil service.

Lands, 20,000 hectares, granted by the Mexican government, in 11 groups, also 11,920 hectares of grazing lands south of the mines. Principal groups are the Soledad, Providencia, Purgatorio and Bricas. Lands include 5 known copper deposits of importance, the copper-bearing formation covering 3,000 hectares, with possibilities of further extensions.

The ore occurs in a formation of Tertiary conglomerates, sandstones and tuffs, traversed at certain points by trachyte, the cupriferous tuffs overlying conglomerates of eruptive rock pebbles, and being surmounted by argillaceous tuffs, all traversed by fissures. The ores are of great variety, including cuprite, melaconite, azurite, malachite, erednerite, chrysocolla, atacamite, covellite and chalcocite, chalcocite and covellite predominating. There are three cupriferous beds, the upper averaging about 3′ in thickness, the middle 2′ to 3′, and the bottom 2′ to 10′. The middle bed carries oxide and carbonate ores in oölithic concretions, known locally as boleos, hence the name of the mine. The lowest bed, partly below the water-line, carries sulphide ores, as well as oxides and carbonates. The ore is disseminated through the tuffs in thin, irregular veins, with clay gouge, and has a marked concentration toward the bottom of each bed, where the ore forms compact layers of 6″ to 12″. The main workings are 15 metres to 200 metres above sea-level, the mine being opened by numerous tunnels, and by 7 shafts of the following depths: Sombrero, 98 metres; Carmen, 53m.; Purgatorio, 55m.; Central, 156m.; Amelia, 48m.; Santa Rita, 86m.; San Juan, 86m. The mine is extensively developed, having about 125 kilometres of workings in 1906.

Owing to the peculiar nature of the mine all drilling is done by hand and the ore is so rich that no mechanical concentration is attempted. Ore is hand-sorted and machine-briquetted at a cost of only 1 franc per ton, the argillaceous gangue serving as a natural binder.

The mine has complete steam and electric plants, generating about 2,000 h. p. from steam-engines, of which 1,500 h. p. is transformed by two 3-phase 500-kw. current generators and two 250-kw. 3-phase generators. The electric plant, at Santa Rosalia, furnishes power for hoisting and traction engines, etc., and also current for 50 arc lights and a number of incandescent lamps. The company is courageous in utilizing new and untried machinery, and has a "boneyard" containing an immense amount of machinery that has been scrapped. The climate being tropical and the country extremely arid, there is a condensing plant, with 4 powerful pumps, for the distillation of sea-water, and, to obviate evaporation, water distilled is stored in underground wells. Potable water comes from a reservoir on the Yaqui plateau, through a 16,074-meter pipe-line, having pumps at Santa Aguede and Santa Rita.

The smelting plant, rebuilt 1901, had ten 150-ton water-jacket blast-furnaces, but these were replaced, 1906, by 10 new furnaces of larger capacity, with 12 to 15 tuyeres each. The smelter has 4 large Connersville blowers, driven by two 175-h. p. compound engines. Sea-water for water-jackets is supplied by a duplex pump having a capacity of 2,400 cubic meters per hour, operated by a 250-h. p. engine. Electric locomotives on the slag-line dump molten slag into moulds in rough holes in the ground, and, after cooling, the masses of slag are dumped over the end of the breakwater, serving a useful purpose in its extension. The first-fusion product is a matte of 58 to 65% copper tenor, about one-third of which is refined to black copper of 89 to 94% tenor, both matte and bars being shipped to Falmouth, England, for refining. A converter plant should be added to the smelter. Fuel for smelting is imported German and English coal and coke, and coal briquettes are used for general fuel. Coke consumption, 1906, was 4,140 tons, imported from Cardiff.

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The plant includes large and extensive machine-shops, capable of handling all classes of mining work, the property occupying a singularly isolated position. The town of Santa Rosalia, absolutely controlled by the company, has a population of 7,000, dependent solely on the mines and works. The village of Santa Rosalia is well laid out, including 4 general stores, warehouses, sawmill, church, 4 schoolhouses, hospital, theatre, amphitheatre and market building.

The harbor of Santa Rosalia has breakwaters of 650′ and 2,500′, with a 340-meter jetty and 2 new wharves, the dock having an area of 15 hectares, the breakwaters being composed of large blocks of slag. The harbor works include a dredge and three 200-ton lighters used therewith. The port handles annually about 125,000 tons of freight, in addition to about 7,000,000′ of lumber. The company owns a 850-ton sailing vessel and a steamer, latter plying between Santa Rosalia and European points. Copper is shipped to Europe on the steamers of the Compagnie Chargeurs Reunis.

A 30-kilometer private railroad connects the mines with the smelters at Santa Rosalia, equipment including 9 locomotives and 120 cars.

The labor question has given considerable difficulty, owing to the scant population of Lower California, necessitating the importation of workmen. Wages are fairly high, for Mexico, averaging 2 pesos daily for miners, and all employes are given the benefit of free medical and surgical attendance, medicines and an excellent hospital service. The importation of 500 Japanese workmen, 1904, proved unprofitable, only 40 men remaining at the mine by the end of the year, and tropical labor from Tepic also proved a failure. A large number of Chinese coolies were hired, 1903-1904, but of the force of 3,440 men employed, January, 1908, only about 200 were Chinese.

The average net copper return from ore smelted was 4.29% in 1900; 4.38% in 1902, and 3.636% in 1906, when a somewhat lower average grade of ore was used, on account of the high price of copper. Production has been as follows. in 1902, from 249,895 metric tons of ore, 10,953 metrics tons fine copper; in 1903, from 230,490 tons of ore, 10,480 tons fine copper; in 1905, from 260,694 tons of ore, 10,350 tons fine copper; in 1906, from 304,940 tons of ore, 22,817,610 lbs. fine copper, and in 1907, from 319,850 tons of ore, production was 24,530,000 lbs. fine copper. It will be noted that the company has steadily increased ore production, under rather trying circumstances. The property is one of great merit and ably managed.

BOLINAS COPPER MINING CO. **CALIFORNIA.**

Office: 253 Spear St., San Francisco, Cal. Mine office: Bolinas, Marin Co., Cal. T. P. H. Whitelaw, president and manager. Lands, sundry claims 4 miles northeast of Bolinas, showing 9 veins, 6″ to 2′ wide, in serpentine, on which considerable development work has been done. Ore on the dumps is said to carry 5 to 10% copper. Has a good equipment, including a concentrator. Idle for several years, and company refuses to furnish any statement.

BOLIVIAN CONSOLIDATED COPPER CO. **BOLIVIA.**

Office: 3102-1 Madison Ave., New York, N. Y.

BOMPA SYNDICATE. **AUSTRALIA.**

Mine office: Glassford Creek, Gladstone district, Queensland, Australia. Presumably idle.

BONANZA BELT COPPER CO. **ARIZONA.**

Office: 31 Nassau St., New York, N. Y. Mine office: Johnson, Cochise Co., Ariz. Robert Huntley, president; A. T. Wells, vice-president; H. L. Dessar, secretary and treasurer; Walter L. Ehrich, superintendent; Gustave N. Gouyard, consulting engineer. Organized Oct. 29, 1906, under laws of Arizona, with capitalization $3,500,000; shares $10 par. Trust Co. of America, New York, registrar. Lands, 12 claims, area circa 230 acres, including the Peabody

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mine, adjoining the Arizona & Michigan, located 1879, which has a 6′ vein giving assays up to 9% copper and 4 oz. silver, and is said to have 16,950′ of workings. Mine is claimed to have produced, under former ownership, about $1,000,000 worth of ore. Present company has shipped some ore running 11.5% copper and 51 oz. silver per ton. In August, 1907, property was attached by the Albert Frank Co. for $40,623.20, for an unpaid advertising bill. Some of the officers are men of excellent standing, but advertising was misleading and mine is not in the same district as the Greene-Cananea, Copper Queen, Old Dominion and United Verde mines, as might be inferred from map printed in company's advertising, although the map carried, in very small letters, a note that it was not drawn to scale. Is not regarded favorably.

BONANZA CIRCLE MINES. **ARIZONA.**

A nickname for the Calumet & Arizona, Superior & Pittsburg, American-Saginaw and Warren Realty & Development properties at Bisbee, Cochise Co., Ariz.

BONANZA COPPER CO. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Said to have been absorbed, 1907, by Copper Company of Arizona.

BONANZA COPPER CO. **MONTANA.**

Office: care of J. H. Tilsey, secretary, Spokane, Wash. Letter returned unclaimed from former mine office, Florence, Ravalli Co., Mont. Jos. Felton, president; A. J. Riese, vice-president; J. W. Doust, treasurer. Lands, 15 claims, known as the Whaley mine, in the Woodchuck district, said to have a 12′ ore body of fair grade, slightly developed by tunnel.

BONANZA COPPER CO. **NEVADA.**

Mine office: Manhattan, Nye Co., Nev. Lands, in East Manhattan, have a 131′ shaft showing stringers of ore assaying about 4% copper, with gold values. Presumably idle.

BONANZA COPPER CO. **NEW MEXICO.**

Mine office: Las Vegas, San Miguel Co., N. M. Chas. N. Petteys, president and manager; Geo. H. Hunter, secretary. Has steam power, a small concentrator and a 25-ton leaching plant.

BONANZA DE COBRE MINING CO. **MEXICO.**

Dead. Succeeded, circa 1907, by Elenita Development Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

BONANZA DEVELOPMENT CO. **MEXICO.**

Dead. Sold lands, 1899, to Santa Rita Mining Co. Formerly at Santa Rita, Grant Co., N. M.

BONANZA MINE. **ALASKA.**

The Bonanza mine in the Copper River district, Alaska, is owned by the Kennicott Mines Co.

BONANZA MINE. **ALASKA.**

The Bonanza mine, on Latouch Island, Alaska, is owned by A. K. Beatson, et al.

BONANZA MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Observatory Inlet, Cassiar district, B. C.

BONANZA MINING CO. **IDAHO.**

Office and mine: Montpelier, Bear Lake Co., Idaho. M. L. de Julien, president and general manager; C. N. Sweet, vice-president; A. D. Young, secretary; F. C. Plummer, treasurer. Organized November, 1905, under laws of Idaho, with capitalization $5,000,000, shares $1 par, succeeding Montpelier Copper Mining & Smelting Co. Lands, 23 claims, unpatented, area 460 acres, circa 9 miles southwest of Montpelier, include the Duke, Emerald and other claims, showing auriferous and argentiferous copper ore in a vein of about

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30′ width with a 5′ paystreak. Has a 200′ two-compartment shaft, planned to be sunk to 600′, on the Duke claim.

BONANZA MINING CO. **MEXICO.**

Office: care of Chas. Sidlar, secretary, Sunbury, Pa. Mine office: Ameca, Jalisco, Mex. Hon. Thos. Savage, president; E. J. Callahan, general manager. Organized 1905, by shareholders of the Ampare Mining Co., to take over the Barranca mine, bought for $30,000. Presumably idle.

BONANZA MINING & SMELTING CO. **WASHINGTON.**

Office: 81 Sullivan Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Chas. Lovejoy, superintendent. Lands are the Edison group, 12 claims, in the Silver Creek district, opened by tunnels aggregating 2,100′ length, showing auriferous copper ores. Has water power.

BONANZA MOUNTAIN GOLD MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Grand Forks, Boundary district, B. C. Has low-grade auriferous and argentiferous copper ores. Idle for several years.

BONANZA QUEEN MINING CO., LTD. **WASHINGTON.**

Office: Minneapolis, Minn. Mine office: Silverton, Snohomish Co., Wash. J. H. Eaton, superintendent. Lands, 8 claims, showing 4 veins, said to be proven by gorges for length of about 4,000′. Main vein is claimed to average 60′ width, with extreme width of 134′. Has a 1,090′ crosscut tunnel. Ten carloads of ore shipped to Tacoma smelter gave returns of $14.50 per ton.

BONITO COPPER CO. **ARIZONA.**

Mine office: Safford, Graham Co., Ariz. Planned installing a leaching plant. Idle.

BONMAHON COPPER MINES DEVELOPMENT SYNDICATE, LTD. **IRELAND.**

Office: Broad Street House, London, E. C., Eng. Mine office: Waterford, County Waterford, Ireland. Sir Jas. Aloysius Power, chairman; H. J. Dixon, secretary; Arthur Llewellyn Pearce, consulting engineer; Herbert T. Marks, mine manager. Organized Nov. 16, 1905, under laws of Great Britain, with capitalization £30,000, shares £1 par.

Lands, 190 acres, on Bonmahon Bay, 17 miles from Waterford, including the Knockmahon and Tankardstown mines, which, 1827-1865, under the ownership of the Mining Company of Ireland, had an authenticated production of £1,339,232, from which profits of £534,011 are said to have been made. Ore extracted during this period is said to have averaged 10%, but must have been secured by very careful hand-selection. After 1875, under a different management, mines are said to have produced about £900,000 worth of ore. The Bonmahon mines are very ancient, having been worked as early as the Sixteenth Century. Last mining work preceding present ownership was done 1878.

The Knockmahon ore body, said to be traceable 5 miles to Kilmackthomas, occurs in clay-slates. Annual production was about 1,000 tons fine copper, circa 1840. The Tankardstown mine, running under the sea for some distance, is said to show considerable bodies of ore of concentrating grade. The Bonivy mine, 300′ deep, has been unwatered. Property as a whole shows large reserves of low to medium grade ores, and is considered decidedly promising, but to be profitable must be operated on a good scale. At last accounts company planned reorganization, on basis of about £200,000 capitalization.

BONNEY MINING CO. **NEW MEXICO.**

Dead. Formerly at Lordsburg, Grant Co., N. M. Described Vol. VI.

BONNIE BELLE MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Rudefeha, Carbon Co., Wyo.

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BONNIE DUNDEE MINING CO., N. L. **AUSTRALIA.**

Office: Cobar, N. S. W., Australia. Mine office: Hermidale, N. S. W., Australia. M. J. Corbett, chairman; preceding officer, J. A. Draper, A. J. L. Flashman, E. B. Treatt and B. A. Sorensen, directors. Property, carrying auriferous copper ore of some promise, is slightly developed.

BOODLE MINING SYNDICATE, LTD. **COLORADO.**

Office: 46 St. Mary Axe, London, E. C., Eng. Letters returned unclaimed from former mine office, Central City, Gilpin Co., Colo. John Peter Reid, chairman; Chas. Pearson, secretary; W. J. Richards, superintendent. Capitalization, £15,000, shares £1 par; issued, 7,500 shares, 15s. called up. Ores carry gold, silver and copper. Idle for some years and apparently moribund.

BOPPY BROKEN HILL COPPER MINE, N. L. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized circa December, 1907, under laws of New South Wales, with capitalization £22,500, shares £5 par. Mine has a 200′ shaft, showing, at bottom, ore estimated to average 30% copper.

BOPPY MOUNTAIN CO. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized 1906, with capitalization £3,000, shares £5 par. Lands, 28 claims, 2 miles north of Mount Boppy gold mine, adjoining the Boppy Blocks mine on the north, showing a strong gossan capping. Idle at last accounts.

COMPAGNIE FRANCAISE DES MINES DE BOR. **SERVIA.**

Office: 60 Rue de la Victoire, Paris, France. Mine and works office: Bor, Zeyetchar, Timok, Servia. Original capitalization of £5,500,000 was increased, 1908, to £7,000,000.

Lands are a 50-year concession with privilege of renewal, known as the St. George, covering 2,400 hectares, and the lease of 6,500 hectares additional lands, in the communes of Bor, Krivelj and Ostrelj, lying circa 13 miles south of Majdenpek. Property shows prominent gossans carrying considerable limonite, ores occurring in a belt of 1 to 2 miles width by about 10 miles length, in fissure veins up to 50′ and even 100′ width, traversing andesite and volcanic tuffs and breccias. Ores include chalcocite, covellite, bornite, chalcopyrite and enargite, associated with galena, sphalerite and pyrite, all slightly auriferous and argentiferous. At Krivelj, a vein of about 40′ width gives average ores of 5.5% copper. At Cuka-Dulkan, a vein of 27 meters extreme width has given average assays of 6% copper. At Crveno-Brdo there are 3 irregular chimneys, averaging 80′ in width, giving average returns of 7% copper. A branch of the Budapest & Constantinople railway is being built to the Bor district. Smelter has 2 blast furnaces, 360-h. p. Babcock & Wilcox boilers and a converter with one stand and four shells.

BOREN GULCH MINING CO. **COLORADO.**

Office: care of Henry C. Deeming, general manager, Harrisburg, Pa. Mine office: La Plata, La Plata Co., Colo. G. C. Cornell, superintendent. Ores are complex auriferous and argentiferous copper, lead and zinc sulphides. Has steam power.

BORNITE COPPER CO. **MONTANA.**

Office: 150 Fifth Ave., New York, N. Y. Mine office: Blackfoot, Teton Co., Mont. Jas. B. Holmes, vice-president; Frank Meyer, secretary. Organized with capitalization $5,000,000, shares $5 par, as successor of Imperial Montana Copper Mining, Smelting & Water Power Co., which was successor of Blackfoot Copper Co. Lands are variously reported as 8 claims, area 160 acres, and as 19 claims, on the north side of Boulder Creek, in the ceded strip of the

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Blackfoot Indian Reservation. Mine has 5 tunnels. Said to have lost lands, which were held under bond and lease, and is moribund.

BORNITE COPPER & GOLD MINING CO. **ARIZONA.**

Dead. Formerly at Wickenburg, Maricopa Co., Ariz.

BORNITE COPPER & GOLD MINING CO. **WASHINGTON.**

Office: care of C. W. Coffin, president, Bangor, Me. Mine office: Darrington, Snohomish Co., Wash. Wilbur E. Frank, secretary; C. G. Austin, general manager; Wm. Hancock, superintendent. Organized under laws of Washington, with capitalization $2,500,000, shares $1 par. Lands, 11 claims in the Stillaguamish district, showing strong outcrops of auriferous and argentiferous bornite and chalcopyrite. Development is by a 2,689' tunnel, and a deeper tunnel was planned. Has water power and is said to have an aerial tram. April, 1908, was offering 1-year 7% notes to shareholders in efforts to raise funds. Presumably idle.

BORTLE COPPER-GOLD CO. **WASHINGTON.**

Office: 822 Penobscot Bldg., Detroit, Mich. Mine office: Republic, Ferry Co., Wash. C. Eugene Bortle, president; Chas. E. Murphy, vice-president; Chas. Kohn, secretary and treasurer; preceding officers, Ralston MacCaig and Chas. Storch, directors; E. J. Delbridge, general manager. Organized June 22, 1906, under laws of Washington, with capitalization $1,200,000, shares $1 par; issued, $800,000.

Lands, 4 claims, area 80 acres, held under bond and lease, also an 80-acre millsite and 160 acres miscellaneous lands, in the Lambert Creek district, adjoining the Belcher mine on the south. Mine has a 357' tunnel and a 52' incline shaft, on the northern extension of the Belcher vein, showing auriferous sulphide ore giving average assays of about 3% copper. Company is said to have expended about $65,000 on the property. There is a sawmill on the smeltersite, on Curlew Lake, where a matting furnace is planned, tentatively. Idle, but plans early resumption.

BOSCASWELL UNITED TIN & COPPER MINE, LTD. **ENGLAND.**

Mine office: St. Just, Cornwall, Eng. Organized circa June, 1908, under laws of Great Britain, with capitalization £200,000, shares £1 par, in half preferred ordinary and half deferred ordinary shares, latter allotted to vendor as purchase consideration. Lands, 7 setts, including the North Boscaswell Downs, Calartha Common and Bortherras mines, about 2 miles from St. Just. Is not regarded favorably.

BOSSMO KISGRUBER. **NORWAY.**

Mine office: Baasmoen, Ranen, Norway. Ore is slightly cupriferous pyrite, assaying 0.5% and upwards in copper, and up to 50% sulphur, latter element furnishing the principal ore values. Yearly production is about 20,000 tons of pyrite, and circa 25,000 lbs. fine copper.

BOSTON & ARIZONA CONSOLIDATED COPPER CO. **ARIZONA.**

Dead. Formerly had an office at 501-7 Water St., Boston, Mass.

BOSTON-ARIZONA COPPER CO. **ARIZONA.**

Office: 1012-60 State St., Boston, Mass. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Hon. Chas. M. Bruce, president. Lands, 21 claims, near the McMillen, in the Richmond Basin, 20 miles from Globe.

BOSTON & ARIZONA COPPER CO. **ARIZONA.**

Office: 131 State St., Boston, Mass. Apparently moribund.

BOSTON-ARIZONA GOLD & COPPER MINES CO. **ARIZONA.**

Dead. Formerly had an office at 405-31 State St., Boston, Mass.

BOSTON-ARIZONA MINING CO. **ARIZONA.**

Dead. Formerly at Wickenburg, Maricopa Co., Ariz. Described Vol. V.

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BOSTON & ARIZONA SMELTING CO. **ARIZONA.**

Letters returned unclaimed from former office, 302 Mills Bldg., San Francisco, Cal., and former works office, Benson, Cochise Co., Ariz. Riley A. Boggess, manager. Organized 1907, under laws of Nevada, with capitalization $2,500,000, shares $100 par, as successor of the Southwestern Smelting & Refining Co., which succeeded the Empire Smelting Co. Lands, 60 acres, on the main line of the Southern Pacific. Has a 200-ton water-jacket blast-furnace, No. 7 Connersville blower, electric power plant, sampling plant with 500-ton Vezin automatic sampler, and an artesian well. Smelter never was blown in. Has an old slag-dump, from a previous smelter, containing circa 100,000 tons of slags, assaying about $5 per ton in values, which probably could be resmelted. Moribund.

BOSTON & BRITISH COLUMBIA COPPER MINING & SMELTING CO. **BRITISH COLUMBIA.**

Dead. Lost property by attachment.

BOSTON & BRITISH COLUMBIA MINING CO. **BRITISH COLUMBIA.**

Office: 39 Cortlandt St., New York. Mine office: Granite Creek, Yale district, B. C. Moribund.

BOSTON & CAROLINA COPPER MINING CO. **NORTH CAROLINA.**

Dead. Formerly at Baker City, Granville Co., N. C.

BOSTON CLIMAX GOLD-COPPER MINING & INVESTMENT CO. **WASHINGTON.**

Office: Union Trust Bldg., Providence, R. I. Benj. F. Harrington, president. Lands, circa 240 acres, in Stevens county, Washington, on which about $25,000 has been spent in development work. Idle for several years.

BOSTON-COLBY COPPER MINING CO. **MONTANA.**

Office and mine: Saltese, Missoula Co., Mont. John Bauer, president; Andrew Flaig, secretary, treasurer and general manager. Organized Sept. 16, 1903, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 7 claims, area 140 acres, also a 5-acre millsite, in the St. Regis district, near Saltese and rail connections. Has a shallow shaft and tunnels of 400′ and 880′, showing 5 ore bodies, claimed to have given average assays of 15% copper, 10 oz. silver and $5 gold per ton. Presumably idle.

BOSTON-COLORADO COPPER CO. **COLORADO.**

Dead. F. H. Colvin was president and general manager. Capitalization, $1,000,000. Is said to have paid $200 for the property. Company claimed a preposterous tonnage of 4% ore above water level. Claimed to have 4 tunnels, aggregating about 2,000′ in length, and claimed an ore body showing an 85′ outcrop, traceable 4,500′. Dennison, the former secretary, is in bankruptcy and gave a bill of sale on unpaid stock, apparently perjuring himself, and Colvin was arrested for taking the bill of sale. Both Colvin and Ecke were indicted, 1907, on complaint of the United States government, for using the mails with intent to defraud. The 100-ton mill and dividends promised, 1906, have not materialized. Was a swindle. Formerly at 124 F St., Salida, Chaffee Co., Colo.

BOSTON-COLORADO COPPER MINING CO. **COLORADO.**

Letter returned unclaimed from former office, 50 White St., New York. Mine office: Fort Collins, Larimer Co., Colo. Edwin M. Keiser, president; Sanford Stark, vice-president and general manager; Roger C. Turner, secretary. Organized 1899, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 7 patented claims, area 63 acres, in the Howes Gulch district, showing carbonate and sulphide ores, giving assays of 7 to 8% copper, 1 oz. silver and $2.60 gold per ton, developed by shafts of 40′ and 240′

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and two 200' tunnels. Has steam power and necessary mine buildings. Idle some years and moribund.

BOSTON & COLORADO SMELTING CO. **COLORADO.**

Office: Boston Bldg., Denver, Colo. Works office: Argo, Denver Co., Colo. C. C. Converse, president; Geo. D. Edmunds, secretary; Crawford Hill, managing director; Harold V. Pearce, general manager. Has a 250-ton smelting plant, with steam and electric power, doing a general custom smelting business. Employs about 200 men.

BOSTON CONSOLIDATED COPPER & GOLD MINING CO., LTD. **UTAH.**

Office: 62 New Broad St., London, E. C., Eng. Mine office: Bingham Canyon, Salt Lake Co., Utah. John E. Dudley Ryder, chairman; Samuel Newhouse, general manager; preceding officers, Chas. S. Henry, M. I. Newhouse, Frank A. Schirmer, Eugene Meyer, Jr., and Capt. Stephen H. Pollen, directors; G. H. Johnson, secretary. Organized May 14, 1898, under laws of Great Britain; capitalization increased, August, 1905, to £725,000, shares £1 par; issued, £625,000. Has a first-mortgage debenture issue of £252,000, at 7%, convertible into shares at £3 or redeemable at £105 on 6 months notice. Property is held through an American corporation, the Boston Consolidated Mining Co., under which title the mine is described. Practically the entire stock issue of the American corporation is held by the British parent company, and funds of the latter are loaned to the American corporation. Shares are listed on the London and Boston stock exchanges.

BOSTON CONSOLIDATED MINING CO. **UTAH.**

Office: 79 Milk St., Boston, Mass. Operating office: 608 Dooly Block, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Samuel Newhouse, president; Frank A. Schirmer, vice-president, secretary and treasurer; Lafayette Hanchett, general manager; Louis S. Cates, general superintendent; S. H. Horner, mine superintendent; A. J. Bettles, mill superintendent; Geo. G. Wald, engineer.

Organized under laws of New York, with capitalization $1,000,000, shares $100 par, entire capital stock, except founders shares, being owned by the Boston Consolidated Copper & Gold Mining Co., Ltd. Owns 20% of stock issue of Garfield Improvement Co., which holds the townsite of Garfield, Utah. A first-mortgage of $1,500,000, Federal Trust Co., New York, trustee, was recorded circa February, 1908, to cover the convertible bond issue of December, 1907, by the English parent company. Pressing needs during the 1907 panic were met by the personal endorsements of directors Frank A. Schirmer and Samuel Newhouse, for which they deserve great credit, and the thanks of all shareholders. During 1907 the company expended, for mill construction, $782,654, and spent upwards of $900,000 for mine development, machinery and other construction account.

Lands, 51 claims, area 379 acres, patented, also the old 200-acre millsite, the Pelican Point millsite of 1,085 acres, the Garfield millsite of 910 acres, and 680 acres miscellaneous lands. Country rocks are limestone, porphyry and quartzite, and the ore is mainly chalcopyrite, with occasional bornite and disseminated chalcocite.

The Boston Consolidated really is two mines in one, the original mine having been opened on fissure veins in limestone and quartzite. Later, the work of the Utah Copper Co. led to the investigation of the monzonite ore bodies of the Boston Consolidated and a monstrous porphyry mine has been developed thereon. Company estimates that the ores of the Sulphide mine average 2.5% copper, 2 oz. silver and $2 gold per ton, and that the porphyry ores average 1.6% copper, 0.25 oz. silver and 30 cents gold per ton.

The Sulphide property, which was the original mine, has an area of about

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100 acres, containing 15 known ore bodies. Two veins are being developed, these having a generally east and west strike, with average dip of 28° N., ore chute being estimated at 160′ width and 340′ length. During 1907 a new and promising ore body was opened by Armstrong No. 1 tunnel. Some of the best ore of the Sulphide mine returns better than 10% copper, with corresponding increase in gold and silver values, but the average return of all sulphide ores, 1906, was 2.802% copper, with a 6% loss in smelting. During 1907 there were 7,799′ of new openings made in the Sulphide mine, which has about 6 miles of workings. The Armstrong No. 1 tunnel, which is the main working artery, has an electric haulage system. The Peabody tunnel shows a body of sulphide ore 190′ in width. Other principal tunnels of the Sulphide mine are Armstrong No. 2, Work, Phoenix and Ingersoll.

The Porphyry mine is opened by 15 tunnels, with about 7 miles of workings, and consists, not of a vein or contact deposit, but of 110 acres of country rock, with values continuing to an undetermined depth. The porphyry is monzonite, a somewhat complex anhydrous silicate of aluminum, sodium, potassium, calcium, manganese and iron, the porphyry ore body being a continuation of the monzonite ore of the Utah Copper Co. The company estimates 52,000,000 tons of porphyry ore in sight. It is probable that, eventually, this ore body will be found to contain between 100,000,000 and 200,000,000 tons of ore, part of which probably will be unworkable, owing to its extremely low copper tenor. The porphyry ores, estimated by the company to average 1.6% copper, range down in tenor to 0.7% copper, which probably is unworkable, at present. The porphyritic ores are mined and overburden stripped by four 90-ton steam shovels, stripping being removed at a cost of 5 to 10 cents per ton, each shovel being capable of handling 2,000 to 3,000 tons daily of overburden or ore, which is broken by blasts, deep holes for charges being bored by Keystone drills.

Mine equipment includes a 700-h. p. steam plant, with 3 cross-compound air-compressors, of 60 drills aggregate capacity. Mine buildings include a 40x80′ machine shop, 30x40′ carpenter-shop, 3 smithies, etc.

There is a 2,000′ incline tram, with double tracks, laid with 36-lb. rails, having 2 Stine drums at the top of the terminal, operating 13-ton skips, estimated capacity of line being 6,000 tons daily. There are 3,000-ton steel ore-bins at the terminal, on Carr Fork, and a half-mile railway connecting with the Rio Grande and Copper Belt railways. The company has a 5-mile private narrow-gauge railway, equipped with 12 locomotives and 190 ore cars.

The 3,000-ton mill, at Garfield, costing upwards of $1,500,000, is in 6 units of 500 tons each, with 13 operating units. The mill is 370x555′ in size, built of steel and concrete. Equipment includes 18,000-ton main ore-bins, 4 Gates crushers, 312 Nissen individual stamps, 284 Wilfley tables, 256 Johnson tables and 312 Callow settling tanks. The mill has no elevators, all material being handled by gravity. Water is supplied partly from springs on the millsite, but mainly by the Garfield Water Co. The mill has a large reservoir.

Miscellaneous buildings at the millsite, all of steel and concrete, include a 50x130′ machine-shop, 40x40′ carpenter-shop, smithy, etc.

The porphyry ores have given decidedly disappointing results in initial production, but it is hoped that better returns can be secured. The top of the porphyry ore deposit shows a considerable excess of iron, and the mill has given an average extraction of about 70% only of the ore values. The porphyry ores can be concentrated about 20 into 1, though necessarily with heavy tailings loss. The porphyry ores, for the first half of 1908, gave smelter returns of only 19 to 22 lbs. fine copper per ton, concentrates averaging 14 to 19% copper and circa 25% iron. It is hoped that ore mined may be brought

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to an average of about 1.5% copper, with an 80% extraction, which would give 24 lbs. fine copper per ton, less small smelter losses.

Production has been secured for several years from the sulphide zone, output, 1906, having been 3,565,483 lbs. fine copper, and 6,146,125 lbs. fine copper, 78,128 oz. silver and 12,446 oz. gold in 1907. The company plans an eventual production of about 30,000,000 lbs. fine copper yearly. Costs, 1907, were figured at 8.55 cents per pound, deducting gold and silver values, but not including construction of mill or sundry heavy expenses of mine development. It is hoped to have the property producing at full capacity during 1909. Notwithstanding the disappointing results given by the porphyry ores in 1908, the mine, by reason of its almost incomprehensible tonnage of porphyry ores, is one of great possibilities, and the management is vigorous and resourceful.

BOSTON & CORBIN COPPER & SILVER MINING CO. MONTANA.

Office: 82 Devonshire St., Boston, Mass. Mine office: Corbin, Jefferson Co., Mont. Nathan L. Amster, president; A. B. Clough, vice-president; C. R. Jeffers, secretary and treasurer; Homer E. Emerson, general manager; preceding officers, Jas. A. Houston and David A. Ellis, directors. Organized Aug. 30, 1906, under laws of Maine, with capitalization $500,000, shares $5 par; issued, $400,000. Boston Safe Deposit & Trust Co., transfer agent. Federal Trust Co., Boston, registrar.

Lands, 9 claims, area circa 175 acres, 1 mile from Corbin and 43 miles from Butte, including the Bertha mine, with about 4,500′ of strike of the Bertha vein. Country rock is granite with intrusive porphyritic rocks, vein system of the Bertha consisting of a number of parallel fissures. Geological conditions are markedly similar to those at Butte, though ore is mainly chalcopyrite instead of chalcocite as at Butte, with some enargite, all argentiferous. The Bertha has 6 different veins, of about 2′ average, width, in addition to the main Bertha vein, which is a well defined fissure, in granite, of 6′ to 18′ width, carrying an 18″ to 2′ paystreak. Silver values increase with depth, ranging 6 to 9 oz. per ton in the upper workings, and 12 to 22 oz. per ton on the lower level. First class ore averages about 7.8% copper and second class ore 4.6% copper, average of all ore shipped from beginning of operations to Apr. 1, 1908, being 5.64% copper and 7.7 oz. silver per ton. Property adjoins the old Alta mine, claimed to have produced about $20,000,000 worth of silver, and which supposedly was opened on a continuation of the Bertha vein.

The mine had about 3,500′ of workings, when taken over by present company, development being by two 900′ tunnels and a 200′ shaft. New management has begun a third tunnel and deepened the 2-compartment Gregory shaft to 500′, and plans sinking to 1,000′. Is crosscutting, on the 500′ level, to cut the parallel veins.

Equipment includes a 500′ hoist and 10-drill air-compressor, with necessary mine buildings and shops. Cost of wagon freight to railroad is $2 per ton on ore, and an aerial tram is planned.

Company ended fiscal year, July 31, 1907, with cash and bills receivable of $73,218.81, with liabilities of $6,947.21. Small ore shipments have been made from development work, to the Butte Reduction Works, and production, 1907, was 157,000 lbs. fine copper.

The company is modestly capitalized and is being developed with vigor by experienced mining men who have proven successful in other fields. The Corbin district has been called, by its friends, another Butte, but has been given a black eye by reason of the failure of numerous small mining enterprises. These, however, were inadequately financed, and, as a rule, were poorly managed, hence the real value of the district remains to be demonstrated. The prospects of the Boston & Corbin seem good.

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BOSTON-ELY COPPER CO. **NEVADA.**

Office: 110 State St., Boston, Mass. Mine office: Ely, White Pine Co., Nev.

BOSTON-ELY DEVELOPMENT CO. **NEVADA.**

Dead. Organized 1906, under laws of Maine, and reorganized, circa November, 1907, as Boston-Ely Mining Co. Formerly at Ely, White Pine Co., Nev.

BOSTON ELY MINING CO. **NEVADA.**

Office: 84 State St., Boston, Mass. Mine office: Ely, White Pine Co., Nev. Employs 15 men. Arthur L. Robinson, president; Chas. H. Farnsworth, vice-president; Jerome C. Smith, secretary and treasurer; preceding officers, Geo. E. Keith, Jos. N. Smith, Wm. D. Elwell and S. Herbert Williams, directors; Ed. W. Ralph, superintendent. Organized November, 1907, under laws of Maine, with capitalization $2,000,000, shares $10 par; $3.15 paid in; issued, $1,700,000. Was a reconstruction of the Boston-Ely Development Co., giving new stock for development stock, stamping latter $3 paid and levying a 15-cent assessment. Owns a two-thirds stock interest in the Ely Western Copper Co.

Lands, 22 claims, patented, area 300 acres, including the Colorado-Ely group, about one-half mile from the Cumberland-Ely and Giroux, and in the vicinity of the Rickard-Ely, opened by the 710′ Emma shaft, showing low grade copper ore in drifts on the 710′ level. Also has 2 fissure veins, said to carry high grade ore, from which small shipments have been made, but if a considerable ore body is developed by the Emma shaft, presumably it will be found quite deep. Has a 15-h. p. hoist and several camp buildings. Company plans deepening shaft and prospecting below the oxidized zone. Lands have been partially explored by churn drill. Management seems efficient, and property is considered as not devoid of promise.

BOSTON EXPLORATION CO. **WASHINGTON.**

Office: Old South Bldg., Boston, Mass. F. E. Houghton, fiscal agent. Organized 1906, with capitalization $5,000,000, shares $5 par. Is a holding company, organized to control the Mineral Hill Tunnel Mining Co. and Mineral Hill Mining Co., both of Ferry county, Washington; the Triune Gold Mining Co. in the Wannicutt Lake district of Okanogan county, Washington, and the Providence Mining Co. in the Cedar Cañon district of Stevens county, Washington.

BOSTON GOLD-COPPER CO. **ARIZONA.**

Dead. Reorganized as Growler Copper Co. Formerly at Gila Bend, Maricopa Co., Ariz.

BOSTON GOLD-COPPER SMELTING CO. **COLORADO.**

Office: 403 Cooper Bldg., Denver, Colo. Works at Leadville, Lake Co., Colo., were leased, 1902, for 10 years, to the Republic Smelting Co.

BOSTON-GREENWATER COPPER CO. **CALIFORNIA.**

Office: Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. W. A. Kidney, president; J. P. Nelson, vice-president and general manager; E. H. Lattimer, secretary; Hon. John MacGinnis, treasurer; Daniel P. Murphy, superintendent. Organized October, 1906, under laws of Arizona, with capitalization $1,250,000, shares $1 par. Lands, 11 claims, area 175 acres, lying about 1 mile east of the Furnace Creek Copper Co., instead of immediately adjoining, as claimed. Lands are claimed to show a wide vein, with numerous cross fissures, giving assays of 25 to 50% copper, but actually having an 8′ vein giving average assays of about 5% copper. There were various charges of fraud in connection with sale of stock in this company by brokers, leading to the arrest of Secretary Lattimer, Miles Almy and Dr. Grant Lyman. Apparently Almy was innocent of intentional fraud, and Lyman, who was at the head of the Union Securities Co., managed to escape punishment, though undoubtedly

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having sold an immense amount of stock through misrepresentation. Idle and presumably moribund.

BOSTON-IDAHO MINING CO. **IDAHO.**

Offices: 306-147 Milk St., Boston, Mass., and 6 First Natl. Bank Bldg., Ogden, Utah. Letter returned unclaimed from former mine office, Nicholia, Lemhi Co., Idaho. R. P. Hunter, president and treasurer; Frank H. Clayton, vice-president and eastern manager; Ernest J. Waugh, secretary; W. N. Pierce, superintendent; Thos. Hampton, mine superintendent. Organized February, 1902, under laws of Utah, with capitalization $200,000, shares $1 par. Lands, 8 claims, area circa 100 acres, including the Ontario mine on Boyle Mountain, in the Spring Mountain district, having 8 tunnels, with about 1,500′ of workings, claimed to have produced upwards of $1,000,000 in the past. Has secured ores assaying up to 27.5% copper, 57% lead, 40 oz. silver and $1.60 gold per ton. The L. Diamond Co., of Boston, advertised this stock, 1907, stating that 5% quarterly dividends would begin next month, and company is regarded with suspicion. Postmaster at Nicholia stated no such company there.

BOSTON-JARILLA COPPER CO. **NEW MEXICO.**

Mine office: Orogrande, Otero Co., N. M. Lands, 7 claims, adjoining the Molly Gibson, from which a little copper and silver ore of good grade has been shipped.

BOSTON & JEROME COPPER CO. **ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Jos. Larson, president; J. C. Scott, vice-president; A. A. Macpherson, secretary and treasurer. Organized April, 1908, under laws of Arizona, with capitalization $1,500,000, shares $1 par, increased, May, 1908, to $2,500,000, shares $5 par. Lands, 9 claims, area 146 acres, known as the Juniper group, circa 2 miles south of Jerome, having a 130′ shaft sunk on a large porphyry and schist dyke, carrying carbonate copper stains. Also has tunnels of 50′ and 60′. Suspended operations circa February, 1908, but plans resumption.

BOSTON & LAKE SUPERIOR COPPER MINING CO. **ONTARIO.**

Dead. Formerly at West Superior, Douglas Co., Wis.

BOSTON & MEXICO GOLD & COPPER MINING CO. **MEXICO.**

Dead. Formerly at Ameca, Jalisco, Mex. Described Vol. VI.

BOSTON-MEXICAN MINES CO. **ARIZONA & MEXICO.**

Office: 141 Broadway, New York, N. Y. Mine offices: Twin Buttes, Pima Co., Ariz., and Hermosillo, Sonora, Mex. S. E. Otis, president; Fredk. Holder, vice-president; Augustus H. Vanderpool, secretary and treasurer; Chas. J. Eames, Jr., general manager. Organized under laws of Arizona, with capitalization $4,000,000, shares $5 par. American Loan & Trust Co., Boston, registrar; Federal Trust Co., Boston, transfer agent. Lands include sundry copper, silver and gold claims. The Copper Beauty group of 10 claims, in the Twin Buttes district, has a shallow shaft and is said to give average assays of 5 to 8.5% copper from surface ores. El Sol mine, 9 miles from Llano, has 2 shallow shafts in veins of 3′ to 4′ width, giving assay values in copper, gold and silver. The Carmen and Adriana mines are said to be near the Black Mountain, in Sonora, and to carry somewhat similar ore. The Caliche mine, in the Magdalena Mountains, supposedly has gold ores. The Concepción mine is a silver property, 20 miles west of Agua Zarca, northern Sonora. The Hada mine is a silver property near the Concepción. La Azurena mine is said to be 3½ miles from Cerro Azul, Sonora, which is not a postoffice, and to have shafts showing a vein of 5′ to 25′ width, giving assays of 35 to 290 oz. silver per ton. Company was said, April, 1907, to have secured circa 1,200 acres of copper lands in the Cananea district. Company is not regarded with especial favor.

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BOSTON & MONTANA CONSOLIDATED COPPER & SILVER MINING CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Works office: Great Falls, Cascade Co., Mont. Sidney Chase, president; John D. Ryan, managing director; David B. Hennessy, secretary and treasurer; preceding officers, Andrew B. Grafius and Jas. Phillips, Jr., directors; Chas. W. Goodale, general manager; John C. Adams, general superintendent; A. E. Wheeler, smelter superintendent; Lee Hayes, engineer; Wallace Corbett, mine foreman.

Organized July 19, 1887, under laws of Montana, and reincorporated, July 19, 1907, with capitalization $3,750,000, shares, $25 par. Debentures, $2,100,000 issued, at 7%; $200,000 outstanding. Practically entire stock issue is owned by Amalgamated Copper Co. Dividends, to Dec. 31, 1907, were $57,725,000. Dividend disbursements have been as follows: $35 in 1901; $6 in 1902; $8 in 1903; $68 in 1904; $40 in 1905; $48 in 1906; $42 in 1907. Quarterly dividends, January, April and July, 1908, were $3 each.

Lands, 483 acres, including working mines, idle properties partially developed, prospected claims and undeveloped mineral lands, also various part interests in sundry full and fractional claims in the Butte district. Miscellaneous lands include an extensive smelter-site, with valuable water rights, at Great Falls, and coal mines at Sand Coulee, 16 miles from Great Falls.

The ore bodies of the various mines are very extensive, and reserves of smelting grade ore alone were estimated, 1906, at about 3,000,000 tons, and probably were larger in 1908. The mine has some stopes of medium to high grade ore nearly 200′ in width, and is opened several years ahead of any possible requirements. Production is approximately 15% smelting ore and 85% concentrating ore. The ores are notably rich in silver and gold, returning an average of 0.025 oz. silver, valued at 1⅝ cents, and ¼ cent in gold, for each pound of copper produced.

The Leonard, which is the principal mine of the Boston & Montana at present, has an old 1,129′ shaft, which became badly drawn, circa 1905, and a new 4-compartment shaft of 1,400′. The Leonard has a very large vein, carrying exceptionally good gold values. Mine is timbered with 12x12″ and 14x14″ square sets, requiring monthly an average of about 1,000,000′ of mine timber, board measure, as solid bulkheading is required in most stopes, owing to width of the vein. The mine has electric lights and bells, and steam and electric pumps. Some trouble was had on account of fire in 1907. Water from the Mountain View, East Colusa and West Colusa mines drains to the 1,200′ level of the Leonard, and is forked thence by a Nordberg duplex station pump, with steam-end 20x40x42″ and 42x7½″ plungers, steam-end being fitted with Corliss valves and carrying a fly-wheel. The water-end was made by the company, and cast in the Silver Bow foundry, at Butte. Valves are of pot form, and the entire water-end is phosphor-bronze, columns being lined with wood, thoroughly soaked with oil and coated on the inside with hot tar, to withstand the corrosive action of the mine waters. There also are 2 Nordberg quintuplex pumps, of 600 gallons capacity each, on the 400′ level. Surface plant at the Leonard is very complete, including a 152′ steel headgear and 2,000-ton ore bins. The power plant has ten 250-h. p. boilers, and a 32x72″ Nordberg hoist, good for 3,500′ depth, hoisting cages with 10-ton skips swung under, with 1½″ round cable. There also is a 12x14″ Risdon sinking engine. Plant includes 3 air-compressors, of 3,000, 4,000 and 5,000 cubic feet capacity, respectively. The largest electrical transformer station in Montana is planned for the Leonard plant.

The Pennsylvania mine has a 400′ shaft at the East Pennsylvania, and a

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three-compartment 1,845′ shaft at the West Pennsylvania. Some trouble was occasioned, 1907, at the West Pennsylvania, by gases coming from the St. Lawrence mine. The Pennsylvania is connected underground with the Mountain View, St. Lawrence and Silver Bow No. 1 mines. The property has extensive stopes above the 600′ level, ore lying nearer surface than in most of the Butte mines. The Butte Coalition owns 38% and the Boston & Montana owns 62% of the Pennsylvania mine. Surface equipment includes 2,000-ton ore bins, a 19x48″ Allis hoist, operating 2 double-deck cages, a 12x24″ sinking engine and an Ingersoll-Sergeant air-compressor with 20x30″ steam cylinders and 30x24½″ air cylinders.

The Mountain View mine has a 1,851′ three-compartment shaft, and a 1,000′ air-shaft. There are 15 exits, mine being connected underground with the High Ore mine of the Anaconda, for drainage. The Mountain View shows 6 veins of 8′ to 60′ width, ore averaging about 5% in copper tenor, being second only to the North Butte in richness in the Butte camp. Equipment includes 4,500-ton ore bins, a hoist good for 3,000′, a 12x14″ Risdon sinking engine and an Allis air-compressor with 20x24″ steam cylinders and 40x42″ air cylinders.

The East Colusa mine has a 3-compartment 900′ shaft, with 4 underground connections with other mines. It is planned deepening this shaft to 1,200′. property shows a vein of about 65′ width, assaying 3 to 4% copper, with streaks ranging up to 12% in copper tenor. Equipment includes a 16x32″ Griffith & Wedge hoist.

The West Colusa mine has a 3-compartment 1,800′ shaft. The West Colusa shows vein matter up to 400′ in width, at one point, and is timbered with 10x10″ and 12x12″ square sets. Considerable trouble was had, 1908, by gases from the fire in the Minnie Healy mine. Surface equipment includes a 60′ steel gallows-frame, a 20x60″ Nordberg hoist operating 2 single-deck cages, and a 13x12″ Iron Bay sinking engine.

The Badger State mine, lying northwest of and adjoining the North Butte, and carrying the extension of the Edith May vein, formerly produced a little good ore from shallow workings, and is opened by a 4-compartment 530′ shaft, planned to be sunk 1,800′.

The Gambetta mine has 2 shafts, No. 1 being 300′ and No. 2 being 200′ in depth.

The Moose mine has a 400′ shaft and is but slightly developed, having been idle for several years.

The Greenleaf mine has a 1,000′ shaft, with hoist good for 2,500′. The property shows an 11′ ore body, having a southerly dip, with several promising streaks of copper ore. Work was suspended circa July, 1908.

The Comanche mine has been but slightly developed. There also are numerous other properties, on which more or less exploratory work has been done at various times.

The leaching plant, costing about $20,000 and treating water from all the mines of the company, is much the largest and best planned in the district, including the usual launders and a building at the Leonard mine for drying and shipping precipitates.

The works, at Great Falls, 171 miles from the mine, receive ore over the Great Northern railway, at a freight charge of $1 per ton, high freights being offset by the advantage of water power obtainable at Great Falls. The works were opened 1891, with a capacity of 1,000 tons, increased, 1903 to 2,000 tons, and later to 4,000 tons. It is planned to increase the capacity to 5,000 tons daily.

The concentrator, second only in size to the monstrous Washoe plant of

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the Anaconda, is in 6 sections, each a complete mill in itself, the 6 having a total capacity of 2,700 tons daily. The building, of wood, is equipped with six 10x20" and twelve 5x12" Blake crushers, 16 Huntington mills, 18 rolls, 317 sieves, 68 Harz jigs, 249 Evans jigs, 5 Overstrom tables, 42 Wilfley tables, 10 six-foot vanners and 50 four-foot vanners.

The smelter treats normally circa 400 tons daily of high grade ore, and the mill-product of 2,500 tons of concentrating ore. Equipment includes 22 McDougal calciners, five 500-ton water-jacket blast-furnaces, four 175-ton reverberatory furnaces, and a converter with 12 stands, having 84x170" shells, of the upright type. Product is blister copper of 99% tenor, including about 40 oz. silver and 0.25 oz. gold per ton.

A new smokestack, under construction, is the largest in the world, costing about $200,000. The new stack is set on a foundation 38' deep and 97' in diameter, composed of 10,000 tons of concrete. The stack is of 506' height, 74' outside diameter at the base and 50' inside diameter at the top, weighing 16,600 tons. Material of stack is perforated segmental brick, slightly shaped to fit the curvature of the stack, equvalent in contents to 5,700,000 common brick. The stack has a sectional lining, and is capable of carrying about 4,000,000 cubic feet of gases per minute, its capacity being equal to any possible increase in the works. A new flue, connecting the smelter and stack, has a 175'x125' dust-chamber and a 1,450' flue-section 48' wide and 28' high.

The electrolytic plant has a capacity of 70 tons of refined copper cathodes daily, gold and silver slimes being reduced in a separate refinery. Equipment includes 3 furnaces for melting cathodes and for casting refined copper into wire-bars and cakes. A considerable portion of the blister copper from the smelter is sent for refining to the Raritan works, at Perth Amboy, N. J. Current for the electrolytic tanks is carried by solid overlapping slabs of copper.

Power for the concentrator, smelter and electrolytic works at Great Falls is taken from the Black Eagle Falls of the Missouri river, this having a 42' effective head and generating 8,700 h. p., except at the lowest stage of water. There also is a 3,000-h. p. auxiliary steam plant. The power plant was practically ruined, June, 1908, by floods that caused the failure of the north wall, and was put out of commission for some months, while rebuilding, closing down the entire works.

The extensive litigation, 1899-1906, between the Boston & Montana and the Heinze interests, was ended February, 1906, by the formation of the Butte Coalition Mining Co., and the slate has been wiped clear of litigation.

The Boston & Montana employs normally about 4,000 men, of whom approximately 2,500 are at the mines and 1,500 at the works.

Production of the Boston & Montana is approximately 90,000,000 lbs. fine copper yearly, though materially less in 1907, owing to suspension on account of the low price of copper in 1907. For the Montana tax year, ending June 1, 1907, production was 1,156,785 tons of ore, yielding gross proceeds of $16,629,643, with net earnings of $7,049,888, while for the tax year ending June 1, 1908, production was 967,685 tons of ore with gross proceeds of $9,775,118 and net earnings of $1,561,061. Average cost of Butte & Montana copper is 10 to 10.5 cents per pound, after deducting included gold and silver values. The ore mined gives average returns of a little better than 4% copper, and about $1.60 per ton in combined gold and silver values. The property is one of the richest and largest copper mines in the world, and the management is excellent in all departments.

BOSTON-SIERRA MADRA MINE INDUSTRY CO. **WYOMING.**

Office: 1118-59 Clark St., Chicago, Ills. Mine office: Slater, Routt Co.,

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Colo. Amos Pettibone, president; Dr. Daniel Pease, vice-president; Lewis A. Pease, secretary, treasurer and general manager. Organized December, 1900, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Annual meeting, second Wednesday in January. Lands, 2 claims, patented, area 40 acres, in the Three Forks district of Carbon county, Wyoming, carrying 2 fissure veins in andesite, opened by a 165′ shaft and several pits of 10′ to 25′ and a 407′ tunnel, with about 1,200′ of workings, showing cuprite, chalcopyrite and argentiferous galena, in veins of 6″ to 30′ width, reported by company to carry small percentages in copper, about 15% lead, up to 60% zinc, 10 to 600 oz. silver, and from a trace to $1,400 gold per ton. Has several buildings. Idle.

BOSTON & TINTIC MINING CO. — **UTAH.**

Office: Herald Bldg., Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. D. P. Rohlfing, chairman; C. E. Allen, vice president; Wm. H. Tibbals, Jr., secretary; Wm. H. Tibbals, treasurer. Organized 1899, under laws of Utah, with capitalization $500,000, shares $1 par; issued, $472,000. Lands, 3 claims, patented, area 41 acres, in the Tintic district, showing 2 fissure veins in porphyry, of which 1, of 3′ to 5′ average width, traceable circa 2,000′, has been opened by tunnels of 70′, 120′ and 40′, and by a 240′ shaft, showing ore assaying 1 to 3% copper, 20 to 55% lead, 45 to 255 oz. silver and 80 cents gold per ton. Idle since 1905.

BRIDGE CREEK MINING CO. — **WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. E. H. Arthur, president; A. L. Braley, secretary and treasurer; B. H. Wells, superintendent. Lands, 100 acres, on Bridge Creek, near the Congress mine, 14 miles north of Keller, opened by a 246′ tunnel, said to show ore assaying $80 per ton in combined copper, gold and silver values.

BOSTON & NEVADA COPPER CO. — **NEVADA.**

Dead. Organized Aug. 15, 1904, under laws of Maine. Lands sold 1905, to Nevada Consolidated Copper Co. Formerly at Ely, White Pine Co., Nev.

BOSTON & NEVADA MINING CO. — **NEVADA.**

Dead. Property sold, 1906, to Nevada Copper Co. Formerly at Yerington, Lyon Co., Nev.

BOSTON & NEW MEXICO COPPER CO. — **NEW MEXICO.**

Office: 502 Colonial Bldg., Boston, Mass. John E. Kimball, president; Andrew Swanson, treasurer; C. J. Arthur, secretary and manager. Organized April, 1903, under laws of South Dakota with capitalization $200,000. Lands, sundry mining claims in Socorro county, New Mexico. Is a mere stock-jobbing scheme.

BOSTON & PIOCHE MINING & DEVELOPMENT CO. — **NEVADA.**

Office: Boston, Mass. Mine office: Pioche, Lincoln Co., Nev. C. S. Miller, general manager. Land, 10 claims, lying to the eastward of the Nevada-Utah property, including the Fannie and Peavine mines, both small producers, in the past. Development is by shaft. Presumably idle.

BOSTON & ST. MARY COPPER MINING CO.

Dead. Formerly had an office at Great Falls, Mont.

BOSTON-ST. PAUL CONSOLIDATED COPPER MINING CO. — **WASHINGTON.**

Office: 712 St. Peter St., St. Paul, Minn. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. Wm. M. Baker, president; O. S. Derringer, secretary. Capitalization $2,000,000, shares $1 par. Lands, 8 claims, adjoining the Ethel. Idle for some years.

BOSTON & SEATTLE MINING CO. — **MONTANA.**

Office: care of C. R. Tuttle, secretary, Cleveland, Ohio. Mine office:

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Elliston, Powell Co., Mont. A. J. Wheeler, president; Robt. I. McKay, treasurer. Lands, 11 claims, 4 patented, circa 12 miles from Elliston, said to show large bodies of low-grade ore, which might be worked advantageously only with railroad facilities, now lacking. Idle.

BOSTON & SEVEN DEVILS COPPER CO. **IDAHO.**

Dead. Formerly at Cuprum, Washington Co., Idaho. Described Vol. III.

BOSTON & SILVERTON MINING & REDUCTION CO. **COLORADO.**

Office: 39 Court St., Boston, Mass. Mine office: Silverton, San Juan Co., Colo. A. A. Lamont, superintendent. Lands, in Illinois Gulch, shortly north of Silverton, show auriferous and argentiferous lead and copper ores. Has steam power and a 10-stamp mill. Claimed too much in its literature offering stock and presumably is idle.

BOSTON TERRACE COPPER MINING CO. **UTAH.**

Office: 631-53 State St., Boston, Mass. H. T. Gerrish, treasurer. Organized under laws of Maine, with capitalization $500,000, shares $1 par; issued, $1,400,000. Lands, 11 claims, area 220 acres, in the Newfoundland district of Box Elder county, Utah, having about one-half mile of underground openings, including 10 shafts of 30′ to 285′ depth. Ores have assayed up to 27% copper, 19% lead, 86 oz. silver and $1.20 gold per ton. Idle.

BOSTON & TEXAS COPPER CO. **TEXAS.**

Office: 405 Tremont Bldg., Boston, Mass. Letter returned unclaimed from former mine office, Spalding, Archer Co., Texas. E. M. Low, president; Jas. M. Wheaton, secretary and treasurer. Organized 1898, under laws of Arizona, with capitalization $2,500,000, shares $10 par. Mortgaged for $25,000 and desirous of selling lands. Long idle and apparently moribund.

BOSTON & TEXAS COPPER MINING CO. **TEXAS.**

Dead. Was promoted, in 1898, by Chas. Denison, Hartford Trust Bldg., Hartford, Conn., who advertised it as another Calumet & Hecla.

BOSTON & UTAH COPPER CO. **UTAH.**

Office: 508 Tremont Bldg., Boston, Mass. Mine office: Castleton, Grand Co., Utah. L. Auerbach, president. Lands, 40 claims, area circa 700 acres, in the La Sal district, showing a vein of 700′ claimed width, traceable for more than 1 mile, claimed to have a 200′ hanging-wall paystreak averaging 6 to 10% copper, with workable values in the balance of the ledge. These figures are gross overstatements. Mine has about a dozen openings, ranging from shallow pits to a 285′ tunnel, all showing copper. A tunnel on the east side of the Copper Queen claim is said to show about 75′ of ore of 3% copper tenor.

BOSTON & WYOMING COPPER-GOLD CO. **WYOMING.**

Letter returned unclaimed from former office, Custer, S. D. Mine office: Wheatland, Laramie Co., Wyo. W. A. Nelson, president; John I. Hightower, vice-president and general manager; W. E. Benedict, secretary. Organized October, 1903, under laws of South Dakota, with capitalization $2,000,000, shares $1 par. Lands, 6 claims, area 120 acres, known as the Seldom Seen group, showing 3 fissure veins in granite-prophyry, giving assays of 5 to 7% copper, 6 oz. silver and $3 gold per ton, from cuprite, chalcocite, bornite, and chalcopyrite, with sulphide ores predominating. Idle.

BOSTON & WYOMING COPPER MINING CO. **WYOMING.**

Office: care of Col. Jas. A. Shinn, Leadville, Colo. Mine office: Tie Siding, Albany Co., Wyo. Organized January, 1903, with capitalization $500,000. Has a 100′ shaft, and at last accounts was developing in a small way, under bond and lease.

BOULDER COPPER MINING CO. **SOUTH DAKOTA.**

Dead. Formerly at Custer, Custer Co., S. D. Described Vol. VII.

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BOULDER CREEK MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Lands are the Central group, about 1 mile from Mullan, having tunnels of 140′ and 400′, showing ore giving assays of 10 to 15% lead, with small copper and silver values. Property considered promising.

BOULDER MINING CO. **BRITISH COLUMBIA.**

Office: Oshkosh, Wis. Lands are gold-copper claims in British Columbia. Presumably idle.

BOUNDARY FALLS SMELTER. **BRITISH COLUMBIA.**

Owned by Dominion Copper Co., Ltd.

SOCIÉTÉ DES MINES DU BOU-THALEB. **ALGERIA.**

Office: 27 Rue Lafitte, Paris, France. Mine office: Rovigo, Alger, Algeria. Jules de Catelin, manager. Lands, 394 hectares, carrying copper, lead and zinc sulphides.

BOX CANYON MINING CO. **ARIZONA.**

Dead. Organized, 1906, by John Fredericks and others, to develop a mine and build a 5-stamp mill on a property in Tombstone Cañon, near the Modern mine. Formerly at Bisbee, Cochise Co., Ariz.

BOZEMAN COPPER CO. **MONTANA.**

Office: Bozeman, Mont. Organized August, 1904, with capitalization $100,000. No traces of any operations.

BRADEN COPPER CO. **CHILE.**

Office: 71 Broadway, New York, N. Y. Mine office: La Junta, Rancagua, O'Higgins, Chile. Barton Sewall, president; Wm. Braden, general manager; W. N. Burk, mine manager; E. K. McCann, superintendent; R. L. Lloyd, metallurgist. Organized June 24, 1904, under laws of Maine, with capitalization $3,000,000, and name changed, August 9, 1904, to present title. Company is protocalized in Chile.

Lands, 15 claims, area 264 acres, located about 40 miles east of Rancagua, nearest seaport being Valparaiso, 200 miles distant by rail. Property includes El Teniente, an antigua, in the Cordillera de Graneras, also the extensions of El Teniente and the Capitana mines.

The ore body is unique, a volcanic vent of about 3 miles circumference being filled with tuff and surrounded by highly fractured diorite, the fracture being mineralized around the circumference. While the mineralization extends for a distance of about 1,000′ around the 3-mile circle, the commercial ore bodies in diorite are found within about 100′ of the contact, as a rule. The dioritic zone has been fractured by porphyry dykes, which occasionally cut into the tuff. The zone of oxidation is shallow, ranging from a few feet to 150′ in depth. The fractures in the rock range from a mere film of sulphide up to 3″ to 4″ of mixed bornite and chalcopyrite, principally the latter.

The Teniente, which is the principal mine, as developed, was worked by the Spaniards before the independence of Chile, and is said to have produced about 50,000 tons of ore of 30 to 50% average copper tenor. El Teniente is developed at the point of contact of porphyry dykes and tuffs, having a gangue of tuff and porphyry breccia seamed with native copper, cuprite, azurite, malachite and tetrahedrite, latter predominating. The breccia of porphyry and tuff has been claimed to somewhat resemble the Calumet conglomerate of the Calumet & Hecla, and both porphyry and tuff are slightly mineralized for a considerable distance along the contact line.

The Fortuna mine was gophered extensively by former owners for high grade ore, which was followed and extracted wherever found. The ore averages lower in grade than in the Teniente, underground workings showing copper sulphides and occasional metallic copper throughout the seams in diorite

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and brecciated contact material, for a depth of about 2,000'. No. 1 tunnel shows an extreme width of about 250' of ore, giving an average assay of 3.71% copper. No. 2 tunnel shows an even larger ore body, and No. 3 is estimated to show more ore than No. 2. The Fortuna mine also is estimated to have 4,000,000 tons of ore developed, ranging in copper tenor from 3 to 4%.

The Capitana mine, in the Cañon Diablo, on the opposite side of the mountain to the Fortuna, has been developed through the Fortuna tunnels, at considerable depth, and shows 15% ore in surface workings. El Soldado mine, practically undeveloped, has promising ore outcrops.

The plan of mining used calls for the extensive use of opencuts, ore being milled down to the tunnel level, this system of extraction requiring little timber.

A 1,000-h. p. hydro-electric plant is fed by water brought by a flume and pipe-line, and the cost of power for the first year of operation was under $2 per h. p. year, not including interest and depreciation.

The property has a good equipment of mine buildings and necessary machinery, the plan of mining followed not requiring heavy hoists. A 30-mile wagon road, costing about $175,000, was complete November, 1905, and over this about 4,000 tons of machinery and supplies were hauled in, as many as 2,500 draft oxen being used. A railroad line is under construction to the port of San Antonio, 150 miles from the mines, of which 40 miles, from Rancagua to La Junta, is being built by the company. This line, of 32" gauge, costing about $400,000, will give reasonably cheap freight rates on supplies and copper output.

Ore is transported from mines to mill by 3 Riblet aerial trams. The main line, 2,000 meters, runs from the mill to the central transfer station, where connection is had with a 1,000-meter line to El Teniente mine and a 500-meter line to La Fortuna mine. The tramways are of 1,000 tons aggregate daily capacity.

The 250-ton mill, planned as the first unit of a 500-ton mill, which went into commission June, 1906, is thoroughly modern in design and equipment, having Hartz jigs, Overstrom and Wilfley tables, Frue venners and Wilfley slimers, and using the Sherman system for settling slimes. The mill puts about 10 into 1, treating ore averaging 3.5% copper and securing an average extraction of about 70%, producing concentrates averaging about 25% in copper tenor. The company plans eventually treating 1,000 tons of ore daily, and producing 12,000,000 to 15,000,000 lbs. fine copper yearly. Production, 1907, was about 3,500 tons of concentrates, equivalent to 1,750,000 lbs. fine copper. The company plans to produce copper for about 6 cents per pound, but will do well if it can produce at an average price of 8 to 9 cents per pound. The property is one of exceptional promise and is under good management.

BRADLEY MINING & MILLING CO. **WYOMING.**

Mine office: Centennial, Albany Co., Wyo. Lands, sundry claims on Michigan Hill, near Centennial, developed by a tunnel being driven to reach a 4' vein of auriferous copper ore, claimed to carry average values of $35 per ton.

BRADFORD COPPER MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Idle.

BRADFORD DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Vail, Pima Co., Ariz. Fully described Vol. V.

BRADSHAW MINING CO. **ARIZONA.**

Office: 327 New York Life Bldg., Chicago, Ills. Mine office: Briggs, Yavapai Co., Ariz. Samuel B. Willey, president; Davis Ewing, secretary and treasurer; Frank T. Day, manager; E. W. Fisher, general superintendent; Wm. Roberts, superintendent. Organized 1904, under laws of Arizona, with

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capitalization $2,000,000, shares $1 par. Property is leased to North American Exploitation Co. Lands, 23 claims, area 400 acres, also a 40-acre mill site in the Castle Creek district, showing contact veins of 30′ to 100′ width, between granite and porphyry, carrying galena, cuprite, melaconite and malachite, said to give assays of 15% copper, 20 to 40% lead, and $6 to $10 gold per ton, opened by shafts of 150′ and 300′ and tunnels of 150′, 80′ and 60′, estimated by management to show 6,000 tons of ore, with 4,000 tons blocked out for stoping. Apparently idle, and management is regarded with suspicion.

BRADSHAW MOUNTAIN COPPER MINING & SMELTING CO. ARIZONA.

Dead. Lands now held by De Soto Mining Co. Formerly at Humboldt, Yavapai Co., Ariz. Fully described Vol. V.

BRAGANZA GOLD MINING CO. ARIZONA.

Office: 708-140 Dearborn St., Chicago, Ills. Mine office: Big Bug, Yavapai Co., Ariz. J. N. Nichols, superintendent. Property is the Henrietta mine, carrying auriferous copper ores, the Henrietta Cyaniding & Developing Co. having been organized to treat sulphide ores from this mine, but the process proved unsuccessful. Company was promoted by J. C. Rankin, and at one time paid 1% monthly dividends, but it is doubtful if same were earned. Idle and presumably moribund.

NEGOCIACION MINERA DE Q. y T. BRANIFF y CA. MEXICO.

Office: Rosales 1, Mexico, D. F. Mine office: Cadereyta, Queretaro, Mex. Thos. D. Murphy, general manager; Walter Neal, mine superintendent. Lands include El Doctor and La Negra mines, carrying mainly silver-lead ores, with small copper values and considerable zinc. Has electric power and a 160-ton mill having 5 stamps and Huntington mills. Also has a 125-ton cyanide plant and a 40-ton smelter, employing circa 250 men.

BREBO COPPER, SILVER & LEAD MINING CO., N. L. AUSTRALIA.

Office: Goulburn, N. S. W., Australia. Mine office: Brebo, N. S. W., Australia. W. H. Bladwell, chairman; J. N. Hay, legal manager. Lands, sundry claims 4 miles from Brebo, the nearest railway station, opened by a 60′ shaft. Was developing, with a small force, at last accounts.

GEWERKSCHAFT GRUBE BRIGCIUS-STOLLN. GERMANY.

Mine office: Annaberg, Saxony, Germany. E. E. Poller, manager. Has argentiferous copper and zinc ores. Idle for several years.

BRIGGS-OLIVER DEVELOPMENT CO. NEW MEXICO.

Mine office: Lordsburg, Grant Co., N. M. Lands, known as the Burro Chief property, lying west of the Copper Gulf, have 3-compartment and 2-compartment shafts, all shallow.

GEWERKSCHAFT BRIGITTA ERZBERGWERK. GERMANY.

Dead. Formerly at Sennheim, Elsass, Germany.

BRINDLE PUP MINING CO. ARIZONA.

Dead. Formerly at Dewey, Yavapai Co., Ariz.

FÉLIX BRIONES. MEXICO.

Mine office: Topia, Tamazula, Durango, Mex. Has silver and copper ores, employing about 30 men at last accounts.

BRISTOL CONSOLIDATED MINES & SMELTING CO. NEVADA.

Letter returned unclaimed from former office, 31 Nassau St., New York, N. Y. Mine office: Pioche, Lincoln Co., Nev. F. L. Underwood, president and treasurer; preceding officer, E. V. Van Orden, W. A. Smith, Wm. Gelder and E. F. Freudenthal, directors. Organized June 4, 1906, under laws of Arizona, with capitalization $400,000, as successor of the Bristol Copper Mining Co. Is said to be controlled by the California-Nevada Copper Co. Lands, 20 claims, area 400 acres, and an 80-acre millsite. Mine has about 2 miles of workings. Ore shipped previous to the completion of railroad to Pioche, 1907, assayed 12

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to 30% copper and about 10 oz. silver per ton, but the average grade of ore extracted is considerably lower, low grade ore having been held for completion of railroad. Has 2 hoists, 2 air-compressors and an electric light plant.

BRISTOL COPPER MINING CO. **NEVADA.**

Dead. Merged June 4, 1906, in Bristol Consolidated Mines & Smelting Co. Formerly at Pioche, Lincoln Co., Nev. Described Vol. VI.

BRISTOL MINE. **CONNECTICUT.**

Mine office: Bristol, Hartford Co., Conn. Was worked 1847-1854, yielding about $200,000 worth of chalcocite, bornite and chalcopyrite. Idle many years, filled with water, and mine machinery at bottom of shaft.

BRITANNIA COPPER MINE, LTD.

Dead. Formerly had an office at 4 Bishopsgate St., London, E. C., Eng.

BRITANNIA COPPER SYNDICATE, LTD. **BRITISH COLUMBIA.**

Dead. Merged, 1908, in Britannia Smelting Co., Ltd. Formerly at Howe Sound, New Westminster district, B. C. Fully described Vol. VII.

BRITANNIA MINING CO. **MONTANA.**

Office: 219 Germania Bldg., Milwaukee, Wis. Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. G. R. Nickey, president and general manager; G. R. Best, secretary and treasurer. Organized Sept. 25, 1892, under laws of Wisconsin; capitalization increased, Mar. 2, 1898, to $350,000, shares $1 par. Has paid dividends of $42,000. Lands, one patented claim, area 13 acres, showing 6 veins, of which 3 parallel veins, of 3′ to 30′ width, are developed by shafts of 100′, 150′ and 400′, with circa 1,000′ of underground openings, showing ore claimed to give average values of about $35 per ton, mainly in silver. Idle and presumably moribund.

BRITANNIA SMELTING CO., LTD. **BRITISH COLUMBIA.**

Office: 31 Davis Chambers, Vancouver, B. C. Mine office: Howe Sound, New Westminster district, B. C. Works office: Crofton, Vancouver Island, B. C. Hon. Edgar E. Dewdney, president; Mason T. Adams, vice-president and managing director; J. W. Lee, secretary and treasurer; preceding officers, D. G. Marshall and C. B. McNeill, directors; R. H. Leach, superintendent Britannia mine; W. C. Freeburn, superintendent Mount Andrew mine; S. S. Raymond, smelter superintendent; H. C. Bellinger, consulting engineer; L. E. Gooding, metallurgist; W. H. Yost, master mechanic.

Organized 1905, under laws of British Columbia, with capitalization $625,000, shares $25 par, later increased to $2,500,000, shares $25 par; issued, $2,207,000. Acquired, 1908, property of the Britannia Copper Syndicate, Ltd. Annual meeting, first Tuesday in March.

Property includes the Britannia mine, at Howe Sound, owned outright, and the Mount Andrew mine, at Ketchikan, Alaska, held under lease, a 49-acre smelter site and 3 townsites.

The Britannia mine, 7 claims, crown-granted, area 297 acres, lies on Britannia Mountain, 4 miles from and about 3,500′ above the sea, carrying approximately 8,500′ of the strike of a mammoth mineral zone, ore-body consisting of mineralized schist in lenses and large irregular bodies, ranging 300′ to 600′ in width, the schistose silicious material being impregnated with copper and iron pyrites. Considerable diamond drilling was done, 1907. There are 8 known ore bodies, of which 3, developed, carry an average of about 2.5% copper, 0.04 oz. silver and 50 to 80 cents gold per ton. Climate is favorable, and owing to immense width of the ore body, mine can be worked open-cast for many years. Development is by large glory-holes, and by tunnels of 300′, 300′, 200′, 1,000′, 1,500′ and 300′, with about 8,000′ of workings, estimated to show 2,000,000 tons of ore, with about 500,000 tons blocked out for stoping. Principal tunnels are the Big Bluff and Jane, latter, which is the main operat-

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ing tunnel, having a 600′ trestle with 10-ton self-dumping cars and an automatic incline railroad. The Big Bluff tunnel has a 640′ trestle with 10-ton self-dumping cars, and a gasoline locomotive. At the mine are Blake crushers that pass crushed ore to a sorting-belt, thence to a 1,000-ton receiving bin, whence ore is taken by a 16,900′ aerial tram in 2 sections, the upper of 5,800′ and the lower of 11,100′, with an intermediate transfer station. The tram is rated at about 300 tons daily capacity, but has given some trouble in operation. The upper section has a drop of 1,400′ and the lower a drop of 1,800′.

Equipment includes 300 h. p. in steam, 400 h. p. in water and 500 h. p. in electric energy. A 35-drill Rand air-compressor, at the beach, sends air to the mine through an 18″ pipe line. There is a 3-mile transmission line, with two 300-kw., 6,600-volt generators, driving the machinery plant at the mine, actuated by a Pelton water wheel, located at the beach, which receives water from a creek under an effective head of about 1,900′. At the beach there is a 250′ wharf with a 90′ wing for receipt of mine supplies and shipment of concentrates.

The 300-ton concentrator, 125x133′ in size, of wood, has 2 Blake crushers, 3 Chilean mills, 4 rolls, 34 Harz jigs, 1 Hancock jig, 2 Cammett concentrators, 11 Wilfley tables, 11 Overstrom tables, 10 Johnson vanners and 22 Frue vanners. Mill was remodeled, 1907, changing its method from fine to coarse crushing, some trouble having been experienced in concentration under the fine crushing system. Buildings include a 40x80′ wooden machine-ship, sawmill, school and store, with about 50 dwellings and miscellaneous buildings.

The Mount Andrew mine, operated under lease, is separately described.

The smelter, built 1902, by the Southwestern Smelting & Refining Co., is located on the eastern coast of Vancouver Island, about 50 miles from Victoria, with which there is rail and water connection, and receives ore by water from the Britannia mine, 60 miles distant, the works being well located for the receipt and treatment of coast and Alaskan ores. Ore is received from the Britannia in railway cars, loaded on barges, at a 750′ wharf having 21′ of clear water, and cars are hauled up incline trestles to six 300-ton receiving bins. There also are eight 300-ton storage-bins, with room for additional bins, all bins having automatic discharge gates.

The sampling mill, 26x32′ on the ground and 84″ high, has two 10x20″ Blake crushers, 1 pair of Davis 12x13″ crushing rolls, Constand automatic sampler and a Coolidge sampler, with a 45-h. p. engine.

The furnace building, 45x75′, has two 250-ton water-jacket blast-furnaces. The dust-flue is 10x12x200′, with a 24x40′ dust-chamber, connecting with a circular brick stack 12′ in diameter and 120′ high, on a concrete base. Slag is granulated and dumped by bucket elevator.

The converter building, 65x75′, has 1 hydraulic stand and four 84x126″ shells, of trough type. Molten matte runs from settlers to converters in a launder, and converter fumes pass through a steel flue into a dust-chamber having water sprays. The converter department has a silica mill, with pneumatic tamper run by a small air-compressor. Product is a blister copper of 99.5% tenor, carrying 12 oz. silver and 2 oz. gold per ton, sent to the United States refinery at Chrome, N. J., for electrolytic treatment.

The briquetting plant is housed in a 35x73′ building with 78x104′ dryshed. Equipment includes a No. 7 Chambers briquetting machine and 2 Scott elevating brick-cars, with steam coils in the loft of the dry-shed. Briquettes are roasted with raw ore.

The power building is 50x60′, with blower-room 40x50′, and boiler-house 40x48′, housing three 140-h. p. boilers. The power plant has a 110-kw. West-

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inghouse current generator, air-compressor for convertor blast, and Nos. 5 and 8 Connersville blowers, connected with a 54" blast-pipe, leading to the furnace, blowers having a united capacity of 9,000 cubic feet of free air per minute.

Smelter fuel is coal and coke, amounting to about 6,000 tons of coal and 10,000 tons of coke yearly. Owing to local shortage, 1907, some coke was imported from New Zealand. The smelter does practically no custom business.

Miscellaneous buildings include a well constructed office, assay office and a small but complete machine-shop. The smelter plant is lighted throughout by electricity.

The company employs, normally, about 300 men, but operations were suspended October, 1907, owing to the low price of copper, coupled with necessity of reconstructing the concentrator. The mill was started, on a test run, June, 1908. Production, 1906, was 4,409,650 lbs. fine copper, 38,265 oz. silver and 5,261 oz. gold. In 1907 about 65,922 tons of ore were treated, yielding 3,011,410 lbs. fine copper, of which the Britannia mine furnished 1,706,734 lbs. The Britannia has been very thoroughly developed and equipped, but to date has proven somewhat disappointing. The management is good, however, and with changes made in the milling system, should obtain better results in the future than have been secured in the past.

BRITANNIA WEST COPPER CO., LTD. **BRITISH COLUMBIA.**

Mine office: Howe Sound, New Westminster district, B. C. Thos. Gibson, mine manager. Organized 1906. Is said to have paid $250,000 for lands, which are on Howe Sound, opposite the Britannia, and were known formerly as the Mallery or Twentieth Century group. Lands have an available water power. Nothing heard of company since shortly after organization, and presumably moribund.

BRITISH AMERICAN COPPER MINES & SMELTER CO. **BRITISH COLUMBIA.**

Office: Williamson Bldg., Cleveland, Ohio. Chas. H. Tucker, president; J. C. Kernohan, vice-president; C. H. Taylor, treasurer; Thos. G. Selleck, secretary; Francis J. Peck, consulting engineer. Organized Aug. 15, 1906, with capitalization $5,000,000, shares $1 par. Lands, 10 claims, area circa 500 acres, held by location, on Warren Creek, a tributary of Wells Creek, which is a tributary of the Similkameen river, which is a tributary of the Columbia river. Lands are 43 miles from Golden and 10 miles from Wells Landing, and instead of neighboring the Granby, as advertised, are distant about 300 miles, in an air-line, from the Granby. Lands, well watered and timbered, are in a very rugged country, showing strong outcrops. Company claimed, in its advertisements to have a 16′ vein, and to have "contracted for" 1,000′ of tunnel, which would "block out ready for mining," $10,575,000 worth of high grade copper ore, which, of course, is a downright lie. Company claims to have a practically inexhaustible body of ore assaying 7% copper, "at a conservative figure," which happens to be an exceedingly reckless figure. Mr. Kernohan, the promoter, stated, 1907, that he had examined this property, and reported that "2 tunnels, one 750′ and one 250′, with shaft connecting, block out $10,000,000 worth of ore, if half the values continue in the 16′ vein." There being no evidences of either tunnels or shaft, this statement carries its own refutation. The company's advertising and literature state that a 10-mile wagon road will give an outlet to the Kootenai Central Railroad, but unfortunately the Kootenai Central has not yet materialized beyond the point of 10 miles of grading, and there is no railroad within 100 miles of the company's mines, neither is there wagon road or river transportation, and the total copper production of the entire district was valued at $1,654 in 1905. Statements of the company in its advertising that this is the richest copper district

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in the world, and that the mine would begin shipping ore at once, were deliberate and intentional lies. The company must be regarded as a swindle.

BRITISH AMERICAN GOLD & COPPER MINING CO. **SOUTH DAKOTA.**

Office: 70 Grand River Ave., Detroit, Mich. Letter returned unclaimed from former mine office, Deadwood, Lawrence Co., S. D.

BRITISH & COLONIAL ESTATES, LTD. **AUSTRALIA.**

Office: 4 Broad Street Place, London, E. C., England. Isaac Smith, chairman; Wm. Bourne, managing director; Jos. Phillips, secretary. Organized July 12, 1895, under laws of Great Britain, with capitalization £150,000, shares £1 par. Property includes the Infirtaria and Belara copper mines, in New South Wales, and sundry other interests. Mines are idle.

BRITISH COLUMBIA AGENCY, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Alberni, Vancouver Island, B. C.

BRITISH COLUMBIA CHARTERED CO. **BRITISH COLUMBIA.**

Dead. Property was the B. C. mine., now owned by British Columbia Copper Co., Ltd. Formerly at Summit, Boundary district, B. C. Described Vol. VI.

BRITISH COLUMBIA COPPER CO., LTD. **BRITISH COLUMBIA & WASHINGTON.**

Office: 814-31 Nassau St., New York, N. Y. Mine and works office: Greenwood, Boundary district, B. C. Newman Erb, president; F. L. Sommer, vice-president; preceding officers, F. L. Underwood, Copley Amory, Anthony N. Brady, Colgate Hoyt, Edwin Hawley, C. E. Laidlaw, Josiah C. Reiff and C. A. Starbuck, directors; R. H. Eggleston, secretary and treasurer; J. E. McAllister, general manager; Frederick Keffer, engineer; M. D. McIntosh, P. W. Lover and H. Johns, mine superintendents; W. C. N. Wilson, cashier.

Organized March, 1898, under laws of West Virginia, with capitalization $2,000,000, increased, 1907, to $3,000,000, shares $5 par; issued, $2,515,000. Paid first dividend, 40 cents per share, $201,200, Sept. 4, 1907. Company has about 1,375 shareholders. Annual meeting, second Tuesday in February. New York Trust Co., registrar and transfer agent. Metropolitan Audit Co., auditor.

Lands are extensive, including various mining groups in the Boundary district of British Columbia, and in the adjoining state of Washington, also a 60-acre millsite. The principal mines are the Motherlode and adjoining properties, in the Deadwood camp, which have large and strong ore bodies that are slightly lower in average grade than the Granby. The mines use about 1,800 h. p., mainly electrical.

The Motherlode group, area 180 acres, has 5 ore bodies, of which 3 are developed, occurring as contact deposits between limestone and eruptive dykes. Ore is exclusively auriferous and argentiferous chalcopyrite, occurring with silicious and calcareous gangue, or in magnetite. The ore bodies are irregular in occurrence, the main vein ranging 80′ to 150′ in width, and is proven, by surface trenching and natural exposure, for a length of 1,800′. Ore assays about 1.5% copper, 0.2 to 0.5 oz. silver and $1 to $2 gold per ton. Underground workings are about 3 miles, disclosing at least 3,000,000 tons of ore, with about 1,000,000 tons blocked out for stoping. Development is by a 475′ four-compartment shaft, with 3 tunnels, latter connected with surface by 6 upraises, of 200′ average height, these reaching quarries on surface, ore being milled through the upraises to tram-cars in the tunnels. Main tunnel has double tracks, equipped with 3-ton tram cars. At the portal of the tunnel there are 24x36″ and 36x42″ Farrel crushers. Equipment at the Motherlode includes a 500-h. p. steam plant, but electric power is used mainly throughout the mine and on surface. Machinery includes two 35-drill Rand-Corliss duplex tandem air-compressors, driven by a 500-h. p. Canadian General Electric motor.

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Buildings at the Motherlode include a 30x50′ carpenter-shop, 30x70′ machine-shop, 17 other mine buildings and 20 dwellings for employes.

No. 7 mine, adjoining the Motherlode, has a continuation of the latter's ore-body, with a 300′ main shaft and about a mile of workings.

The Oro Denoro mine, 4 claims, area 180 acres, bought June, 1906, adjoins the Emma and British Columbia mines, showing 3 ore bodies, of 20′ to 120′ width, carrying auriferous and argentiferous chalcopyrite, associated with pyrite, with silicious and calcareous gangue, being valuable for fluxing, owing to excess of both iron and lime. New ore bodies were proven, 1907, by diamond drill borings. Mine has a 190′ shaft and 3 tunnels, but is worked largely open-cast.

The British Columbia mine, about a mile from the Emma, held formerly by the British Columbia Chartered Co., consists of 11 claims, 3 fractional, developed by about 2 miles of workings, showing argentiferous and slightly auriferous chalcopyrite, similar to the ore of the Oro Denoro and Emma. Equipment includes a 225-h. p. steam plant, with 4-drill Rand and 5-drill Ingersoll-Sergeant air-compressors.

The Emma mine, adjoining the British Columbia and Oro Denoro, is owned three-fourths by the British Columbia Copper Co., Ltd. and one-fourth by the Hall Mining & Smelting Co., but is operated by the British Columbia. The incline shaft is 252′ deep, ore being much the same as at the Oro Denoro. Electric power has been substituted for steam, equipment including a 200-h. p. Westinghouse motor, 8x10″ Lidgerwood hoist and a 1,400′ Rand air-compressor.

The Sunset group, at Princeton, B. C., on Copper Mountain, in the Similkameen district, has low grade copper ore, high in silica and low in iron.

The Napoleon mine, in the Pierre Lake district, near Marcus, Stevens Co., Wash., consists of 46 claims, bought for $60,000. Ores are low in copper tenor, but carry good gold values. Property has a rock-crusher and aerial tram, and installation of a cyanide plant, to treat gold ores, is under consideration.

The Lone Star mine, also in Washington, shipped, 1907, circa 1,500 tons of high grade copper ore, secured from development, and is considered a promising property.

The Apex group of 11 claims, and the Gloucester group of 3 claims, in the vicinity of Chesaw, Okanogan Co., Wash., are in the development stage.

The smelter, at Greenwood, 5 miles from the Motherlode mines, receiving ore therefrom over the Canadian Pacific railway, does a general custom business. Motive power is electric energy, taken from Bonnington Falls, normal requirements being circa 1,600 h. p. All buildings are of steel, and the plant, remodeled, 1907, is of about 2,000 tons daily capacity.

The bins at the works have capacity for 12,000 tons of ore and 2,000 tons of coke. A 600-ton sampling mill, 65x79′ and 3 stories high, has a custom-ore bin, connected with the sampler ore bins by a belt-conveyor.

The blast furnace building has 3 new 700-ton blast-furnaces, each 48x240″ at the tuyeres. A 12x14x620′ dust-flue leads to a 121′ stack. There are five 15-ton Baldwin-Westinghouse electric locomotives, 3 for charging and miscellaneous purposes and 2 for the slag line, latter having 25-ton side-dumping ladle-cars, each with an electric motor having a worm gear for tilting and dumping, operated from the locomotive.

The converter building, 45x90′, of steel, adjoining the blast furnace building, has 2 stands, with 84x126″ horizontal shells, taking matte of 15 to 55% copper tenor, and producing blister copper of 99.3% tenor, carrying 20 to 50 oz. silver and 10 to 25 oz. gold per ton, sent to the United States Metals Refining Co., at Chrome, N. J., for electrolysis. Stands are tilted by hydraulic

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accumulators, and shells are handled by a 40-ton 4-motor traveling crane. The converter department has a 72" silica-mill for linings.

The power-house, 40x81', has three 100-h. p. boilers and a 150-h. p. Reynolds-Corliss engine, held in reserve for emergencies, electric power being used throughout the works. Equipment includes three 300' Connersville blowers, each belted to a 300-h. p. induction motor. There also is a Nordberg air-compressor, operated by a 300-h. p. induction motor.

The works have a briquetting plant handling flue dust. Smelting fuel is coke, costing $6.50 per ton, consumption being circa 90,000 tons yearly.

The works include a machine-shop and several other buildings. The plant is protected by a complete water system, having hydrants at frequent intervals. About 600 men are employed at the mines and works.

The company's balance sheet of November 30, 1907, showed cash and accounts receivable, $338,645.87, with current liabilities of $268,844.40. Production, 1905, was 5,601,309 lbs. fine copper, 95,410 oz. silver and 26,226 oz. gold; production, 1906, was 5,820,651 lbs. fine copper, 82,193 oz. silver and 20,238 oz. gold, while for 1907 production was 8,519,502 lbs. fine copper, secured from 242,788 tons of ore smelted, of which the Emma mine produced 18,374 tons, the Oro Denoro 14,480 tons, and the British Columbia 1,712 tons. Ores are slightly lower in average grade than those of the Granby, returning from the smelter an average of 21 lbs. copper and $1.25 per ton in combined gold and silver values. Smelter costs, 1907, were $1.18 per ton. For fiscal year ending Nov. 30, 1907, costs were about 13 cents per pound for fine copper, but should be much smaller on the larger tonnage since secured, and for June, 1908, costs were said to have been only 9.79 cents per pound. The mine has an immense tonnage of assured ore, and while the ore is low in average tenor, it can be mined and smelted at unusually low costs. The management is good, and the property has been carefully developed, to the present point of assured productive capacity, with excellent prospects for the future.

BRITISH COLUMBIA EXPLORATION, LTD. **BRITISH COLUMBIA.**

Dead. Succeeded, Jan. 15, 1904, by Kamloops Mines, Ltd. Formerly at Kamloops, Yale district, B. C.

BRITISH COLUMBIA & LAKE SHORE COPPER CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Summit, Yale district, B. C.

BRITISH COPPER SYNDICATE, LTD.

Office: 16 St. Helens Place, London, E. C., Eng. Organized Nov. 9, 1905. under laws of Great Britain, with capitalization £500, shares £1 par.

BRITISH SOUTH AFRICA CO. **RHODESIA.**

Office: 2 London Wall Bldgs., London, E. C., Eng. This great corporation owns sundry copper fields of promise in northern Rhodesia, which, as developed to the point of actual exploitation, are set aside as subsidiary companies. Owns a 35% interest in the Kansanshi mine, 65% belonging to Tanganyika Concessions, Ltd.

BRITT COPPER CO. **ARIZONA.**

Office: care of A. T. Hammons, Globe, Gila Co., Ariz. Mine office: Ft. Thomas, Graham Co., Ariz. Organized Feb. 11, 1907, under laws of Arizona, with capitalization $1,250,000, shares $10 par. Lands, sundry claims in the Aravaipa district, circa 25 miles from Ft. Thomas, said to give an encouraging surface showing of copper ore.

K. K. BERG- UND HÜTTENVERWALTUNG BRIXLEGG. **AUSTRIA.**

Mine office: Brixlegg, Tyrol, Austria. Gustav Kroupa, general manager; Vincens Svoboda, superintendent and mining engineer; Cayetan Hummel, smelter superintendent; Josef Link, purchasing agent. Mining lands, circa

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22.5 hectares. Ores are argentiferous and slightly auriferous copper sulphides. Smelter, at Brixlegg, has blast and reverberatory furnaces for smelting, also refining and anode furnaces and a small electrolytic plant; having 60 tanks, with multiple arrangement of electrodes, treating black copper of about 90% average tenor. Annual production averages about 5 kgs. gold, 600 kgs. silver, and 225,000 kgs. fine copper.

BROKEN HILL PROPRIETARY CO., LTD. **AUSTRALIA.**

Is no longer a copper producer. Described Vol. V.

BROMIDE COPPER CO. **NEW MEXICO.**

Dead. Formerly at Tusas, Rio Arriba Co., N. M.

BROMIDE COPPER & GOLD MINING CO. **NEW MEXICO.**

Dead. Lost lands circa 1904. Foundry at Tusas, Rio Arriba Co., N. M.

BROMIDE COPPER MINING CO. **NEW MEXICO.**

Office: Bloomsburg, Pa. Mine office: Tusas, Rio Arriba Co., N. M. Lands, 42 claims, including the Pay Roll mine, opened to depth of 250', showing auriferous copper sulphides of good average tenor.

COMPAÑIA ESPLOTADORA LOS BRONCES. **CHILE.**

Mine office: Los Condes, Santiago, Chile. Has a long tunnel, driven in connection with Francisco de P. Perez. Ore is shipped to the Maitenes smelter for reduction. Production, 1903, was circa 400,000 pounds fine copper.

SOCIEDAD MINERA DE LOS BRONCES. **CHILE.**

Office and mine: La Serena, Coquimbo, Chile. Organized Apr. 12, 1902, under laws of Chile, with capitalization 60,000 pesos, shares 250 pesos par. Presumably idle.

BROOKLYN-ARIZONA COPPER CO. **ARIZONA.**

Office: 2 Kilby St., Boston, Mass. Mine office: Mayer, Yavapai Co., Ariz. Dr. S. P. Smith, president; Calvin Cruchet, secretary; F. E. Small, treasurer. Organized under laws of Maine, with capitalization $2,500,000, shares $25 par. Was promoted by the American Securities Co., of which Small is also treasurer. Lands, 14 claims, known as the Brooklyn group, in the Squaw district, circa 20 miles east of Mayer, opened by a 70' three-compartment shaft, said to show ore assaying 10% copper, 12 oz. silver and $9.50 gold per ton. Mine is claimed to have $5,000,000 worth of ore in sight, which is not credited. Has a 12-drill air-compressor. Property considered promising.

BROOKLYN COPPER & GOLD MINING CO. **WASHINGTON.**

Dead. Formerly claimed lands in the Colville Reserve, Stevens Co., Wash.

BROOKLYN MINING CO. **CALIFORNIA.**

Mine office: Dale, San Bernardino Co., Cal. H. H. Ames, superintendent. Ores carry gold and copper. Has gasoline power and a 8-stamp mill. Idle.

BROOKLYN MINING CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill. Presumably idle.

BROOKLYN MINING CO. **NEVADA.**

Mine office: Contact, Elko Co., Nev. Has gasoline power. Long idle.

BROOKS CONSOLIDATED COPPER CO. **MEXICO.**

Office: Bisbee, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mex. Clinton W. Moon, president; G. O. Schaecker, secretary and treasurer; George Metz, superintendent. Organized Jan. 25, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par, as a reconstruction of the Cochise Prospecting, Mining & Development Co. Lands, 3 groups, area 620 acres, in the Tordillo district of the Ajo Mountains, 40 miles northeast of La Cananea. Development is by open-cuts, pits, and a 425' tunnel, showing oxide, carbonate and sulphide ores, latter predominating, ores being estimated to average 8.75%

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copper, 4% zinc, 12 oz. silver and $5 gold per ton. Vein is very strong, ranging 50′ to 60′ in width, and traceable 1½ miles. Property is considered promising.

BROOKSHIRE MINING CO. **ARIZONA**

Mine office: Mayer, Yavapai Co., Ariz. Organized January, 1900, under laws of West Virginia, with capitalization $100,000. Is controlled through ownership of 80% of stock, by the George A. Treadwell Mining Co., a notorious swindle. Mine, 4 miles south of Jerome, has been idle since 1905.

BROUGHTON COPPER CO., LTD. **ENGLAND.**

Works office: Widnes, Lancashire, Eng. Property is a copper reduction plant.

BROWNHEAD COPPER MINES. **IRELAND.**

Office: 7 Tower Bldgs. North, Water St., Liverpool, Eng. R. Shacklady, liquidator. Was organized June 30, 1906, under laws of Great Britain, with capitalization £65,000, shares £1 par, to take over a mining property known as the Crookhaven Estate, area 3,135 acres, situated in the northern part of County Cork, Ireland, but did not buy the property, and on September 7, 1906, resolved to liquidate voluntarily.

BROWN-ALASKA COPPER CO. **ALASKA & BRITISH COLUMBIA.**

Office: 1201 Alaska Bldg., Seattle, Wash. Mine offices: Coppermount, Prince of Wales Island, Alaska, and Port Simpson, Skeena division, B. C. G. D. Mumford, president; Maurice D. Leehey, secretary; N. O. Lawton, manager Mamie mine; Arthur A. Wakefield, manager Maple Bay mine. Capitalization $1,000,000, shares $1 par.

The Mamie mine, at Coppermount, has an ore body of about 40′ width, said to give average assays of 6% copper and $1 per ton in combined gold and silver values. Ore is chiefly chalcopyrite, associated with pyrite and pyrrhotite, occurring in lenticular bodies connected by thin seams. Early 1907 the Mamie was shipping circa 1,500 tons monthly.

The Maple Bay group, 14 claims, partly fractional, northeast of Maple Bay, in the Portland Canal district, includes the Maple Bay or Outsiders mine, Blue Bell, Regina and Copper Queen mines. The Regina and Copper Queen, opened by 3 tunnels, longest 300′, show a vein of 5′ to 14′ width, carrying disseminated chalcopyrite averaging about 3% copper. Production of the Maple Bay group, 1906, was 293,269 lbs. fine copper, and the group was said, March, 1907, to be shipping, circa 2,200 tons monthly.

Normal forces are about 40 men at the Mamie and 60 men at the Maple Bay, ore going to the Alaska Smelting & Refining Co., commonly known as the Brown-Alaska smelter.

BROWN-ALASKA SMELTER. **ALASKA.**

Owned by Alaska Smelting & Refining Co.

BRUCE & CHESSOR MINING CO. **BOLIVIA.**

Mine office: Oruro, Bolivia. Has steam power and employed about 100 men at last accounts, producing native copper from conglomerate strata.

BRUCE COPPER MINES, LTD. **ONTARIO.**

Dead. Voluntarily liquidated May, 1902. Lands are now held by Copper Mining & Smelting Co. of Ontario, Ltd. Formerly at Bruce Mines, Algoma, Ont.

BRUCE MINING CO. **IDAHO.**

Mine office: Junction, Lemhi Co., Idaho. A. T. Bruce, general manager, at last accounts. Has copper-gold ores, opened by tunnel. Presumably idle.

BRUGER y CA. **BOLIVIA.**

Office and mine: Toledo, La Paz, Bolivia. Has steam power and firm is a small copper producer.

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BRUNSWICK MINING & MILLING CO. **COLORADO.**

Mine office: Tin Cup, Gunnison Co., Colo. A. Lejune, superintendent. Property is the Jimmy Mack mine, producing gold, silver and copper. Has steam power and a 100-ton concentrator. Employs circa 20 men.

BRUSTAD MINES, LTD. **NORWAY.**

Office: 62 London Wall, London, E. C., Eng. Mine office: Eidsvold, Hedemarken, Norway. G. T. Broadbridge, secretary. Organized Feb. 11, 1905, under laws of Guernsey, as a second reconstruction of Golden Mint Mines, Ltd., with capitalization £120,000, shares £1 par. Mine, 8 miles east of Lake Mjosen and 50 miles north of Christiania, was first worked very early in the Nineteenth Century. Development is by tunnel, showing a vein of 30′ width, carrying copper and gold values. Has a mill with 15 stamps, 3 Frue vanners, Wilfley tables and an Elmore concentrating plant. Mine evidently has made some considerable production in the past, as evidenced by large slag-piles.

BUCHANAN COPPER MINES, LTD. **AUSTRALIA.**

Mine office: Mungana, Queensland, Australia. Lands, sundry claims at Welcome Creek, circa 15 miles west of Mungana. Presumably idle.

BUCHANAN MINE. **CALIFORNIA.**

Office and mine: care of G. A. Pherson, owner, Daulton, Madera Co., Cal. Lands, sundry claims, 5 miles northeast of Daulton, near the Green Mountain mine, opened by shafts and tunnels. Property shows diabase and amphibolite schist, both mineralized. Ores are oxides near surface and unaltered sulphides at depth. Shipments made by lessees averaged about 15% copper and $3 gold per ton. Idle for some years.

BUCKEYE & CALUMET-ARIZONA MINING CO. **ARIZONA.**

Mine office: Red Rock, Pinal Co., Ariz. Organized circa April, 1906, to operate in the Owl Head district. Presumably idle.

BUCKEYE CONSOLIDATED GOLD & COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Socorro, Socorro Co., N. M.

BUCKEYE COPPER CO. **WASHINGTON.**

Office: 318 American Trust Bldg., Cleveland, Ohio. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. Organized under laws of Washington. Lands, 3 claims, 5 miles southeast of Index, formerly held by Index-Independent Mining Co., showing a vein of 4′ to 12′ width, carrying a 15″ to 18″ pay-streak of massive chalcocite, balance of vein carrying bornite and chalcopyrite with quartz gangue. Has tunnels of about 500′ and 1,000′, and has shipped several carloads of ore giving returns of about 50% copper. Idle.

BUCKEYE COPPER MINING CO. **IDAHO.**

Office and mine: care of S. P. Fairweather, Wallace, Shoshone Co., Idaho. Organized circa July, 1907, with capitalization $375,000, shares 25 cents par. Lands, 9 claims, adjoining the Bullion property, near the Montana line.

BUCKEYE MINING & SMELTING CO. **OREGON.**

Office: care of W. H. Ramsey, vice-president, Grants Pass, Ore. Mine office: Galice, Josephine Co., Ore. J. M. James, president; W. P. McCoy, general manager. Organized under laws of Pennsylvania. Property is the Buckeye mine, opened by two tunnels, showing ore assaying up to 20% copper and $5 to $20 gold per ton. Company planned building a 100-ton smelter, but it did not materialize.

BUCKHORN GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Greenwood, Boundary district, B. C.

BUCKSKIN MOUNTAIN COPPER CO. **ARIZONA.**

Mine office: Ryan, Coconino Co., Ariz. Lands, 33 claims, area 660 acres,

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also 80 acres miscellaneous lands, 7 miles from Ryan, showing blanket veins carrying highly silicious carbonate ores, estimated to average 10% in copper, which is too high, and said to have 500,000 tons of ore in sight, with 100,000 tons blocked out for stoping, also considered an overestimate. Mine is worked open-cast, and ore is sent to works at Ryan by wagon. Works include a 100-ton leaching plant and a small smelter, obtaining water from the mine by a 7-mile pipe-line.

BUDGEEYGAR MINING CO., N. L. **AUSTRALIA.**

Mine office: Hermidale, Canbelego Co., N. S. W., Australia. Organized 1907, under laws of New South Wales, with capitalization £5,000, shares 2s. par. Has a 260′ shaft said to show a 9′ vein of 30% copper ore. In July, 1908, planned installing a £700 hoisting plant.

BUDGERY KING COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Hermidale, Canbelego Co., N. S. W., Australia. Organized circa November, 1907, under laws of New South Wales, with capitalization £6,000, shares £5 par.

BUDGERY MINES, N. L. **AUSTRALIA.**

Mine office: Cobar, N. S. W., Australia. Mine office: Hermidale, Canbelego Co., N. S. W., Australia. M. J. Corbett, chairman; J. M. Williams, superintendent. Organized 1906, under laws of New South Wales, with capitalization £80,000, shares 10s. par. Lands, 3 miles from Hermidale, show a series of lenses, with an oxidized zone of considerable depth carrying native copper and cuprite. The 365′ main shaft shows low grade ores of about 4.5% average copper tenor, and a vein of black sulphide ore, reported as 20′ to 25′ in width. Company claims ore reserves of 40,000 tons on the 164′ level. Production, 1906, was circa 200 long tons of ore, yielding 22 tons long fine copper. Employed 22 men at last accounts. Property considered promising.

COMPAÑIA MINERA EXPLOTADORA DE BUENA ESPERANZA. **CHILE.**

Office: Iquique, Chile. Mine office: Santa Rosa, Tarapacá, Chile. Organized Dec. 5, 1905, under laws of Chile, with capitalization £10,000, shares £1 par.

BUENA VISTA COPPER MINES, LTD. **MEXICO.**

Dead. Formerly at Santa Rosalia, Sur, Baja California, Mex. Described Vol. VI.

BUENA VISTA COPPER MINING CO. **ARIZONA.**

Mine office: Solomonville, Graham Co., Ariz. Has a 100′ shaft, showing ore, and sent a sample shipment of 25% ore to the El Paso smelter, 1903. Idle.

BUENA VISTA COPPER MINING CO. **CALIFORNIA.**

Mine office: Valley Springs, Amador Co., Cal. Property includes the Bull Run and Russell mines, carrying sulphide copper ores in schistose diabase. Has steam power. Idle.

BUENA VISTA MINING & MILLING CO. **ARIZONA.**

Dead. Formerly at Washington, Santa Cruz Co., Ariz.

BUENA VISTA SMELTING & REFINING CO. **COLORADO.**

Office: Chester, Pa. Works office: Buena Vista, Chaffee Co., Colo. R. G. Hinkson, general superintendent; Wm. P. Eyre, superintendent. Plant is a 125-ton smelter, employing circa 40 men. Company does a general custom smelting business on gold, silver and copper ores.

BUENOS AIRES MINING CO. **MEXICO.**

Dead. A swindle, perpetrated by the notorious Dr. R. C. Flower. Supposedly located at Cusihuiriáchic, Iturbide, Chihuahua, Mex. "Assets" were inherited by the Pan-American Mining & Smelting Co.

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COMPAÑIA MINERA BUERREBO DE VALLE HERMOSO. **ARGENTINA.**

Office: Santiago de Chile. Mine office: Mendoza, Argentina. Organized Feb. 16, 1907, under laws of Chile, with capitalization 230,010 pesos, shares 15 pesos par.

BUFA MINING, MILLING & SMELTING CO. **MEXICO.**

Mine office: 709 Lankershim Bldg., Los Angeles, Cal. Letter returned, unclaimed from former mine office, La Bufa, Sahuaripa, Sonora, Mex. Davis. Richardson, president; Wm. E. Richardson, vice-president and general manager; Baron W. Riley, secretary; Lewis B. Richardson, treasurer. Organized 1902, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Has paid 5 dividends, last being $60,000, July, 1905. Lands, 123 acres, also a 10-acre millsite, and 5,000 acres miscellaneous lands, showing 6 fissure veins, of which 2 under development average 4′ width, opened by a 600′ incline, giving average assays of 10% copper, 10% lead, 4% zinc, 150 oz. silver and $2.50 gold per ton, from argentiferous tetrahedrite and copper sulphides. Has shafts of 300′ and 600′, and a 225′ tunnel, with 8,000′ of workings and about 20,000 tons of high-grade ore blocked out, with a considerable amount of low-grade ore on the dump, for eventual treatment.

Machinery includes a 120-h. p. plant at the mine, with 2 hoists, 2 Rand air-compressors and 7 power drills. Mine buildings include several small shops, a store, sawmill and about 20 dwellings.

The 35-ton concentrator has a small sampling mill attached. There also is a 20-ton leaching plant.

The smelter, at the mine, receives ore by gravity tram. Equipment includes 10-ton and 25-ton reverberatory furnaces, built of silica brick, made on the ground. Fuel is inferior wood, cut on the premises. Product is a matte carrying 50% copper, 600 to 800 oz. silver and 1.5 oz. gold per ton, which is shipped to Aguascalientes, via Guaymas, for refining, some rich ore being shipped also. Transportation is by burros, but rail connection is expected from the extension of the Cananea, Rio Yaqui y Pacifico. Production, 1904, was about 1,200,000 lbs. fine copper, but operation since hampered by Yaqui Indian uprising. Has employed as many as 600 men in the dry season. Idle since circa 1906.

BUFFALO-ARIZONA GOLD MINES CO. **ARIZONA.**

Offices: 42 Westminster St., Providence, R. I. Mine office: Turkey, Yavapai Co., Ariz. Arthur E. Brown, secretary and treasurer. Lands, 18 claims, area 360 acres, known as the Parker group, 2½ miles from Turkey. Mine, originally a gold producer, shows copper values at depth of 50′ in a vein of 75′ estimated width. Has a 5-stamp mill and plans adding a cyanide plant. Has shipped a little ore to the Humboldt smelter.

BUFFALO & ARIZONA MINING CO. **ARIZONA.**

Mine office: Morristown, Maricopa Co., Ariz. W. H. Crandall, treasurer; J. Harry Bennett, general manager; Henry G. Bennett, superintendent. Lands, in Bennett Gulch, on lower Turkey Creek, between Morristown and Hot Springs, have a 319′ shaft, bottomed in chalcopyrite ore running about 3% copper, 2 oz. silver and $2 gold per ton. Mine has 3 levels, with about 800′ of workings. Has steam and gas power, a 2-stamp-mill having a 5,000-gallon storage tank, and 13 buildings. Employed 15 men and shipped a $4,000 bullion bar, circa June, 1908.

BUFFALO MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. O. H. Linn, superintendent. Capitalization increased, 1907, to $1,500,000, shares $1 par. Lands, 28 claims, on Big Creek, near the divide of the Bitter Root Mountains, 6 miles east of the

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Monitor, showing 4 copper veins, 2 argentiferous, developing by a crosscut tunnel.

BUFFALO SMELTING WORKS. **NEW YORK.**

Owned by Calumet & Hecla Mining Co.

COMPAÑIA DEL FERROCARIL y MINAS DEL BUITRON. **SPAIN.**

Mine office: Zalamea la Real, Huelva, Spain. Don Diego Bull, general manager. Company is controlled by F. C. Hills & Co., of London. Mines include El Castillo del Buitron and La Poderosa, area 6 hectares, at Zalamea le Real, and the Concepción mine, area 42 hectares, at Almonáster. Sundry other properties are under exploration. Annual production averages about 1,500,000 lbs. fine copper.

BULLARD BROS. **ARIZONA.**

Office: Wendendale, Yuma Co., Ariz. Lands, 5 claims, in Cunningham Pass, Harcúvar Mountains, are said to show considerable ore assaying 7 to 10% copper and $10 in gold and silver per ton.

BULL DOMINGO MINING CO. **WYOMING.**

Mine office: Hecla, Laramie Co., Wyo. Ores carry copper and gold values. Idle for several years.

BULLION-BECK & CHAMPION MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John Beck, president; W. J. Beatty, secretary; Philo T. Farnsworth, general manager; L. C. Doty, superintendent. Capitalization $1,000,000, shares $10 par. To March, 1908, had paid dividends of $2,568,000, regular dividend rate being 2 cents per share, and paid a 60-cent dividend, of $60,000, April, 1908.

Lands, 3 claims. In 1908 sold circa 10 acres of fractional claims, formerly in dispute, to the Centennial-Eureka, and made side-line agreements with that company, stopping litigation. Mine produces mainly auriferous lead carbonates and silver chlorides, with small copper values, and has one small reserve of high grade ore, with considerable quantities of low grade ore developed for extraction later. Has a 1,300′ shaft, with a 200′ winze from the bottom level, and is mining from the 100′ to 1,200′ levels, inclusive, there being considerable water on the 1,300′ level. Has a 200-ton mill, with steam and electric power, employing about 75 men, and has been a producer since circa 1880. Production, 1907, was 248 carloads of ore, and output, first half 1908, was circa 1,000 tons of ore monthly, partly from work of lessees.

BULLION CITY BORNITE COPPER MINING & MILLING CO. **COLORADO.**

Office: Ebensburg, Pa. Letter returned unclaimed from former mine office, Aspen, Pitkin Co., Colo. T. V. Hott, president; A. W. Van Houten, secretary and general manager. Lands, 11 claims, 7 patented, area 110 acres, 8 miles distant from railroad, with good wagon-road between. Has shafts of 50′ and 90′, showing a 2′ vein of bornite, assaying 25% copper, 53 oz. silver and 1 oz. gold per ton.

BULLION GOLD & COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Reno, Washoe Co., Nev. Capitalization $1,000,000, shares $1 par. Lands, 8 claims, in the Peavine district, circa 20 miles north of Reno and 1½ miles from a railroad, having several shallow shafts.

BULLION MINING CO., LTD. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. B. F. O'Neil, president; Jas. H. Taylor, secretary; A. D. McKenzie, general manager. Organized 1902, under laws of Idaho, with capitalization $1,000,000, shares $1 par. Lands, 8 claims, 3 patented, area 160 acres, lying about 4 miles west of the Monitor mine, on the Idaho slope of the Bitter Root divide.

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Property shows a vein of 20′ maximum width, with average of 6′ to 12′, carrying mainly chalcopyrite, with some bornite, associated with siderite, having a limestone gangue, said to average 3.2% copper and 0.4 oz. silver per ton, with traces of gold, also some ore of better grade. Mine is opened by a 70′ upper tunnel and a 780′ crosscut lower tunnel, with 1,380′ of workings, well timbered with pine, hemlock, tamarack and fir. Has steam power and a 12-h. p. hoist.

BULLION MOUNTAINS COPPER CO. **CALIFORNIA.**

Office: 1221-52 Broadway, New York, N. Y. Mine office: Lavic, San Bernardino Co., Cal. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Was promoted by H. R. Leighton & Co., since bankrupt. Company claims to have mines and reduction works at Lavic, hence presumably succeeded to property of the Peacock Copper Co., which had a 50-ton concentrator, but ran out of ore. Regarded with suspicion. Idle.

BULLOCK MINING & MILLING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Has 600,000 shares. Property has 2 veins, carrying argentiferous copper sulphides of fair tenor. Begun shipments 1908.

BULLWHACKER COPPER CO. **MONTANA.**

Office: care of Patrick Clark, president, Spokane, Wash. Mine office: Butte, Silver Bow Co., Mont. J. J. Stewart, vice-president; W. C. Moyer, secretary; F. S. Hays, treasurer; John Bresnehan, superintendent. Organized March 20, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Is controlled by President Clark, who is supposed to own about 80% of the stock. Paid monthly dividends of 1 cent per share, early 1907. Lands, 1 claim, lying east of the Pittsburg & Montana, having a 400′ shaft showing a 50′ fault with a paystreak of 15′ to 20′ width, carrying workable values, mainly in carbonate ores and chrysocolla, averaging about 3.5% copper, both carrying practically no gold or silver values. Also has a little chalcocite, up to 24% in copper tenor. Ore is silicious and does not concentrate well, hence experiments have been made with a leaching process. In 1906 lessees produced 6,228 tons of silicious ore, averaging 4.97% copper, extracted from depth of less than 100′, and company itself produced nearly an equal amount of ore, giving production estimated as equal to 850,000 lbs. fine copper. Shipments ceased latter half of 1907. Property considered promising.

BULLWHACKER GOLD & COPPER CO. **ARIZONA.**

Dead. Merged in Great Belcher of Arizona Co. Formerly at Prescott, Yavapai Co., Ariz.

BULLY HILL COPPER MINING & SMELTING CO. **CALIFORNIA.**

Office: 42 Broadway, New York, N. Y. Mine office: Winthrop, Shasta Co., Cal. D. M. Riordan, president; Anson W. Burchard, vice-president; M. F. Westover, secretary; John B. Keating, general superintendent; Herbert R. Hanley, assistant superintendent. Organized 1900, under laws of New Jersey, with capitalization $2,500,000, shares $25 par, full paid, but, after acquisition of control, 1905, by General Electric Co., capitalization was reduced to $1,000,000. Bonds, $400,000, issued for construction of Sacramento Valley & Eastern Railway, stock of which is owned by the Bully Hill.

Lands, 23 claims, 18 patented, area 213 acres, in the Pittsburg district, circa 25 miles northeast of the Iron Mountain mine and supposedly in the same geological horizon. Property includes the Bully Hill, Winthrop, Copper City and Anchor or Rising Star mines, all connected properties except the Copper City, circa 3 miles southwest of the Bully Hill. Company is said to have bought the Northern Light mine, at Winthrop, and the Tamarack group at Shasta City is held under a $10,000 bond.

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The Bully Hill was opened as a gold mine, working the gossan with rather indifferent results, until copper ores were developed at depth. Bully Hill, with a diameter of about 4,000′, rising 1,200′ above the surrounding country, is composed of eruptive rocks, principally basalt and rhyolite, with 3 mineral zones, having a strike of approximately north and south, the ore occurring in shear-zones in rhyolite and meta-diabase dykes, all of superficially slaty structure, lenses having a clay gouge of 1′ to 30′ on one or both walls. Main lenses have stringers and feeders, ranging from a few inches to 30′ in width, carrying 2 to 30% copper. The principal lenses are 20′ to 300′ long and 2′ to 40′ wide, averaging about 30′, and opened to a depth of circa 1,000′. The zone of secondary enrichment shows about 10′ of bonanza ore, the main ore bodies below carrying chalcopyrite associated with pyrite, also a little bornite and chalcocite, with occasional oxidized ores and native copper. The best ore body gives average assays of about 15% copper, 6 oz. silver, and $8 gold per ton, and shows native copper and native silver in considerable quantities on the 670′ level, the average copper tenor of the mine being about 5%, with combined gold and silver values up to $25 per ton.

The Bully Hill mine is opened by crosscut tunnels of 600′, 800′, 1,000′ and 1,200′, giving a back of about 350′. No. 2, the main working tunnel, 1,000′ long, has double tracks and a 100x100′ underground station containing powerful pumps and double-drum electric hoist for the 3-compartment 970′ blind shaft starting from this point.

The Bully Hill has steam and electric power aggregating 300 h. p. at the mine and 350 h. p. at the smelter. Equipment includes four 100-h. p. hoists, good for 1,000′ depth each, and 3 Rand air-compressors, of 14 drills aggregate capacity. Buildings, about 20 in number, include a 40x50′ iron-sheathed machine-shop.

The Copper City mine, area 70 acres, is opened by an upper tunnel of 150′ and a lower tunnel of circa 1,000′ length, driven by Capt. J. R. De La Mar.

The Anchor, or Rising Star mine, has a 3-compartment 800′ shaft, with double-drum electric hoist, and works 2 levels, known as the 6th and 7th, showing considerable good ore.

The Winthrop mine has a 16′ vein of ore of fair copper tenor.

The smelter, about one-half mile from the mine, receives ore therefrom by the Bully Hill railroad, a 4-mile standard-gauge private line having a 65-ton Baldwin locomotive. The smelter, remodeled 1907-1908, is reported by company to have about 250 tons daily capacity, fuel being mainly coke, supplemented by petroleum for the reverberatory. The smelter building is 39x310′, with a 90′ stack, and is terraced throughout, permitting handling of all material by gravity. The calcining department has roast-stalls in series, with 2 McDougal circular calcining furnaces and two 42x120″ rectangular water-jacket blast-furnaces, with one 50-ton reverberatory for treating fines and flue-dust. First-fusion product is a matte of 35 to 50% copper tenor, taken in ladles, by electric traveling crane, to the converter department, which has 2 stands, with 68x96″ shells of barrel type, turning out blister copper of 99% tenor, shipped to the DeLamar works at Chrome, N. J., for electrolytic refining. Limestone and iron ore for fluxing are obtained from quarries on the McLeod river, 6 miles distant, but there is a scarcity of suitable ferruginous copper ores for fluxing the high grade sulphides of the Bully Hill mine.

The Sacramento Valley & Eastern Railway, 17 miles long, controlled by the company, completed, 1907, at a cost of circa $500,000, runs from Winthrop to a connection with the Southern Pacific, at Pitt, 3 miles from Kennett, running through Heroult and Copper City.

The property employs about 500 men. Ores from the 3 leading mines

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have been given thorough smelting tests, and the company's permanent plans arranged in accordance with the results. There was no copper production, 1906 or 1907, during which years the property was being systematically developed, but smelting was resumed March 30, 1908, with one furnace. Annual production formerly was about 5,000,000 lbs. fine copper, but should reach nearly 15,000,000 lbs. fine copper in 1909. The Bully Hill is perhaps the highest grade copper mine in California, and has an experienced and thoroughly capable management.

BUNDARRA MINE. **AUSTRALIA.**

Mine office: Bundarra, N. S. W., Australia. Max Gorler, owner. Lands, in the Tingha division of the Peel & Uralla mining district, show a 4′ to 8′ vein of sulphide ore, deepest workings being circa 300′. Has a smelter with a small reverberatory furnace, making 45% matte. Production, 1907, estimated at 250,000 lbs. fine copper. Employed 60 men, 1907.

BUNKER HILL MINE. **ARIZONA.**

Office: care of Col. Emil Rautman, Prescott, Ariz. Mine office: Big Bug, Yavapai Co., Ariz. Lands, 10 claims, in the Big Bug and Walker districts, circa 10 miles southeast of Prescott, opened by a tunnel of about 1,600′ length.

BUNKER HILL MINING & SMELTING CO. **WASHINGTON.**

Office: 5011-1 Madison Ave., New York, N. Y. Mine office: Index, Snohomish Co., Wash. Works office: Reiter, Snohomish Co., Wash. Chas. G. Reiter, president; Lewis H. Nash, vice-president; John D. Campbell, secretary; Wilbur Morris, treasurer; V. V. Clark, general manager; Chas. A. McClain, superintendent; Thos. W. Collins, smelter superintendent. Organized Oct. 24, 1902, under laws of Maine, with capitalization $3,000,000, shares $1 par, as successor of Bunker Hill-Sullivan Copper Mining Co., and capitalization reduced, June, 1908, to $1,500,000, shares $1 par; also, June, 1908, authorized an issue of $500,000 of 8% cumulative preferred stock, to raise funds for retirement of bonded debt, payment of second-mortgage notes, and payment of sundry current obligations.

Lands, 18 claims, area circa 300 acres, 5 miles west of Index, on May Creek, below Lake Isabelle, known as the Copper Bell group, also a 5-acre millsite. Lands show fissure veins in granite, and contact veins between granite and diorite. Property was diamond-drilled, 1907. Mine has shafts of 86′ and 600′, showing 2 ore bodies, one a vein of 2′ to 50′ estimated width, carrying chalcopyrite averaging about 1% copper, 0.5 oz. silver and 40 cents gold per ton. Has compressed air and electric power, generated by a water-wheel taking water from Lake Isabelle, 2 hoists and a 10-drill Ingersoll-Sergeant duplex air-compressor, with various mine buildings.

The mill, enlarged, 1907, to 100 tons daily capacity, has Blake and Austin crushers, rolls, Wilfley tables, slime tables, buddles and a magnetic separator.

The 75-ton smelter, of wood frame, was blown in July, 1908. Some concentrates were shipped, 1906.

BUNKER HILL-SULLIVAN COPPER MINING CO. **WASHINGTON.**

Dead. Organized March 20, 1900, and reorganized Oct. 24, 1902, as Bunker Hill Mining & Smelting Co. Formerly at Index, Snohomish Co., Wash.

BUNKERVILLE MINING CO. **NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. Idle.

BURGAN DEVELOPMENT CO. **MEXICO.**

Office: Douglas, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mex. Property, near Fronteras, is said to be opened to depth of circa 400′. Presumably idle.

BURLINGTON COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Idle.

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BURMA COPPER MINES, LTD.

Office: 716 Salisbury House, London, E. C., Eng. W. T. Warriner, secretary. Organized Nov. 5, 1903, under laws of Great Britain, with capitalization £100, shares £1 par. Moribund.

BURMA MINES DEVELOPMENT & AGENCY, LTD. **BURMAH.**

Office: 730 Salisbury House, London, E. C., Eng. M. F. Kindersley, chairman; H. E. Franck, secretary. Organized Nov. 6, 1903, under laws of Great Britain, with capitalization £50,000, shares £1 par, fully issued, to prospect for copper in the Monywa district, and dredge for gold on the Chindwen river, Burmah.

BURNETT (QUEENSLAND) EXPLORATION CO., LTD. **AUSTRALIA.**

Dead. Lands sold to Queensland Copper Co., Ltd. Formerly at Mount Perry, Bowen Co., Queensland, Australia.

BURNIE COPPER MINES. **TASMANIA.**

Office: National Mutual Bldg., Melbourne, Australia. Mine office: Cuprona, Tasmania. Jas. Harvey, chairman; Leigh J. Hancock, superintendent; H. Hodgson, auditor. Is incorporated. Lands, 205 acres, partly freehold, including the townsite of Cuprona. Mine, known as the Copper King, has a 155′ shaft, sunk in the footwall. At 150′ depth the north ore chute had disappeared, and the south ore chute showed decreased values. Property has a fair power equipment. A little ore, shipped to New South Wales smelters, returned circa 25% copper. Employs about 30 men. Production, 1906, was 236,880 lbs. fine copper. Prospects of company are not especially promising.

BURNS MINING CO. **WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Lands include the Myrtle and Justice claims, opened by tunnel. Idle.

BURNS-MOORE MINING & TUNNEL CO. **COLORADO.**

Mine office: Jackson Bldg., Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. Dr. John M. Shaller, secretary, treasurer and general manager. Organized March 27, 1902, under laws of West Virginia, with capitalization $250,000, shares 10 cents par. Lands, 40 lode claims, 5 placer claims and a millsite, all patented. Development is by a 3,210′ tunnel, starting from Chicago Creek, circa 7 miles from Idaho Springs, and running to Saxon Mountain, intersecting a number of mineralized veins carrying gold, silver, lead and copper values. Has water power. Idle for several years.

BURRA (BOBBY) COPPER MINING CO. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized, 1907, under laws of New South Wales, with capitalization £1,500, shares £10 par.

BURRA BURRA COPPER MINING CO., N. L. **AUSTRALIA.**

Office: Eagle Chambers, Adelaide, South Australia. Mine office: Burra Burra, Burra Co., South Australia. T. B. Gall, chairman; V. Lawrence, secretary and treasurer; Wm. West, general manager; Jas. S. Pryor, superintendent. Organized 1901, under laws of South Australia, with capitalization £120,000, shares £1 par, 10s. paid in; issued, £95,173. Lands, 672 acres, freehold, with mineral rights to 11,065 acres of adjoining lands. Country rock is argillaceous slate. Mine is opened by 5 tunnels, of 600′, 300′, 330′, 420′ and 180′. Ores in upper levels were cuprite, malachite, azurite and native copper, occurring in very rich but irregular bunches, lower levels showing bornite and chalcopyrite. Property, opened 1845 and closed 1877, made 51,662 long tons fine copper, valued at £4,749,224, and paid dividends of £826,585. Ore was shipped to Port Adelaide, 107 miles, by rail, for smelting. Fuel was wood, costing 12s. per cord, and soft coal at 30s. per ton. Was reopened 1901, ore averaging about 2% copper only, and production, 1903, was about 100 long tons fine copper. Has steam and electric power. Idle several years.

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BURRAGA COPPER CO. **AUSTRALIA.**

Mine office: Burraga, Bathurst Co., New South Wales, Australia. Mine, opened 1877, circa 1 mile east of the Lloyd, has a vein of 67′ average width, with a chute of rich ore of about 100′ length carrying chalcopyrite with quartz gangue, averaging 6.5% copper tenor, with 1 to 3 oz. silver per ton. The vein occurs in a belt of highly altered rocks, ranging from porphyry to schistose slates. Mine is circa 800′ deep. Smelter has 3 reverberatory furnaces, using wood for fuel, making a 47% matte, sent to Lithgow for refining. Supply of fuel is precarious in bad weather, when the roads are impassable. Presumably idle.

BURRO MOUNTAIN COPPER CO. **NEW MEXICO.**

Office: 402-108 Equitable Bldg., Chicago, Ills. Mine office: Leopold, Grant Co., N. M. Nathan F. Leopold, president; E. Shepherd, vice-president; Alfred F. Leopold, secretary and treasurer; Jas. T. Hall, superintendent. Organized 1904, under laws of New Mexico, with capitalization $50,000, increased, 1906, to $100,000, shares $1 par. Phelps, Dodge & Co. hold a share interest, and are represented on the board of directors by C. E. Mills. Company is operated as a close corporation.

Lands, 60 claims, area circa 1,000 acres, formerly held on bond and lease, but bought, 1906, from Southwestern Copper Co. Property shows 36 porphyry dykes, all carrying silicates giving assays of 10 to 25% copper, 5 ore bodies being developed. Extensive diamond drilling is planned.

The old mine, 15 claims, known as the St. Louis, is said to have produced upwards of $1,000,000 worth of ore, under former ownership, shipping ores ranging 15 to 25% in copper tenor.

Principal development has been on the Sampson and St. Louis veins, opened laterally for more than 2,000′, estimated to show about 3,000,000 tons of ore with approximately 2,500,000 tons blocked out, assaying 3.4% copper, mainly from chalcocite, without appreciable precious metal values. About 25,000′ of openings have been made on the 2 veins, and the Sampson ore body is estimated at 100′ to 200′ width, 300′ depth and about 1,000′ length.

Mine is developed by 4 shafts, the Sampson, St. Louis, McKinley and Boston, each more than 200′ in depth, with especially promising indications in the Boston shaft. The east ore body, which is the last developed, shows about 2,000,000 tons of ore, averaging over 3% copper. Mine is operated largely on the caving system, obviating excessive timber requirements. Equipment includes electric hoists and pumps, with a steam hoist at the Sampson shaft.

Lands include a townsite, improved with water-works, electric lights and substantial buildings, including a hotel and numerous dwellings.

The concentrator, built circa 1905, has been twice remodeled and brought to present capacity of 300 tons daily. Equipment includes a dynamo for power and a 300-light electric generator. It is planned increasing the mill to 1,500 tons daily capacity.

There is a 10-ton smelter, of antiquated design, left by former owners, which is idle and worthless.

Survey has been made to the mine for a 14-mile spur of the Atchison, Topeka & Santa Fé railway, and road probably will be built in 1909.

The Burro Mountain was a considerable producer in 1907, and did not suspend work during the panic period, though reducing output of concentrates and curtailing in various directions. Concentrates have been smelted by the Boston & Colorado Smelting Co. and Shannon Copper Co., and production, to end of 1907, was about 15,000,000 lbs. fine copper. Property is considered of exceptional promise, and management is good.

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BURTON CONSOLIDATED COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

BUSTER BROWN CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. Chas. F. Hoff, president and general manager. Capitalization $3,000,000, shares $1 par. Lands, 5 claims, area 100 acres, in the Amole district, 16 miles northwest of Tucson, slightly developed, showing ores carrying fair assay values in copper and silver. Presumably idle.

BUSTER MINES SYNDICATE, LTD. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz. Described Vol. VI.

BUTLER-LIBERAL CONSOLIDATED MINING CO. **UTAH.**

Office: 418-60 State St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. J. J. Corum, president; C. N. Strevell, vice-president; S. M. Orem, secretary and treasurer; Walter C. Orem, general manager; Wm. Robbins, superintendent. Organized 1903, under laws of Utah, as a consolidation of the Ben Butler Mining & Smelting Co. and the Liberal Mining Co., with capitalization $500,000, shares $1 par. Paid a dividend of $2,500, October, 1903.

Mine is opened by the Butler shaft and tunnel, latter said to show 2′ of smelting ore, and the Jacobs tunnel. Has shipped ore to the United States smelter returning 6% copper, 12 oz. silver and $1 gold per ton.

BUTLER MINING & MILLING CO. **UTAH.**

Dead. Merged, 1904, in Butler-Liberal Consolidated Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

BUTTE & ANACONDA COPPER CO. **MONTANA.**

Dead. Succeeded, 1902, by Carlisle Copper Co., also dead. Formerly at Butte, Silver Bow Co., Mont.

BUTTE & ANACONDA COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Phil C. Goodwin, president; Wm. Metting, vice-president; John E. Corette, secretary and treasurer; preceding officers, F. Tomek, Geo. P. Porter and Jas. R. Spencer, directors. Organized June 6, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 20 claims, north of the Butte & Bacorn, showing mineralized ledges.

BUTTE-ARGENTA COPPER CO. **MONTANA.**

Office: Butte, Silver Bow Co., Mont. Mine office: Argenta, Beaverhead Co., Mont. J. P. Oppenheimer, president; John F. Cowan, manager; J. T. Ross, superintendent. Organized Feb. 12, 1906, under laws of Montana, with capitalization $3,000,000, shares $10 par. Property, 12 miles west of Dillon, known as the Iron Mountain mine, has a tunnel and 2 shafts, opened to a depth of 200′ on a wide vein of argentiferous silver-lead and copper ore, having streaks assaying up to 16.5% copper and 30 oz. silver per ton. Upper levels were worked, years ago, for silver-lead, which changed to copper at slight depth. Equipment includes a 125-h. p. hydro-pneumatic power plant, with Pelton wheel, and an 8-drill Ingersoll-Rand air-compressor. Employed circa 35 men at last accounts.

BUTTE & ARIZONA COPPER CO. **ARIZONA & MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont., and Prescott, Yavapai Co., Ariz. Described Vol. VI.

BUTTE & ARIZONA COPPER MINING CO. **ARIZONA.**

Office: care of J. H. Vivian, president, Butte, Mont. Mine office: Hereford, Cochise Co., Ariz. A. P. Pohndorff, president; B. H. Dunshee, vice-president; John E. Corette, secretary; John C. Adams, treasurer; preceding officers, L. O. Evans, Charles S. Shoemaker and D. M. Watts, directors; John Hoatson, gen-

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eral manager; Caspar Schultz, mine superintendent. Capitalization $1,250,000, shares $1 par.

Lands, 14 claims, 11 patented, costing circa $60,000, for which directors took $450,000 stock, well watered and partially wooded, in the Huachuca Mountains, circa 35 miles west of Bisbee and about the same distance north of Cananea.

Property shows an ochrous gossan of 10′ to 300′ width, covering a contact vein between syenite and limestone carrying occasional copper oxides, chalcocite, pyrite and argentiferous gray copper, chalcocite of fair tenor, though not in large quantities. Development is by a 2,300 tunnel cutting several small veins giving assays up to 18% copper with an average of 4.5% tenor, mine having upwards of 3,000′ of workings. Main vein 350′ from mouth of tunnel is claimed to show 39′ of 6% chalcopyrite, which probably is an overestimate. Nearest railroad is 15 miles, with fair wagon road. Has steam power and air-compressor, employing circa 20 men. Continued work steadily during period of depression, but in 1908 suspended operations temporarily on account of a fire.

BUTTE & ARIZONA COPPER MINING CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Mayer, Yavapai Co., Ariz. Ernest A. Haggott, president; Emil J. Baxter, vice-president; T. C. Job, secretary; M. B. Hazeltine, treasurer; preceding officers and B. O. Kendall, directors; Ivy Burleson, superintendent. Organized June 6, 1905, under laws of Arizona, with capitalization $5,000,000, shares $1 par; issued, $2,200,000. Annual meeting, first Monday in May.

Lands, 9 claims, unpatented, area 180 acres, also 160 acres placer lands, in the Big Bug district, showing Algonkian schists, quartzite and diorite, carrying 3 veins, ore bodies occurring as replacements in chloritic schist and as contact deposits between hornblende schists and quartzite, 2 being developed. Main vein, of 70′ estimated width, traceable 4,800′, with 1,800′ of workings, is opened by a 360′ tunnel and shafts of 120′, 175′ and 300′, showing chalcopyrite averaging about 2.5% copper, 2 oz. silver and $2 gold per ton. Company plans continuous development.

BUTTE & BACORN MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. F. W. Bacorn, president and manager; Geo. I. Whitney, treasurer; H. L. W. Hyde, secretary; Ed. Renouard, superintendent. Organized Feb. 12, 1906, under laws of Maine, with capitalization $5,000,000, shares $1 par. Lands, 21 claims, partly fractional, area circa 230 acres, in the northeastern part of Butte, about 1 mile north of the Pittsburg & Montana and 1 mile northeast of the Anaconda, some distance from any producing mine. Allowed options on claims on which the Calumet shaft is located to expire, 1907, and attempted to remove improvements, but owners of lands prevented. Had 3 shafts, including the Calumet, the Colleen Bawn shaft being about 400′ deep and the Belinda shaft 840′. The 1,050′ Calumet shaft crosscut and drifted on 2 veins, showing ore below commercial grade. Had an 18x36″ first-motion hoist, good for 1,500′, on the Calumet claim. Idle early 1908, owing to failure of fiscal agents. Property is entirely outside the proven zone, but is not devoid of promise, though payable ore, if found, probably will occur at great depth.

BUTTE-BALLAKLAVA COPPER CO. **MONTANA.**

Office: 315 Sellwood Bldg., Duluth, Minn. Mine office: Butte, Silver Bow Co., Mont. R. B. Dear, president; P. H. Nelson, vice-president; John A. Percival, secretary; Milie Bunnell, treasurer; preceding officers, John Panton, I. Freimuth and Gus Carlson, directors; Hon. D. E. Morgan, J. T. Wyman and W. D. Winston, trustees of escrow stock; Chas. W. Newton, superintendent.

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Organized under laws of Arizona, with capitalization $2,500,000, shares $5 par; issued, $2,100,000.

Lands are the adjoining Burke and Ballaklava claims, fractional, area 6.5 acres, in a long irregular strip. Property was tied up by litigation for many years, but a settlement finally was secured between various claimants, by which title was vested in the Catholic bishop of Helena, who sold lands to present company for $400,000 cash, final payment being made circa October, 1907. Property is entirely surrounded by holdings of the Anaconda, Boston & Montana and Butte Coalition. Owing to the peculiar shape of the tract, which is 1,860′ long on the strike of the vein system, it carries the apex of 5 veins, of 25′ average width, with an aggregate of about 3,600′ of their strike. These veins are the Speculator and Edith May of the North Butte, the Old Joe, Mountain Chief and Sioux Chief, which, by reason of apexing on Butte-Ballaklava lands, can be followed to any depth desired. By reason of this peculiar situation, the property is, for all practical purposes, materially larger than its actual area, by reason of the law permitting the following of apexing veins.

The mine has 2 shafts, 1 to the northwest of shallow depth, while the other, an old 2-compartment shaft, 283′ deep, has been cut down to 3-compartment size and sunk to 1,000′ depth. Crosscuts have been run on the 500′ and 700′ levels, and are being run on the 1,000′ level. The 2 upper levels show 5 veins, ranging 25′ to 90′ in width. The 500′ level shows iron pyrites and a little high grade silver-lead ore, which probably will not hold to depth. The 700′ level shows stringers of massive chalcopyrite, with frequent bornite, both argentiferous, and a narrow streak of chalcocite was cut in the shaft.

Electric power is used throughout, with an auxiliary steam plant in reserve for emergencies. Equipment includes a 165-h. p. double-drum electric hoist, good for 1,500′ depth, and 2 Ingersoll-Sergeant compound belt-driven 8-drill air-compressors having cross-compound air-cylinders, each driven by a 100-h. p. General Electric motor. An electric station pump is to be installed. Buildings include a wooden head-frame, engine-house, carpenter-shop, smithy and office.

The Butte-Ballaklava is 640′ from the North Butte mine, and carries the extension of both the Speculator and Edith May veins of the North Butte. The Mountain Chief mine of the Butte Coalition, immediately to the north, was a small producer under the management of Mr. Heinze. The Modoc and Modoc Extension claims of the Anaconda, immediately to the south, carry the largest ore body in Butte, but this is of low grade to the depth developed, which is only 1,000′. The Butte-Ballaklava lies immediately west of the Leonard and north of the Colusa, which are about 1,000′ distant each, these being the principal mines of the Boston & Montana. The location is one of the best in Butte, and as the management is good, there seems every reason to predict the opening of an exceptionally large and rich mine.

BUTTE & BEAVERHEAD COPPER CO. **MONTANA.**

Office: Butte, Mont. Mine office: Argenta, Beaverhead Co., Mont. John P. Reins, manager. Organized 1907, with capitalization $1,000,000, shares $1 par. No trace of operations.

BUTTE & BINGHAM COPPER CO. **UTAH.**

Office: Butte, Mont. Mine office: Bingham Canyon, Salt Lake Co., Utah. W. H. Nichols, president. Lands, 6 acres. In debt and moribund.

BUTTE & BINGHAM COPPER MINING & DEVELOPMENT CO. **UTAH.**

Letter returned unclaimed from former office, 35 Congress St., Boston. Mine office: Bingham Canyon, Salt Lake Co., Utah. Idle.

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BUTTE & BOSTON CONSOLIDATED MINING CO. MONTANA.

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Jas. Phillips, Jr., president; Wm. D. Rockefeller, secretary and treasurer; John D. Ryan, general manager; Wm. E. Kane, mine foreman. Organized 1896, under laws of New York, with capitalization $2,000,000, shares $10 par. Debentures, $1,500,000 first-mortgage bonds, at 6%, due April, 1917. Has paid dividends, to Dec. 31, 1907, of $1,800,000, last dividend, $1 per share, having been paid February, 1904. Annual report to Montana authorities, June 1, 1908, gave assets of $3,636,918 and liabilities of $209,734. Net earnings were circa 89 cents per share in 1904; $5.38 per share in 1905; $6.25 per share in 1906, and $1.47 per share in 1907. Is controlled, through ownership of practically entire stock issue, by Amalgamated Copper Co. Annual meeting, first Monday in April.

Lands, 261 acres, including sundry mines and undeveloped claims, with part interests in other properties, also several thousand acres of placer lands, all in the Butte district.

Silver Bow No. 1 mine has a 3-compartment 1,000′ main shaft, connected underground with the Pennsylvania, Berkeley and Silver Bow No. 3 mines. Timbering is with 8x8″ square sets, and ore is trammed by horses. There is an 800-gallon Riedler pump on the 1,000′ level. Hoisting is done by a 16x42″ engine, operating 2 single-deck cages.

Silver Bow No. 2 has been idle for some years.

Silver Bow No. 3 mine has a 4-compartment 700′ shaft, planned to be deepened, and is timbered with 10x10″ square sets, with a 500-gallon Knowles pump on the 600′ level, and a 12x14″ Risdon hoist operates 2 single-deck cages.

The East Grey Rock mine has a 3-compartment 1,600′ shaft. Surface equipment includes a 20x48″ hoist, operating 2 double-deck cages, and a 28-drill Nordberg air-compressor.

The West Grey Rock mine has a 1,200′ shaft.

The Berkeley has a 3-compartment 900′ shaft, with 18x32″ hoist, operating 2 single-deck cages. It has been planned to work the Snohomish and Tramway mines through the Berkeley shaft. Property was tied up for nearly 5 years, until 1906, by litigation with the Heinze interests.

The Blue Jay mine has a 1,075′ incline shaft, sunk at 72°, having 2 compartments to the 600′ level and 3 compartments below. Hoist is 16x32″, operating 2 single-deck cages, with skips swung under.

The Belle of Butte mine, in Walkerville, has a 500′ shaft, developing argentiferous copper ore, with values mainly in silver, and has been worked, on a small scale, by leasers, for the past 10 years or more.

The Josephine mine, supposed to have a continuation of the Lexington vein of the La France, was operated, 1906-1907, by leasers, mainly for silver values.

Miscellaneous properties include the Kane No. 3, having a 200′ shaft, Wild Bill and various other mines having slight development.

The Butte & Boston owns two-thirds of the Tramway mine and one-half of the Snohomish mine, balance belonging to Butte Coalition, and these properties are described under title of latter company. The Tramway shaft has been sunk 1,500′, jointly, by the Butte & Boston and Butte Coalition.

The old concentrator and smelter, at Meaderville, were closed, 1905, and demolished later, ore now being sent to the Washoe works at Anaconda. There remain at the site of the old Meaderville works large quantities of slag, which may be resmelted.

The company employs, normally, about 400 men at its various mines.

The Butte & Boston ores are leaner in copper and richer in silver than

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the average of the camp, ore averaging returns of circa 60 lbs. fine copper per ton, while its blister copper carries about 100 oz. silver per ton. For fiscal year ending June 1, 1906, production was 331,630 tons, yielding gross values of $10.89 per ton, with cost of extraction of $3.79 per ton, and of reduction $2.27 per ton. Gross proceeds for year were $3,611,652, and total operating expenses $2,362,184, leaving net earnings of $1,249,467. For year ending June 1, 1908, extraction was 193,830 tons of ore, with gross costs of $1,609,763 and total expenses of $1,314,158, leaving net earnings of $295,604. Production, 1907, was about 10,000,000 lbs. fine copper.

BUTTE & BOULDER MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office; Boulder, Jefferson Co., Mont. Lands, 2 claims, held under bond and lease, having a 750′ tunnel, expected to cut, at depth of circa 500′, a vein carrying argentiferous and auriferous copper-lead ores. Was developing with a small force at last accounts.

BUTTE & BOZEMAN COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. O. P. Chisholm, president; C. B. Chisholm, vice-president and treasurer; R. B. Chisholm, secretary. Organized July, 1906, with capitalization $100,000, shares $1 par. Lands, 2 claims, area 40 acres, known as the Emily and Etta, lying northeast of the Butte & Bacorn. Idle.

BUTTE & BRADLEY COPPER MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Jas. A. Talbot, manager. Organized circa January, 1907, with capitalization $1,500,000, shares $1 par. Lands, 5 undeveloped claims, in the extreme northeastern portion of the Butte district, said to carry 6 veins showing surface ores carrying copper and silver values. Idle.

BUTTE & BUXTON COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Chas. O. Savage, vice-president; Chas. Fasel, secretary and manager; Jas. B. Higgins, consulting engineer. Organized April, 1908, under laws of Arizona, with capitalization $3,500,000, shares $10 par; issued, $1,500,000.

Lands, 13 claims, 3 held under bond and lease, area circa 250 acres, 15 miles southwest of Butte, in the foothills of Fleecer Mountain, carrying circa 6,000′ of the strike of a vein which was mined for silver-lead values, circa 1890, by several shallow shafts. Country rock is granite, much similar to that at Butte, covered by a 1′ to 4′ wash, having a mineralized zone of about one-half mile width, with 4 veins, with a diorite dyke to the northward. Shallow pits and trenches show continuity of veins, which are leached at surface, showing a little carbonate ore below commercial grade.

Development is by several old and shallow shafts, and by a tunnel of circa 300′. A wide ledge carries a mineralized streak along the foot-wall, showing mainly pyrite, with some argentiferous chalcopyrite and occasional carbonate stains, with a highly silicious gangue. Has secured ore assaying up to 14 to 23% copper and 24 oz. silver per ton, with small gold values, also galena assaying 11% lead, 24 oz. silver and $1 gold per ton. Company plans sinking shafts. Property considered promising and present management good.

BUTTE-CABLE COPPER & GOLD MINING CO. **MONTANA.**

Office: 116 Hamilton St., Butte, Mont. Mine office: Cable, Deer Lodge Co., Mont. R. G. Huston, president; J. Chauvin, secretary and treasurer. Organized Nov. 21, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, 4 patented, circa 15 miles west of Anaconda, near the Cable Consolidated Mining Co., showing a 30″ vein of ore of commercial grade, opened by tunnel.

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BUTTE-CAROLINA MINING & MILLING CO. **MONTANA.**

Office and mine 47 East Broadway, Butte, Silver Bow Co., Mont. J. R. Ellingwood, secretary and treasurer. Organized circa 1906, with capitalization $200,000. Company advertised May, 1906, that it would be shipping ore next month, but failed to redeem this promise. Apparently merely a stock-jobbing enterprise.

BUTTE CENTRAL & BOSTON COPPER CORPORATION. **MONTANA.**

Office: 27 State St., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. Chas. Howard Weston, president; R. G. McMeekin, vice-president; John A. Condy, secretary; Freeman I. Davidson, treasurer; Sir F. W. Gordon, chairman executive committee; John M. Cameron, managing director. Organized April, 1906, under laws of Maine, with capitalization $15,000,000, reduced, August, 1906, to $7,500,000, shares $10 par, divided into $2,500,000 cumulative 7% preferred stock and $5,000,000 common stock. Lands, 2 claims, patented, area 28 acres, one of which is the Ophir mine. In 1906 bought lands of the Butte Northern Copper Co., area 98 acres, over which there was some litigation, apparently now settled. Company claims 8 ore bodies, of which 4 have been developed more or less. The Ophir has 3 veins, carrying fair silver values, with increasing copper values at depth, and with only slight traces of zinc on the 500′ level. Company reports veins as of 17′ to 90′ width, with sulphide ores ranging from a trace to 1% copper, 8% lead, from a trace to 8% zinc, 20 oz. silver and $1 to $10 gold per ton. Development is by shafts of 520′, 120′ and 160′, with several other shafts of 20′ to 60′ depth, giving a total of 9,000′ of workings, estimated to show 750,000 tons of ore, with 250,000 tons blocked out for stoping, which seems an overestimate. The Ophir, which has yielded ores assaying up to 7.2% copper, 5 oz. silver and $2.20 gold per ton, is an old property, operated 1880-1883, when a considerable producer, though poorly opened, with indications that a profitable copper zone may be reached at a depth of about 1,000′. Old shaft was cut down and enlarged, 1907, to 3 compartments. Mine has levels opened at 100′ intervals, upper levels having been stoped out by former owners. Property includes the Snowbird claim, south of the Davis-Daly, with options on various other claims in Butte.

Equipment includes a 250-h. p. steam plant and 60-h. p. electric plant, 60-h. p. and 500-h. p. hoists and a 7-drill Rand air-compressor. There are several buildings, including an 18x24′ carpenter shop, 18x36′ smithy, office, engine-house, etc.

Work was suspended December, 1907, previous to which 16 sets of leasers were working, paying 35% royalty on gross values. Second-class ore is stocked, as extracted, and probably can be concentrated later. Ore produced, 1907, carried 30 oz. to 60 oz. silver per ton, with trivial copper values.

Company has confessed judgment of $51,445 on a note due the Tri-National Copper Corporation, of Boston, and is said to have an indebtedness of circa $150,000. Considerable property was attached, 1908, but a petition in bankruptcy, filed by sundry creditors, was defeated, circa June, 1908.

BUTTE CENTRAL COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Organized Apr. 17, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Apparently has some connection with the Butte Central & Boston Copper Corporation.

BUTTE CENTRAL COPPER MINING & SMELTING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized February, 1906, under laws of Montana, with capitalization $2,500,000, shares $5 par. Ap-

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parently is the parent company of the Butte Central & Boston Copper Corporation.

BUTTE COALITION MINING CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Thos. F. Cole, president; John D. Ryan, vice-president; Arthur C. Carson, general manager; preceding officers, Urban H. Broughton, Capt. Thos. Hoatson, Chester A. Congdon, Benj. B. Thayer, F. L. Ames and Wm. Dixon, directors; J. W. Allen, secretary; Jas. O'Grady, treasurer; Geo. Moulthrop, superintendent.

Organized Feb. 24, 1906, under laws of New Jersey, with capitalization $15,000,000, shares $15 par. Retired, 1906-1907, bonds at 6% to amount of $3,500,000, these being $2,500,000 bonds of Nipper Consolidated Copper Co. and $1,000,000 bonds of Montana Ore Purchasing Co. Paid initial dividend, Sept. 17, 1906, and to Dec. 31, 1907, had paid dividends of $2.45 per share, first dividend being 40 cents, 3 next 50 cents each, and last, December, 1907, being 15 cents per share. Dividends were passed, first half 1908. American Trust Co., Boston, transfer agent. Old Colony Trust Co., Boston, registrar. Shares are listed on the Boston stock exchange. Net income, 1907, was $1,461,465, and company begun 1908 with cash, on hand and in banks, $3,503,156, with liabilities of only $5,842. Company began business with $4,000,000 cash.

The Butte Coalition Mining Co. holds its properties through the Red Metal Mining Co., which has direct title, but entire stock issue of the Red Metal is owned by Butte Coalition, hence the property is described under this title, although the Red Metal is the operating company, in Butte.

The Butte Coalition was formed by the joint efforts of John D. Ryan and Thos. F. Cole, to put an end to the desperate litigation that had raged for 7 years between the Amalgamated and Heinze interests. This end was effected, the Butte Coalition taking over all of the Heinze holdings except La France Copper Co., properties and interests so taken over including the Montana Ore Purchasing Co., Nipper Consolidated Copper Co., Guardian Copper Co., Minnie Healy Mining Co., Belmont Mining Co., Johnstown Mining Co., Hypocka Mining Co. and Corra-Rock Island Mining Co., in addition to which the company owns a controlling interest in the Alice Gold & Silver Mining Co.

Lands are circa 145 acres, including various preponderant fractional interests, with a total of about 60 claims and fractional claims, also mineral rights to 108 town lots in Butte, on one of which the Glengerry mine is located. Principal properties are the Rarus group, Nipper group and the Corra group, also a 38% interest in the Pennsylvania mine, of which the Boston & Montana owns 62%, the Pennsylvania being described under the title of Boston & Montana. Properties turned over by the various Heinze companies were largely interlocking fractional interests in various Heinze properties.

Company's principal productive mines are in the Rarus group, which includes the Minnie Healy, Rarus, Tramway and Snohomish mines. The Minnie Healy, area circa 5 acres, is perhaps the best mine of the Butte Coalition, as matters now stand. The Minnie Healy adjoins the Leonard and Colusa mines, the best properties of the Boston & Montana, and had a 2-compartment 1,400′ shaft, connected underground with the Leonard, Rarus and Tramway mines, but shaft was lost through fire, 1907-1908, on the 600′ and 700′ levels, and the mine is to be operated through the new Rarus shaft. The Minnie Healy shows a mineralized zone of 200′ to 300′ extreme width, carrying ore of excellent average grade.

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The Rarus has a 3-compartment shaft, 2,000′ deep, August, 1908, which will operate the Minnie Healy, Tramway and Snohomish mines also. Ore body is not clearly defined, but is upwards of 300′ wide in places, and of good grade, averaging about 4% in copper tenor. Levels are opened at 200′ intervals, and the mine is timbered with square sets. Little stoping has been done below the 800′ level. A Webster Camp & Lane 32x32″ hoist operates 2 double-deck cages, with 6-ton skips swung under.

The Johnstown, area 6.66 acres, is a fractional claim lying next east of the Rarus, and is operated as part of the Rarus mine.

The Tramway, lying between the Minnie Healy and Rarus, owned one-third by Butte Coalition and two-thirds by the Butte & Boston Consolidated Mining Co., has a 3-compartment 1,700′ shaft, but will be operated partly through the new Rarus shaft. Mine shows a large body of very rich chalcocite on the 1,400′ level. Shaft has a 108′ steel headgear with 3 sheaves, and a 2,500-h. p. hoist.

The Snohomish mine, adjoining the Tramway, south of the Minnie Healy, is owned half and half by Butte Coalition and Butte & Boston, and is operated in connection with the Tramway.

The Mountain Chief claim, area 1.15 acres, lies next north of the Butte-Balaklava, and is said to have produced about $1,500,000 worth of ore, from a shallow shaft which was blown up by dynamite, under the Heinze regime, on account of litigation, injunctions and dynamite being the favored weapons of those happy days.

The Nipper group includes the Nipper, Chief Joseph, Balm and L. E. R. claims. The Nipper mine, area 15.18 acres, has 2 shafts, of circa 1,000′ and 1,200′ depth, with 12 exits, being connected underground with the Parrot, Never Sweat and Little Minah mines, and has been operated to some extent through the Parrot shaft. Mine is timbered with 10x10″ square sets.

The Belmont mine, adjoining the Anaconda and formerly having ore hoisted through the Anaconda shaft, has an 1,800′ shaft, cut down to 3 compartment size and retimbered. Upper levels showed ore rich in silver, with an impoverished zone at depth of circa 350′, but good ore shows again at 1,000′. The Belmont Mining Company turned over to the Butte Coalition sundry fractional interests, with claims aggregating 67½ acres, lying in the southeastern part of Butte.

The Corra group, turned over by the Corra-Rock Island Mining Co., includes the Corra and Rock Island mines, with a ninth interest in the Silver Queen, a third interest each in Robert Emmet I and II, a seventh interest in the Snoozer and a half interest in the Blackfoot. The Corra mine has a 2,200′ shaft, with mainly silver values above the 1,000′ level, below which the ore is low in copper and higher in silver than the average of the district. The area of the Corra-Rock Island group is circa 30 acres, including the Corra mine of 13.15 acres, Rock Island mine of 5.15 acres and Snoozer of 9.37 acres.

The Glengerry mine, having an 800′ shaft, has the mineral rights to sundry town lots in Butte.

Miscellaneous claims, slightly developed or practically virgin, owned in whole or part by the Butte Coalition, include the Little Ida claim, area 1 acre; Nightingale, area 1.3 acres; Sweitzer, area 3.5 acres; Highland Chief, area 12 acres; Mountain Chief No. 3, Black Diamond, Wild Goose, A. J. P., Hazley, Pompey, Montana, Clifton, Scottish Chief, Lioness, Kinkaid and Taffy.

The Alice property, controlled through stock ownership, is described under title of Alice Gold & Silver Mining Co.

The ore of the Butte Coalition is smelted under contract by both the

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Boston & Montana and Anaconda smelters, going mainly to the Washoe works.

In September, 1907, production was reduced about two-thirds and was suspended December 1st, until early spring. Production, 1907, was circa 377,000 tons of ore, returning an average of 51.47 lbs. copper and up to 18 oz. silver per ton, yielding 19,416,377 lbs. fine copper, 444,809 oz. silver and 2,480 oz. gold. For 1906 ore treated gave average returns of 75.86 lbs. copper and 2.216 oz. silver per ton. About 10% of the ore mined is of smelting grade, averaging 9% in copper tenor, balance being concentrating ore. The various mines have a large amount of ore developed, and reserves are being added systematically, despite difficulties caused by the Minnie Healy fire. The property has a maximum productive capacity of about 2,000 tons of ore daily, or circa 35,000,000 lbs. fine copper yearly, at a cost of about 10 cents per pound, and before the drop in metal prices, 1907, was yielding about 1,600 tons daily. Costs, April, 1908, were said to be under 8.5 cents per pound. Ores mined July, 1908, were said to average about 5% copper and $2 per ton in combined gold and silver values. The numerous properties of the Butte Coalition are of greatly varying values, but include some excellent mines, and the management is experienced, aggressive and capable.

BUTTE & COEUR D'ALENE MINING CO. **MONTANA.**

Office: care of F. C. Robertson, Spokane, Wash. Mine office: Saltese, Missoula Co., Mont. Organized circa July, 1907, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, 9 claims, adjoining the Boston-Colby, having a 670′ crosscut tunnel showing a vein carrying oxidized copper ores of low average tenor and a 2′ vein of silver-lead ore assaying up to 10% lead and 100 oz. silver per ton.

BUTTE COMMERCIAL COPPER MINING & DEVELOPMENT CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. VI.

BUTTE CONSOLIDATED COPPER CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. Capt. Alvin P. Nipgen, president; Robt. J. Buckley, vice-president; Frank M. Douglass, secretary and treasurer; preceding officers, Dr. W. R. Lincoln and S. H. Johnson, directors. Organized Jan. 12, 1906, under laws of Montana, with capitalization $6,000,000, shares $1 par. Lands, 34 claims, area circa 500 acres, including 10 patented claims, known as the Susie group, adjoining the Butte & Bacorn on the north, having a 225′ tunnel and a 2-compartment 150′ shaft, latter very wet. Idle.

BUTTE CONSOLIDATED COPPER MINING CO. **MONTANA.**

Office: care of D. D. Twohy, president, Butte, Silver Bow Co., Mont. Mine office: Corbin, Jefferson Co., Mont. Martin Mulvahill, vice-president; preceding officers, C. D. McCarthy, T. J. Walsh and C. R. Gruwall, directors. Organized June 30, 1906, under laws of Montana, with capitalization $600,000, shares $1 par. Lands, northeast of the Corbin-Wickes, have a 300′ shaft with crosscut, seeking the Bertha vein, which has developed a little sulphide ore giving assays of 30 oz. silver. Has steam power.

BUTTE CONSOLIDATED MINING CO. **MONTANA.**

Dead. Property, known as the Red Lake Placers, including the Ella mine, is now held by the British Butte. Was promoted by J. Brown Goode, presumably the same as Jas. B. Goode, better known as "Jimmy Be Good," a notorious mining swindler of St. Louis. Formerly at Butte, Silver Bow Co., Mont.

BUTTE CONTINENTAL COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Dr. G. E. Blackburn, president; J. Bruce Kremer, vice-president; E. J. Baker, treasurer; C. E.

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Alsop, secretary; preceding officers and Fred Tomek, directors. Organized January, 1907, with capitalization $1,000,000. Lands, 8 claims, area 160 acres, partly patented, on the continental divide, about 5 miles east of Butte, showing a big vein, on which it is hoped that commercial ore may be found at circa 500′ depth. The Maryland claim has shafts of 50′ and 150′, latter showing about 4′ of ore giving assays of 3 to 8% copper.

BUTTE COPPER CO. **MONTANA.**

Dead. Held bonds on the Jessie and other claims. No relation to present Butte Copper Co. Formerly at Butte, Silver Bow Co., Mont.

BUTTE COPPER CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Organized March 13, 1906, with capitalization $1,500,000, shares $1.50 par. Is controlled, through stock ownership, by the Butte Copper Montana, and apparently is a twin of the Butte Copper Mining Co.

BUTTE COPPER BELT MINING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. VI.

BUTTE COPPER EXPLORATION CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Fully described Vol. VI.

BUTTE COPPER KING MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. Organized Apr. 19, 1906, under laws of Montana, with capitalization $1,500,000, shares $1.50 par. Lands, 3 fractional claims, area 28 acres, west of the Jennie Dell mine. In August, 1906, was said to plan sinking a shaft on the Missouri Girl claim, but nothing since heard of the proposed shaft.

BUTTE COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Organized March, 1906, with capitalization $1,500,000, shares $1.50 par. Is controlled, through ownership of majority of stock, by Butte Copper Montana, latter being practically a reorganization of the Butte Copper Co. Apparently is a twin of the Butte Copper Co.

BUTTE COPPER MINING & SMELTING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. V.

BUTTE COPPER MONTANA. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. C. E. Burrelle, president; E. H. Sherman, vice-president; John MacGinnis, general manager; W. L. Lawler, treasurer; preceding officers and W. L. Moyer, directors; Robt. Hauswirth, superintendent. Organized Dec. 1, 1906, under laws of Maine, with capitalization $1,750,000, shares $1 par. Trust Company of America, New York, transfer agent. Was practically a reorganization of the Butte Copper Mining Co., but apparently was formed without the knowledge of the Butte owners of the old company's lands and without notice to shareholders, plan of promotion seeming decidedly devious. Controls, through stock ownership, the Butte Copper Co. and Butte Copper Mining Co. Lands, owned or claimed to be owned, apparently are the Trifle, Anselmo 1 and 2, and a part interest in Robert Emmet 1 and 2. Lands lie just west of Missoula Gulch, there being a total of 5 patented claims, area circa 35 acres, but the Butte Copper Mining Co. apparently claims to own these lands outright. Lands are supposed to carry the Gagnon and Stewart veins, the North Anselmo vein supposedly being an extension of the Gagnon. Properties have produced about $700,000 in gold and silver, mainly in the latter, some bonanza ore in the past running up to 9,000 oz. silver per ton. Principal development is on the Trifle claim, which has a 700′ shaft, planned to be sunk to 1,000′ depth, which cut

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a large vein at depth of 375', this giving assays of about 4% copper from selected ores. Machinery plant is good for 1,000' depth. The Emmet claims have a 300' shaft, said to show 7% copper in the bottom when former operators were driven out by water and lack of cash. Work suspended July, 1907. Is not regarded favorably.

BUTTE COPPER & ZINC CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Alvin L. Strasburger, president; A. J. Seligman, vice-president; A. L. Bailey, secretary and treasurer; preceding officers, C. A. Wimpfheimer, Dr. Maurice Eisenberg, Bernard Naumburg, W. L. Moyer and V. Thiegeberg, directors. Organized Nov. 28, 1904, under laws of Maine, with capitalization $2,500,000, shares $5 par, practically as a reorganization of the Montana Zinc Co. Property is the Emma mine, which has proven a hoodoo to all of its possessors, and has brought to financial grief every company that ever attempted working it. Idle, and finances practically exhausted in paying for property.

BUTTE & CORBIN CONSOLIDATED COPPER MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Matthew Dunn, president; Lee Dever, vice-president; J. B. Fitzpatrick, secretary and treasurer. Organized April, 1907, under laws of Montana, with capitalization $700,000, shares $10 par. Lands, 5 claims, on the eastern side of Valparaiso Mountain. Development was interrupted by a suit of the Copper Mountain Mining & Smelting Co., decided April, 1908, in favor of the Butte & Corbin.

Development is by the Rarus tunnel, said to show an 11' vein assaying 2.5% copper, with a 4' paystreak carrying mainly covellite, assaying 6% copper, 8 oz. silver and $3 gold per ton. Is said to plan a new machinery plant.

BUTTE-CORBIN COPPER CO. **MONTANA.**

Office: care of R. P. Barclay, Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Organized Dec. 1, 1906, under laws of Montana, with capitalization $500,000, shares $1 par. Lands, sundry claims in the Corbin district, said to show 7' of high grade ore.

BUTTE-CURTIS & MAJORS COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Geo. D. Curtis, manager. Organized Sept. 20, 1906, under laws of Montana, with capitalization $1,000,000, shares $2 par. Lands, in the southern part of Butte, have a shaft circa 200' deep. Presumably idle.

BUTTE & DULUTH COPPER CO. **MONTANA.**

Office: care of Julius D. Howard, Duluth, Minn. Mine office: Butte, Silver Bow Co., Mont. Preceding officer, Fred Stroh, J. D. Welcome, Otto Stroh and Wm. Burrell, directors. Organized 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Property was an option on sundry lands in the Butte district.

BUTTE & ELLISTON GOLD & COPPER MINING CO. **MONTANA.**

Office: care of Patrick Wall, Butte, Mont. Letter returned unclaimed from former mine office, Elliston, Powell Co., Mont. Said, 1907, to be paying quarterly dividends of 1½ cents per share. Mine, 6 miles from Elliston, circa 300' deep, shipped ore, 1907, averaging about 8% copper, 17 oz. silver and $10 gold per ton. Employed circa 25 men at last accounts.

BUTTE & ELY COPPER CO. **NEVADA.**

Office: 130 Pennsylvania Bldg., Butte, Mont. Mine office: Ely, White Pine Co., Nev. F. L. Melcher, president; Malcolm Gillis, vice-president; Chas. L. Scott, secretary; John L. Carroll, treasurer; preceding officers, Dr. Tom D. Moore and E. F. Pelton, directors; J. B. Leggat, managing director. Organized July 27, 1905, under laws of Montana, with capitalization $500,000, shares

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$1 par. Stock was made assessable in 1907. Lands, 12 claims, area 210 acres, lying between the Nevada Consolidated and Giroux Consolidated, have shafts of 200', 200' and 300', latter with steam hoist, showing sulphide ore of low tenor, but of some promise, in all shafts. Property includes a water-right, 20 miles distant, said to be capable of supplying 2,000,000 gallons daily. Suspended operations late 1907.

BUTTE EXEMPTION COPPER CO. **MONTANA.**

Office: Spokane, Wash. Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Wm. A. Nicholls, president; F. J. Finucane, treasurer; Geo. Seely, secretary; N. E. Linsley, consulting engineer. Organized May 20, 1906, under laws of Maine, with capitalization $2,500,000, shares $1 par. Knickerbocker Trust Co., New York, registrar. Trust Co. of America, New York, transfer agent. Lands are the Mountain Spur claim and a ¾ interest in the Colleen Bawn, Canyon and Exemption claims, other fourth being owned by Butte Coalition Mining Co. Lands lie east of the Bullwhacker, and a tunnel on the Exemption claim has shown a small vein giving ore assaying 5% copper.

BUTTE & FURNACE CREEK COPPER MINING CO. **CALIFORNIA.**

Dead. Organized 1906; name changed, circa September, 1906, to Furnace Creek Extension Copper Co. Formerly at Greenwater, Inyo Co., Cal.

BUTTE-FURNACE RANGE COPPER CO. **CALIFORNIA.**

Office: care of Jos. H. Vivian, Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. Dr. H. D. McDonald, president; A. H. Mueller, secretary and treasurer. Organized June 15, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, adjoining the Furnace Creek Copper Co.

BUTTE GOLD, SILVER & COPPER CO. **WASHINGTON.**

Office: Spokane, Wash. Lands are about 25 miles from head of Lake Chelan, Washington, showing 2 veins, one 8' wide, opened by tunnels. Idle and apparently moribund.

BUTTE GREEN COPPER CO. **MONTANA.**

Office and mine: care of Samuel A. Hall, general manager, Butte, Silver Bow Co., Mont. Organized February, 1906, under laws of Montana, with capitalization $500,000, shares $1 par. Lands include the Green claim, near the Belmont mine of the Butte Coalition. Employed about 20 men, and was claimed to be producing 15 to 20 tons of good copper ore daily, in March, 1906, but shortly later dropped out of sight.

BUTTE & GREENWATER COPPER CO. **CALIFORNIA.**

Office: care of Wallace Corbett, president, Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. Daniel P. Murphy, vice-president; J. V. Shaw, secretary; O. O. Kinkaid, treasurer; preceding officers, John Adams and R. P. Kelley, directors. Organized October, 1906, under laws of South Dakota, with capitalization $1,500,000. Lands, 10 claims, near the center of the Greenwater district, showing 6 veins giving assays up to 6% copper. Has a 60' shaft. Idle.

BUTTE-HERCULES COPPER CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Thos. F. Stephens, president; D. J. Charles, vice-president; C. M. Parr, secretary; Geo. E. DeSnell, treasurer; preceding officers, Emil H. Renisch and C. S. Passmore, directors. Organized 1906, with capitalization $2,500,000. Lands, 10 claims, near the old Trenton concentrator, in the southwestern portion of the Butte district, slightly prospected by a 75' crosscut tunnel, said to show a 35' vein with 18" paystreak carrying medium grade values in copper, lead, silver and gold. Sunk a 100' shaft and suspended operations February, 1907.

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BUTTE HILL COPPER MINING CO. **MONTANA.**

Office: 1538-42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. James Higgins, president; Dr. Maurice Eisenberg, vice-president. Organized Apr. 18, 1906, under laws of Montana, with capitalization $5,000,000, shares $5 par. Lands, 11 claims, area 173 acres, in an undeveloped district north of Walkerville and about 1 mile from previous mining attempts. Has a 200′ shaft, cutting a vein of 40′ estimated width, showing a few stringers and bunches of ore assaying up to 3% copper and 20 oz. silver per ton. Idle at last accounts.

BUTTE & IDAHO GOLD & COPPER MINING CO. **IDAHO.**

Mine office: Salmon, Lemhi Co., Idaho. Wallace Corbett, president; A. L. Desourdy, vice-president; Dr. W. H. Haviland, secretary and treasurer; T. H. Emery, assistant secretary and treasurer. Lands, 6 claims, a millsite and a water right, on the northern fork of Carmen Creek, near Salmon, having a 207′ tunnel cutting a 6′ vein carrying medium grade auriferous and argentiferous copper ore, with other tunnels of 75′ and 150′ showing other ore bodies, mine having a total of 600′ of workings.

BUTTE & IOWA MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Apparently moribund.

BUTTE-KNICKERBOCKER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Geo. B. Conaway, vice-president and general manager; preceding officer, B. F. White; Geo. H. Roberts, Samuel H. Treloar and Thomas Davidson, directors. Organized Nov. 27, 1906, under laws of Montana, with capitalization $5,000,000, shares $5 par.

Lands are in 3 groups, the main group of 4 claims including the Jennie Dell, Twilight, October and La Monta claims, lying west of the Lexington and of Missoula Gulch. The Jennie Dell has a 450′ shaft, showing, at 358′, a 10′ ledge, supposedly the continuation of the Lexington vein, carrying about 1% copper, with small gold and silver values. Company is said to plan sinking a 200′ shaft on the La Monta claim.

The Determination group of 14 claims, said to have been secured early 1908, lies west of the Butte & Bradley and northwest of the Butte & Bacorn.

The Golden Leaf group, secured 1908, under a 2-year bond and lease, consists of 20 claims, near Bannock, Beaverhead county, Montana, and includes the Montana and Old Gold mines, latter having a mill, which it is planned to remodel.

BUTTE LODE EXTENSION MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. John MacGinnis, president; Chas. S. Warren, vice-president; John M. Murphy, secretary; C. J. Kelly, treasurer; preceding officers and Jos. Russell, directors. Organized Apr. 28, 1906, under laws of Montana, with capitalization $500,000, shares $1 par. Lands, 4 claims, known as the St. Angus group, 12 miles northeast of Butte, having a 150′ shaft with a crosscut showing 2 veins.

BUTTE & LONDON COPPER CO. **MONTANA.**

Dead. Organized 1905 and name changed, 1906, to Butte & London Copper Development Co. Formerly at Butte, Silver Bow Co., Mont.

BUTTE & LONDON COPPER DEVELOPMENT CO. **MONTANA.**

Office and mine: 46 East Broadway, Butte, Silver Bow Co., Mont. Hon. Theo. Brantley, president; James H. Lynch, vice-president; W. E. Reynolds, secretary; Alex. Johnston, treasurer; preceding officers, James A. Talbot, E. J. Anderson, Charles F. Booth, W. W. McDowell, Charles J. Kelly, Guy W. Stapleton, B. F. White and Herman B. Eisenberg, directors; T. H. Emery, assistant secretary; Thos. W. Heather, superintendent. Organized, 1905, under laws of Arizona, with capitalization $5,000,000, shares $5 par, as the Butte & London

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Copper Co.; title changed April, 1906. Company reported, circa June 1906, assets of $5,439,527.08, including cash and stock in the treasury, but suspended operations 1907 from lack of funds.

Lands, 113 acres, known as the Greendale placer claims, lying immediately north of the Pittsburg & Montana, and stated by management supposedly to carry the eastern extension of the veins of the North Butte, which is a rather remarkable claim, considering that the North Butte veins have as yet given no indications of a desire to turn at right angles in order to dive under the Greendale placers.

Development is by a 3-compartment 1,130′ shaft. North and south crosscuts on the 1,100′ level are said to show several veins, one up to 20′ in width, the southern crosscut showing ore assaying 2% copper, 50 oz. silver and $2 gold per ton, but no commercial ore has been developed.

Equipment includes four 125-h. p. boilers, Corliss double-conical drum hoist and a 5-drill air-compressor. Company in bad shape financially, at last accounts, and apparently under the necessity of raising fresh funds or reorganizing. Property, while not devoid of promise, is outside the proven ore zone of Butte.

BUTTE & MADISON MINING CO. **MONTANA.**

Mine office: Rochester, Madison Co., Mont. Has a 150′ two-compartment shaft.

BUTTE & MICHIGAN MINING CO. **MONTANA.**

Office and mine: care of Dr. Wm. S. Bishop, Butte, Silver Bow Co., Mont. Organized Apr. 28, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, in Leslie Gulch, 6 miles southeast of Butte and only 1½ miles southeast of the poor farm, have a 250′ shaft on the Julian claim. Presumably idle.

BUTTE-MILWAUKEE COPPER CO. **MONTANA.**

Office: care of G. M. Minzesheimer & Co., New York, N. Y. Mine offices: Owsley Blk., Butte, Silver Bow Co., Mont., and Argenta, Beaverhead Co., Mont. John F. Cowan, president and manager; B. E. Calkins, vice-president; C. H. Smith, secretary and treasurer; John H. Mills, superintendent. Organized March 28, 1906, under laws of Montana, with capitalization $3,000,000, shares $2 par. Is controlled, through ownership of about 80% of issued stock, by Butte & New York Copper Co., which exchanged 304,000 shares of its stock for 760,000 shares of treasury stock of the Butte-Milwaukee, there being some complaint by shareholders over this deal.

Lands, 6 claims, near the Butte & Argenta, at Argenta, on which apparently no work has been done, and 5 adjoining claims, known as the Pollock, Col. Sellers, Bird, Florence and Stonewall, about a mile north of the North Butte. Final payment on the Butte claims is due February, 1909.

The Pollock mine is said to have produced $400,000 worth of ore, some years ago, mainly in gold and silver, though a little ore running 2% copper and 15 oz. silver per ton, with small gold values, was produced, 1906, by present owners. The Pollock has 4 veins, of which 2 are developed by a short tunnel and 730′ shaft. Equipment includes a 5-ton Nordberg first-motion hoist, good for 2,000′ depth.

The Col. Sellers mine, having a 605′ shaft, is said to give promising surface indications. The Florence also has a shallow shaft. Work was resumed circa April, 1908, after some months idleness.

BUTTE MINE & EXPLORATION CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. VI.

BUTTE MINES EXPLORATION CO. **UTAH.**

Office: care of Wallace Corbett, director, Butte, Mont. Letter returned unclaimed from former mine office, Tecoma, Elko Co., Nev. Capitalization, $1,500,000. Lands are in Box Elder county, Utah, near the Nevada line.

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BUTTE MINING & DEVELOPMENT CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. II.

BUTTE MONITOR TUNNEL MINING CO. **MONTANA.**

Office: care of C. W. Pomeroy, vice-president, 63-263 La Salle St., Chicago, Ills. Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Wm. S. Switzer, president, secretary and treasurer. Capitalization, $3,750,000, shares $1 par. Lands, 7 claims, area circa 102 acres, opened by tunnels of 300′ and 1,300′, showing chalcopyrite averaging about 2% copper and 2 oz. silver per ton, with small gold values. Idle for some years.

BUTTE MONTANA MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. T. M. Barnsball, president; J. T. Browning, vice-president; W. H. Lindsay, secretary, treasurer and general manager; preceding officers, F. J. Bennett, J. K. McMullen, John B. Chatman and C. W. Whitcomb, directors. Organized Feb. 13, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. It is reported that F. Augustus Heinze is in control, but this is not credited.

Lands include the Alexander Scott and Little Annie claims. The Alex. Scott, said to be owned outright, is a fractional claim of about 5 acres area, adjoining the West Colusa mine on the north, having about 500′ of the strike of 4 veins, opened by a 1,050′ shaft, showing on the 600′ level an 18″ pay streak of high grade ore, mainly chalcocite, and it is claimed that $1,000,000 worth of ore has been blocked out on this level. In April, 1908, leasers were shipping, to the Pittsmont smelter, 75 to 100 tons weekly, of ore said to run 20% to 30% copper, with good gold and silver values, taken from the 600′ level. The Boston & Montana did some sinking, 1908, in the Alex. Scott shaft, for the purpose of reaching the fire zone in the Leonard and Colusa mines.

The Little Annie claim, lying between the Goldsmith and Little Georgia claims, northwest of Walkerville, has 200′ shaft, and is idle.

The Alex. Scott claim is most excellently located, and scarcely can fail to make a good mine, if properly developed. A reorganization is said to be planned.

BUTTE & NEW YORK COPPER CO. **MONTANA.**

Office: care of G. M. Minzesheimer & Co., New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Jas. A. Talbot, president; Harry E. Mittenthal and Wm. L. Moyer, vice-presidents; B. Binnard, secretary; Lee Schlesinger, treasurer. Organized circa October, 1906, under laws of South Dakota, with capitalization $4,000,000, shares $5 par. Is a holding company only, controlling the Butte-Milwaukee Copper Co. through ownership of about 80% of stock issue, having exchanged 304,000 shares of Butte & New York for 760,000 shares of the treasury stock of the Butte-Milwaukee, there being some complaint over the transfer by shareholders of the latter. Is said also to control, through total stock ownership, the Montana Consolidated Copper Co. Suit was brought April, 1907, for a share of the partnership profits of promotion by John C. McIntyre and Wm. Snidow.

BUTTE-NEW YORK COPPER CO. **MONTANA.**

Dead. New Jersey charter forfeited, 1903, account of unpaid taxes. Formerly at Butte, Silver Bow Co., Mont.

BUTTE NORTHERN COPPER CO. **MONTANA.**

Dead. Lands sold, 1906, to Butte Central & Boston Corporation. Formerly at Butte, Silver Bow Co., Mont. Described Vol. VI.

BUTTE-POTOSI MINING CO. **MONTANA.**

Mine office: Pony, Madison Co., Mont. Organized Dec. 1, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Has a 740′ tunnel, showing stringers of argentiferous copper sulphides assaying up to 25% copper and 21 oz. silver per ton with traces of gold. Idle early 1908, but said to plan resumption.

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BUTTE RANGE COPPER MINING CO. **MONTANA.**

Office: care of Geo. B. Conway, Butte, Mont. Organized Dec. 2, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par.

BUTTE & RED EAGLE COPPER CO. **MONTANA.**

Office and mine: care of A. A. McMillan, Butte, Silver Bow Co., Mont. Organized circa May, 1907, under laws of Montana, with capitalization $5,000,000, shares $5 par, by J. D. Slemons, Fayette Harrington, et al. Lands, 6 claims, southeast of the Butte & Bacorn, opened by a tunnel, circa 400′ long, on the Red Eagle claim, showing little or no ore.

BUTTE REDUCTION WORKS. **MONTANA.**

Owned by Colusa-Parrot Mining & Smelting Co.

BUTTERNUT GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Humboldt, Yavapai Co., Ariz.

BUTTE & ST. LOUIS MINING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont. Fully described Vol. VI.

BUTTE & SPOKANE MINING CO. **MONTANA.**

Office: care of Patrick Clark, Spokane, Wash. Mine office: Butte, Silver Bow Co., Mont. Organized 1905, to take over sundry claims at Butte. Apparently succeeded by Bullwhacker Copper Co.

BUTTE STANDARD COPPER MINING CO. **MONTANA.**

Office and mine: 51 East Broadway, Butte, Silver Bow Co., Mont. W. H. Hall, president; Hon. C. E. Nolan, vice-president; T. E. Collins, treasurer; preceding officers, J. L. Templeman and A. M. Stevens, directors. Organized circa May, 1907, under laws of Montana, with capitalization $1,000,000, shares $1 par.

BUTTE & SUMMIT VALLEY COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. C. D. Joslin, vice-president; Jas. A. Talbott, treasurer; J. W. Thomas, secretary; H. H. Taft, superintendent. Organized Apr. 9, 1906, under laws of Montana, with capitalization $3,000,000, shares $5 par. Lands, 5 claims, area 67 acres, in Saratoga Gulch, southeast of Butte, near the Ida-Montana, having 2 shafts, deepest 500′. Did some diamond drilling early 1908.

BUTTE & SUPERIOR COPPER CO. **MONTANA.**

Office: Duluth, Minn. Mine office: Butte, Silver Bow Co., Mont. Capt. Augustus B. Wolvin, president; presiding officer, Archibald M. Chisholm, W. L. Brown, Arthur H. Wethey, John F. Killoran and Thos. J. Davis, directors; Victor Rakowsky, consulting engineer; R. C. Davis, superintendent. Organized August, 1906, under laws of Arizona, with capitalization $6,000,000, shares $5 par. Bonds, $500,000, first-mortgage, at 8%, authorized; issued, $201,000.

Lands, 6 claims, including the Black Rock, Niagara, Raymond and Old Silver mines. Principal property is the Black Rock, which had a 500′ shaft that has been cut down to 3-compartment size, and was 1,175′ deep July 1, 1908. The Black Rock carries an exceptionally strong vein, ranging 50′ to 100′ in width, with mainly silver values, but with ore up to 3% in copper tenor on the 300′ level, with mainly zinc ore showing below. It is believed by the management that the zinc will be replaced, at considerable depth, by a large body of ore of commercial grade. The Black Rock shaft has a 60′ gallows frame.

The Niagara mine, worked by leasers, 1907, produced a little ore carrying up to 200 oz. silver per ton.

The plant at the Black Rock is exceptionally good, including 7 boilers, a 500-h. p. double-drum hoist good for 2,000′, air-compressor and a small electric plant. Buildings include combined engine-house and boiler-house, of steel and brick, a good carpenter shop and other necessary mine structures. Company

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plans to complete the electrification of its works, holding the steam plant in reserve as an auxiliary.

Production was suspended, late 1907, because of refusal of smelters to buy ore from leasers. Company has secured several extensions of payments due on its bond. The directorate includes a number of experienced and successful mining men. The property is outside the proven copper zone of Butte, but if the popular theory is correct, and zinc ore is succeeded by copper at depth, the Butte & Superior has excellent prospects of making a good mine.

BUTTE & VERONICA COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. John F. Hogan, Maurice Lenihan, M. H. McNulty, John J. Lenihan and Lewis P. Forestell, directors. Organized Apr. 20, 1906, under laws of Montana, with capitalization $1,500,000, shares $2.50 par. Lands, 2 claims, area 12 acres, west and south of the Belmont, opened by shafts of 70' and 130'. Shipped a little ore, 1906, ranging 5 to 10% copper tenor. Idle.

BUTTE & WALKER LAKE MINING CO. **NEVADA.**

Office: Butte, Silver Bow Co., Mont. Mine office: Loma, Esmeralda Co., Nev. Carroll E. Dolan, secretary and treasurer; F. A. E. Starr, superintendent. Lands, 3 miles south of Loma, are said to show, at 60' depth, a 50' vein in granite, carrying melaconite, malachite and chalcopyrite assaying 4.5% copper and $1 gold per ton.

BUTTE-WALLACE COPPER & SILVER MINING CO. **IDAHO.**

Mine office: Wallace, Shoshone Co., Idaho. Has 2 tunnels on a vein said to be 15' to 35' wide, with a 2-compartment blind shaft sunk from the lower level, showing ore giving assay values in copper and silver.

BUTTE-WALL STREET MINING CO. **MONTANA.**

Office: care of Geo. Benjamin, secretary, Boulder, Mont. Preceding officer, W. G. Northrop, E. L. Deno and F. H. Benjamin, directors. Organized circa May, 1907, with capitalization $1,500,000. Lands, adjoining the Baltimore mine, are said to show an 8' ore body.

BUTTE & WASHINGTON MINING CO. **WASHINGTON.**

Mine office: Orient, Stevens Co., Wash. Lands, at Hall Bridge, near Orient, have 2 tunnels, lower circa 200' long, said to show bornite and chalcopyrite associated with argentiferous galena and sphalerite.

BUTTE-YERINGTON MINE. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Lands, south of the Copper Mountain mine, have a 145' shaft.

BUTTON GOLD MINING CO. **ARIZONA.**

Dead. Formerly at Minnehaha, Yavapai Co., Ariz.

BY-CHANCE COPPER CO. **NEW MEXICO.**

Office: 517 Francis St., St. Joseph, Mo. Mine office: Orogrande, Otero Co., N. M. Geo. J. Greene, president; Geo. A. Guild, vice-president; T. G. Travis, secretary-treasurer; preceding officers, Ben Phillips and E. C. King, directors; Jas. J. Murray, general manager; I. Bohanna, mine superintendent; H. D. Reynolds, engineer. Organized March 29, 1906, under laws of New Mexico, with capitalization $2,000,000, shares $10 par; $1,000,000 issued. Officers and shareholders are closely connected with the Southwest Smelting & Refining Co. Annual meeting, first Thursday after first Tuesday in March. Lands, 4 claims, area 80 acres, in the Silver Hill district, showing two contact veins between granite and limestone, carrying chalcocite and chalcopyrite, estimated to average 3% copper, associated with pyrite, in a main vein of 25' estimated average width, opened by shafts of 25', 30' and 90', with a total of 325' of workings, estimated to give 10,000 tons of ore blocked out for stoping. About 250' of diamond drilling has been done. Has a 35-h. p. steam plant, with 3 mine buildings. Property is 3 miles from the Southwest

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smelter, to which ore is sent for reduction, cost of mining and transporting ore being estimated by company at $2 per ton.

MINA EL CABALLO. **MEXICO.**

Mine office: Indé, Durango, Mex. Wm. Benton, owner. Has cupriferous silver ores and steam power. Presumably idle.

CABAÑAS CONSOLIDATED COPPER CO.

Office: care of A. H. Rose, vice-president, 186 First Ave., San Francisco, Cal. Location of property, if any, not learned.

MINAS CAREZAS DEL PASTO. **SPAIN.**

Owned by Sociedad Colectiva C. & J. Sundheim.

CARINET RANGE MINING CO. **IDAHO.**

Office: care of Hon. Wm. C. Maybury, Detroit, Mich. Mine office: Priest River, Kootenai Co., Idaho. Lands, difficult of access, near the Priest Lake Mining Co., are on the west side of Priest River, about 10 miles north of Priest Lake, carry silver-lead and silver-copper ores, former carrying values mainly in silver, running up to 87 oz. per ton, and latter assaying up to 26% copper, 1% lead and 100 oz. silver per ton.

CABLE CONSOLIDATED MINING CO. **MONTANA.**

Office: care of Fred W. Bacorn, Butte, Mont. Mine office: Cable, Deer Lodge Co., Mont. Property includes the Cable gold mine and other properties, about 20 miles west of Anaconda, former having copper ore, opened 1906, on the tunnel level, this carrying an excess of iron, rendering it valuable for fluxing. Up to Feb. 15, 1907, had shipped 541 tons of copper ore averaging 3.84% copper to the Washoe smelter. Suspended operations late 1907, because of a Pittsburg bank failure, and resumed circa August, 1908.

CABRALES COPPER SYNDICATE, LTD. **SPAIN.**

Dead. Liquidated, voluntarily, 1906.

EPIGMENIO CABRERA. **MEXICO.**

Office and mine: Guachinango, Jalisco, Mex. Lands, 30 hectares, showing large ore bodies, carrying values in copper, silver and gold. There are some old workings, with limited development of a recent date. Idle at last accounts.

CABRERA MINING CO. **MEXICO.**

Dead. Formerly at Velardeña, Cuencamé, Durango, Mex.

CABULLONA DEVELOPMENT CO. **MEXICO.**

Office: Calumet, Mich. Operating office: Douglas, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mex. Thos. H. Collins, president and manager; Capt. Jas. Hoatson, vice-president; Capt. Thos. Hoatson, secretary and treasurer; Edw. McFarland, superintendent. Organized 1907, with capitalization $500,000, shares $10 par.

Lands, circa 2,000 hectares, extending from a point 16 miles south of Douglas to a vicinity immediately north of Fronteras, including the Sant Rosa group, area 126 hectares, 3½ miles from the Nacozari railroad, showing 3 contact veins, between porphyry and limestone, carrying ores reported by former owners to assay up to 37% copper, 35% lead and 20 oz. silver per ton, with small gold values, which figures are too high. Development is by 5 short tunnels and 5 shafts, No. 1 being 350′, and No. 3 being 300′ deep, showing pockets of ore in leached iron, with a 50′ ore body on the 200′ level. Equipment includes a good machinery plant, with a 50-h. p. engine, and about a dozen mine buildings. Former owners shipped a little ore to the Douglas smelter. Formerly employed circa 35 men, but company is understood to have surrendered bond and to have dismantled the plant.

BASILIO CACERES. **CHILE.**

Mine office: Pueblo Hundido, Antofagasta, Chile. Property is El Manto

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Tres Gracias, formerly a considerable producer, but reduced, 1903, to selection of rich ore from old dumps. The mine, however, shows large bodies of low to medium grade ore, and might become an important producer, if given adequate transportation facilities, now lacking.

MINAS y FUNDICION DE CACOMA. MEXICO.

Is the Mexican incorporation of the Cacoma Mining & Smelting Co.

CACOMA MINING & SMELTING CO. MEXICO.

Office: 820 Security Bldg., St. Louis, Mo. Mine office: Autlán, Jalisco, Mex. D. P. Richardson, president and treasurer; John Dee, vice-president and general manager; John Nesserly, secretary; John Mann, mine superintendent; M. E. Raines, smelter superintendent. Organized under laws of Arizona, with capitalization $1,000,000, shares $10 par, and protocolized in Mexico.

Lands are various groups in vicinity of Autlán, showing mainly fissure veins in diorite, of 5′ to 50′ width, carrying silver-lead ore and auriferous chalcopyrite, principal values apparently being in lead and zinc. One vein was worked to shallow depth, and length of nearly 3,000′, for gold, by a previous owner.

The Volcancillos mine, area 28 hectares, 12 miles west of Autlán, which is the principal property, shows a vein of 8 meters estimated average width, carrying chalcopyrite assaying 3 to 22% copper and $4 to $12 gold per ton, opened by about 1,000′ of tunnels and shafts. Massive chalcopyrite from the paystreaks formerly was selected and matted, copper therefrom being sold to native metal workers in the neighborhood.

The Purisima mine, area 24 hectares, 12 miles west of Autlán, has a 6′ vein of auriferous chalcopyrite, opened by circa 400′ of tunnels, and is said to have produced $60,000 in gold from oxidized surface ores.

El Paso mine, area 40 hectares, 12 miles west of Autlán, shows an 8′ vein, opened by a 150′ shaft, carrying copper, lead, silver and gold, values being mainly in silver-lead.

La Veta Grande mine, area 60 hectares, 30 miles west of Autlán, near a proposed railway line, is said to have a 200′ vein showing bornite at surface and chalcopyrite at depth, both auriferous. Several thousand horse power is available from the Autlán River at this point.

The Palestina mine, area 8 hectares, 12 miles west of Autlán, has a vein of 6 meters' width, opened by tunnels showing auriferous copper ore, and free gold has been taken, in considerable quantities, from surface workings.

The Olvidado mine, area 4 hectares, 12 miles west of Autlán, has an 8′ vein of auriferous copper ore, slightly developed by tunnel.

The San Luis mine, area 2 hectares, 12 miles west of Autlán, carries very low grade argentiferous ore, valuable mainly for fluxing.

El Cajon mine, area 8 hectares, 12 miles west of Autlán, slightly developed by shaft, has a 25′ vein of hematite, carrying silver and copper values, useful mainly for fluxing.

Miscellaneous properties are La Junta, area 6 hectares; San Carlos, 15 hectares; San Juan, 15 hectares; San José, 40 hectares; Anaconda, 11 hectares; El Tigre, 75 hectares, and Ouelitlán, 30 hectares. More or less work has been done on all of these properties, which are antiguas, formerly worked above the sulphide zone.

Mining equipment includes a steam plant, with boilers, pumps, etc.

Reduction works consist of a 10-ton mill and a 10-ton smelter, latter apparently left by former owners. Mill has a crusher, rolls and jigs, but the smelter is entirely inadequate for profitable production. Company is in litigation, with affairs considerably snarled, former owners alleging company's failure to comply with contract. Property considered valuable.

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CACTUS DEVELOPMENT CO. **ARIZONA.**

Office: Lonsdale Bldg., Duluth, Minn. Mine office: Globe, Gila Co., Ariz. Employs circa 30 men. W. A. Eaton, president; H. B. Fryberger, vice-president; H. L. Palmer, secretary and treasurer; preceding officers are present directors, but four additional directors are to be named, 1909; C. W. Pritchett, general manager and consulting engineer; Thos. W. Hamilton, superintendent. Organized October, 1908, under laws of Minnesota, with capitalization $500,000, shares $1 par. Company sold 480,000 shares at 60 cents, for cash, giving a net cash fund of $288,000, available for development, 20,000 shares going to owners of lands.

Lands, 33 claims, area circa 600 acres, in 2 groups, held under bonds and leases aggregating $415,000, of which $20,000 was paid on organization, leaving $395,000 due on bonds, in easy installments, over a 7-year period, expiring 1916. Property is 4 miles west of the Miami, on Pinto Creek, which runs through the southern part of the lands, and is circa 14 miles from Globe, with a fairly good wagon road between. The Miami is to have railway connections shortly.

The property shows a formation markedly similar to that of the Miami, with an even better surface showing of iron stains. The lands carry an area of highly altered schist, surrounded by areas of intrusive and extrusive igneous rocks, similar to the holdings of the Miami and Inspiration mines, 4 miles east, and the schistose areas of the Cactus and Miami district undoubtedly were continuous, at some ancient period, but were divided by intrusions of igneous rocks, and subsequent erosion. The schist is very old, and extensively metamorphosed, and apparently was of sedimentary origin. The schist is fractured and crumpled, this affording a basis of subsequent mineralization through forming innumerable cracks and crevices, there being an enormous area of coarsely brecciated schist, well suited for the circulation of mineral-bearing solutions and deposition of ores. The management hopes to develop a large body of cupriferous altered schist, similar to that of the Miami. Payable values were found in the Miami at depth of circa 230′, and apparently should be found at depth of 200′ to 300′ in the Cactus.

Old workings, by former owners, consist of a number of short tunnels and a 300′ two-compartment shaft, sunk at the southern end of the property. The old shaft has been abandoned, as it was sunk on a fault-plane showing copper stains, but not likely to prove workable, as the fault was of a comparatively late period, hence the old workings are of no present value. Present development is by a 2-compartment shaft, started Nov. 30, 1908, which is for exploratory purposes only, as the location of permanent shafts will depend upon developments at depth.

Equipment includes a 60-h. p. boiler and a small hoist. Buildings include a smithy, boarding-house and tent-houses for workmen.

Mr. Pritchett estimates that about 2 years will be required to develop a large mine, if ore is found as expected, and that about $1,000,000 will be required to build a large modern concentrator, with another year or 18 months needed for equipment and beginning of production on a large scale. The property has an excellent management, and is of unusual promise, differing from most new mining promotions in that it is practically certain to make either a very large mine or no mine at all, with chances favoring the making of a large mine.

CACTUS MINE. **UTAH.**

Owned by Newhouse Mines & Smelters.

CACTUS SMELTING & COPPER CO. **UTAH.**

Dead. Absorbed by Royal Copper Mining Co., now Newhouse Mines & Smelters. Formerly at Newhouse, Beaver Co., Utah.

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CADENA DE COBRE MINING CO. **MEXICO.**

Office: Secretary, Bisbee, Ariz. Emil Marks, president; H. L. Fenner, vice-president; M. Newman, treasurer; R. C. Stanford, secretary; preceding officers, John W. Gillingham, John Falls, John Pennypacker, H. W. Aiken and C. A. McDonald, directors. Organized Dec. 24, 1904. Lands, circa 250 pertenencias, in the Sahuaripa district of Sonora, Mexico, developed by 3 tunnels, said to show good ore. Company paid for lands, but former officers seem to have vested titles in their own names. Ernest E. Hughes, former president, was deposed early in 1906, and present management sued former officers to cancel the issue of 550,000 shares of stock, which said officers voted themselves as a gratuity. According to statement of new management, the old officers simply stole the 550,000 shares. The case seems a parellel to that of the South Bisbee.

CADIA COPPER MINING & SMELTING SYNDICATE. **AUSTRALIA.**

Mine and works office: Cadia, N. S. W., Australia. Mine, in the Orange district, has shown payable ore from surface, ranging from 5 to 13% in copper tenor. Has a smelter, built 1906-1907, with 4 reverberatory furnaces, and employs about 150 men. Production, 1906, was 1,043,840 lbs. fine copper. Property considered valuable.

CADIA EXTENDED MINE. **AUSTRALIA.**

Office: Newcastle, N. S. W., Australia. Mine office: Cadia, N. S. W., Australia. Property, on Waterfall Creek, about 1½ miles from Cadia, known formerly as the Little Canoblas, shows a tremendous blowout, and a remarkably wide gossan of low grade iron ore. A number of shallow shafts show native copper, carbonate and sulphide ores and tetrahedrite. Formerly considerable cupriferous iron ore was taken from this mine for fluxing the ores of the Cadia property. Property considered promising.

SOCIEDAD ANONIMA MINAS DE CALA. **SPAIN.**

Office: Bilbao, Spain. Mine office: Cala, Santa Olalla, Huelva, Spain. Conde de Rodas, president; Don Emilio Vallejo, secretary. Organized Aug. 31, 1900, under laws of Spain, with capitalization 15,000,000 pesetas. Property is a group of 8 mines, area 346 hectares, at Cala, carrying magnetic iron ore and cupriferous pyrites, ore bodies apparently being extensive. Company is supposed to have built a 97-kilometer railroad, from the mines to San Juan del Aznalfarache, on the Guadalquivir River, in the adjoining province of Sevilla. Presumably idle.

CALABASAS COPPER CO., LTD. **ARIZONA.**

Dead. A swindle, perpetrated by Douglas, Lacey & Co., 66 Broadway, New York, N. Y. For methods of this firm see article on Amalgamated Gold & Copper Co. Formerly at Patagonia, Santa Cruz Co., Ariz.

COMPAÑIA DE MINAS i FUNDICION DE CALAMA. **CHILE.**

Office: Valparaiso, Chile. Mine office: San José del Abra, Calama, Antofagasta, Chile. Works office: Calama, Antofagasta, Chile. Organized Apr. 16, 1903, under laws of Chile, with capitalization 600,000 pesos, shares 100 pesos par, and reorganized, Apr. 31, 1903, under laws of Chile, with capitalization £250,000, shares £1 par. Lands, in the desert, 2 kilometers east of Calama, produce ores of 10 to 13% in copper tenor. Has a hydro-electric power installation, with 260-h. p. turbine, direct-connected with a 250-h. p. dynamo, taking water from the Rio Loa, 1 mile distant. Has a small concentrator with 1 crusher and 3 jigs. Smelter, known as Los Chorillos, has 3 reverberatory calciners and a 5′ cylindrical blast-furnace, also a furnace for calcining limestone used for making briquettes, and turns out ejes of 46.3% average copper tenor. In 1903 one ton of coke was required for smelting 1.6 tons of charge, slags averaging 0.5% copper. Wages at smelter are high, av-

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eraging 4 pesos per day. Production, 1908, was 1,717,035 lbs. fine copper, and should have been much larger for 1907. Is an important property with a vigorous management.

CALVERAS MINING ASSOCIATION. **NEW MEXICO.**

Mine office: Alamagordo, Otero Co., N. M. E. A. Hersperder, superintendent, at last accounts. Lands include the Black Burro mine, showing sulphide ores of copper and lead. Perhaps succeeded by Calaveras Mining Co.

CALAVERAS MINING CO. **NEW MEXICO.**

Letter returned unclaimed from former office, Pittsburg, Pa. Mine office: Jarilla, Otero Co., N. M. Property is the Garnet mine, held under lease. Main shaft, 400', shows sulphide ore, with gold and silver values. Has shipped some good ore netting $900 to $1,500 per car.

CALCANTE MINES. **ITALY.**

Mine office: Traves, Torino, Italy. Property, in the western Alps of Piedmont, formerly was a considerable producer of nickel, cobalt and copper, latter from chalcopyrite, found in stratified archaic rocks. Idle at last accounts.

MANUEL CALDERON. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Property is the San Augustin mine, worked in a primitive way, which is a small producer of native copper carried in conglomerate rock.

CALDWELL COPPER CO. **MICHIGAN.**

Dead. Absorbed December, 1906, by La Salle Copper Co. Was organized June 11, 1906, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Lands were 560 acres, south and west of the Tecumseh. Formerly at Calumet, Houghton Co., Mich.

CALEDON COPPER CO. **TRANSVAAL.**

Mine office: Zoutpansberg, Transvaal. Lands are 96 claims on Farm Monfarland No. 1435, adjoining the Messina Extension; 96 claims on Farm Sumpe No. 1439; 206 claims immediately west and 300 claims immediately east of M'Tamba, and 204 claims adjoining the Amatola. Apparently only surface trenching has been done, though company planned, 1907, starting a shaft.

CALEDONIA COPPER CO., LTD. **NEW CALEDONIA.**

Dead. Was promoted by the notorious London & Globe Finance Corporation, Ltd., and was robbed before born. Property sold to Australian Smelting Corporation, Ltd. Formerly at Noumea, Diahot, New Caledonia. Fully described Vol. VI.

CALEDONIA GOLD & COPPER MINING CO. **IDAHO.**

Mine office: Wallace, Shoshone Co., Idaho. Lands supposedly are in the vicinity of Stevens Peak.

CALEDONIAN EXPLORATION CO. **MEXICO.**

Dead. Formerly at San Nicolás del Oro, Coyuca de Catalán, Guanajuato, Mex.

CALEDONIAN MINING CORPORATION, LTD. **NEW CALEDONIA.**

Dead. Liquidated, voluntarily, December, 1903. Formerly at Noumea, Diahot, New Caledonia.

COMPAÑIA MINA DE CALIFORNIA. **MEXICO.**

Dead. Formerly at Cumuripa, Guaymas, Sonora, Mex.

CALIFORNIA-ALASKA MINING & DEVELOPMENT CO. **ALASKA.**

Mine office: Valdez, Alaska. Capt. Austin E. Lathrop, manager. Lands, near the Alaska Consolidated Copper Co., in the Copper River district, produced an 800-lb. mass of native copper, 1908.

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CALIFORNIA-AMECA MINING CO. **MEXICO.**

Mine office: Ameca, Jalisco, Mex. Property is the San Pedro mine, showing copper ore. Presumably idle.

CALIFORNIA-ARIZONA COPPER CO. **ARIZONA.**

Mine office: Wellton, Yuma Co., Ariz. F. A. Meyer, superintendent. Property has tunnels of 100′ and 160′, and was developing, with a small force, at last accounts.

CALIFORNIA & ARIZONA COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Ft. Huachuca, Cochise Co., Ariz. Described Vol. IV.

CALIFORNIA & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Ft. Huachuca, Cochise Co., Ariz. Described Vol. VI.

CALIFORNIA & ARIZONA GOLD & COPPER CO. **ARIZONA.**

Office: 622 Citizens National Bank Bldg., Los Angeles, Cal. Jos. C. Erman, president; Selwin J. Michelson, vice-president; Jos. Wilkinson, secretary and treasurer.

CALIFORNIA COPPER CO. **CALIFORNIA.**

Dead. Succeeded, August, 1906, by California-Nevada Copper Co. Formerly at Daulton, Madera Co., Cal.

CALIFORNIA COPPER KING CO. **CALIFORNIA.**

Dead. Formerly in Riverside County, California. Described Vol. III.

CALIFORNIA-CORONA MINING & MILLING CO. **CALIFORNIA.**

Office: care of W. S. Zehring, secretary, Salt Lake City, Utah. Mine office: Manvel, San Bernardino Co., Cal. W. J. Craig, president; J. W. Currie, vice-president; E. O. Howard, treasurer; preceding officers, Harrison O. Shepard, A. W. Smith and Andrew T. Stahl, directors; Alex Colbath, Jr., superintendent. Organized December, 1906, under laws of Utah, with capitalization $600,000, shares $2 par. Lands, 16 claims, 8 patented, circa 5 miles north of Manvel and about 7 miles from the Salt Lake railroad, showing auriferous and argentiferous copper and lead sulphides with quartz gangue, well suited to concentration. Mine is said to have considerable ore of good grade blocked out for stoping.

CALIFORNIA GOLD & COPPER CO. **CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, president; Otto Noehler, general manager. Has auriferous and argentiferous copper ores, with water and electric power, and shipped, 1907, a little high grade ore to Shasta County smelters. Possibly succeeded by Mineral Hill Mining & Smelting Co.

CALIFORNIA GOLD & COPPER CO. **CALIFORNIA.**

Office: 354 South Hill St., Los Angeles, Cal. Mine office: Vontrigger, San Bernardino Co., Cal. A. H. Cram, president and general manager; C. W. Page, vice-president; H. C. Hibbard, secretary. Organized, 1904, with capitalization $500,000.

Lands, 9 claims, 2 miles from Vontrigger, including the Vontrigger mine, having contact deposits between granite, quartzite and limestone, with diorite dykes. Property is said to carry 8 clearly defined parallel veins of slightly auriferous copper ore in 2 ore zones of 200′ to 300′ width. Below the oxidized zone of circa 80′ depth ore is reported to range 9 to 15% in copper tenor, with fair gold and silver values. Development is by shafts of 100′, 150′ and 317′, and a 350′ tunnel, with about 4,000′ of workings, deepest shaft being bottomed in ore giving average assays of about 20% copper, with gold values up to $3 per ton.

Mine has gasoline power, and pipes water 6½ miles from Hackberry Springs to a 40x50x7′ reservoir. Has circa 15,000 tons of ore on the dump, secured from development work, and has shipped carload lots of ore returning 8.7 to 10.9% copper, with small gold and silver values. Is experimenting

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with an electrolytic reduction plant, and is said to plan a 200-ton concentrator. Property considered promising.

CALIFORNIA IMPROVEMENT CO. **CALIFORNIA.**

Office: 101 Sansome St., San Francisco, Cal. Mine office: Mills College, Alameda Co., Cal. F. M. Smith, president and general manager. Property is the Leona Heights mine, in the outskirts of Oakland, producing cupriferous pyrite, carrying 1 to 2% copper and about 45% sulphur. Production, 1905, was 4,303 tons of pyrite, valued at $18,958.57, shipped crude to acid-makers.

CALIFORNIA & MASSACHUSETTS COPPER MINING CO. **CALIFORNIA.**

Mine office: Red Bluff, Tehama Co., Cal. N. E. Guyot, manager; Eugene Burrill, foreman. Lands, circa 40 claims, unpatented, west of Red Bluff, in Section 25, Township 27 North, Range 9 West, known as Tom Head mine, which have been bored by diamond drill. Property shows a 24' vein carrying native copper, bornite and chalcopyrite, and considerable ore of medium and high grade has been blocked out. Equipment includes a hoist, 2 air-compressors and a sawmill. Plans were prepared tentatively, 1907, for a 300-ton smelter, to have electric power. Idle at last accounts.

CALIFORNIA MINING CO. **UTAH.**

Dead. Formerly at Park City, Summit Co., Utah. Described Vol. VI.

CALIFORNIA MOUNTAIN MINING CO. **COLORADO.**

Mine office: Eureka, San Juan Co., Colo. A. H. Kunkle, superintendent. Has auriferous and argentiferous ores of lead, copper and zinc, with electric power.

CALIFORNIAN COPPER SYNDICATE, LTD. **CALIFORNIA.**

Dead. Succeeded, April, 1902, by Fresno Copper Co., Ltd. Formerly at Clovis, Fresno Co., Cal.

CALIFORNIA-NEVADA COPPER CO. **CALIFORNIA.**

Office: 1801-43 Exchange Place, New York, N. Y. Mine office: Daulton, Madera Co., Cal. F. L. Underwood, president; E. B. Van Norden, treasurer; Horace Mitchell, clerk; W. C. Brace, manager. Organized Aug. 11, 1906, under laws of Maine, with capitalization $2,500,000, shares $5 par; issued, $1,375,000. Has authorized a bond issue of $2,500,000, at 7%, convertible into stock within 5 years. Controls, through stock ownership, the Bristol Consolidated Mines & Smelting Co., and owns the Ne Plus Ultra mine, near Daulton, formerly held by the California Copper Co., having refractory ores that have proven difficult of economical reduction. The Ne Plus Ultra has a 100-ton smelter, which is not a success. Company also owns the Aetna gold mine, near the Treadwell mine, Alaska, said to show a vein of 50' to 100' width, traceable 3 miles, carrying an average of $3.50 gold per ton.

CALIFORNIA-NEVADA MINING & MILLING CO. **CALIFORNIA.**

Office: care of E. S. Collett, secretary, Denver, Colo. Mine office: Bishop, Inyo Co., Cal. B. Gregory, president; J. E. Reinhart, treasurer; Albert E. Gregory, superintendent. Organized Dec. 7, 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 10 claims, at the head of Black Cañon, 5 miles north of Cedar Flat and circa 16 miles southeast of Bishop, developed by a number of 10' pits and tunnels, said to show well-defined veins carrying auriferous and argentiferous copper and lead ores.

MINA DA CALINNHA. **PORTUGAL.**

Office: care of M. Paul Chapuy, manager, Santa Appolonia, Lisbon, Portugal. Supposedly owned by a French company. Property is in Portugal, presumably in province of Alemtejo. Is a small exporter of cupriferous iron pyrites to England.

CALLINGTON COPPER MINING CO. **AUSTRALIA.**

Mine office: Callington, South Australia. Mine is opened to depth of

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600' and length of 700', on a vein circa 16' wide. Company asks an advance of £1,000 from the government, for the reopening of the mine, which has been idle since 1875.

CALSTOCK TIN & COPPER, LTD. **ENGLAND.**

Offices: 16 Place Vendome, Paris, France, and 30 Moorgate St., London, E. C., England. Mine office: Calstock, Cornwall, England. Geo. Robinson, chairman; G. Gilnicki, mine manager; John A. Russell, secretary. Organized May 5, 1900, under laws of Great Britain, with capitalization £60,000, shares £1 par; issued, £63,988. Debentures, £14,120, at 5%. Property is the Prince of Wales tin mine, and sundry mineral licenses on adjoining property. Has a 56-stamp mill. Idle.

CALUMET & ALGOMA DEVELOPMENT CO. **ONTARIO.**

Dead. Succeeded, 1903, by Hermina Mining Co., Ltd. Formerly at Massey, Algoma, Ont.

CALUMET & ALGOMA MINING CO. **ONTARIO.**

Office: 109 Fifth St., Calumet, Mich. Mine office: Massey Station, Algoma, Ont. Joseph Hermann, chairman; Lucas Hermann, secretary. Organized, circa 1905, with capitalization $1,000,000, shares $1 par, as successor to Copper Queen Mining Co., Ltd. Lands, 1,166 acres, showing a 45' fissure vein, traceable circa 3 miles, carrying medium grade chalcopyrite, more or less auriferous, with occasional bornite and malachite, and giving assays of 5 to 25% copper. Has 2 shafts, No. 1 being 138' deep, and 2 tunnels, longest 195'. Lands are heavily timbered and well watered. Is in bad shape financially. Idle several years and practically moribund.

CALUMET & ARIZONA MINING CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Works office: Douglas, Cochise Co., Ariz. Chas. Briggs, president; Capt. Jas. Hoatson, vice-president; Capt. Thos. Hoatson, second vice-president; Louis W. Powell, third vice-president and general manager; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thos. F. Cole, Geo. E. Tener, Chester A. Congdon and Chas. d'Autremont, Jr., directors; Jas. Wood, smelter superintendent; Henry B. Paull, auditor; W. E. McKee, master mechanic; W. H. Whitley, engineer; J. N. Kinsey, smelter clerk; John Collins, mine foreman; A. J. McDermott, smelter foreman.

Organized March, 1901, under laws of Arizona, with capitalization $2,500,000, shares $10 par; issued, $2,000,000. Annual meeting, second Monday in April. Merchants & Miners Bank, Calumet, Mich., registrar. Shares are listed on the Boston stock exchange. Has paid dividends as follows: $6.50 per share in 1904; $8.50 in 1905; $13 in 1906, and $16.50 in 1907. Dividends for 3 first quarters of 1908 were $1 each, giving total dividend payments, to Sept. 1, 1908, of $7,500,000. Ended 1907 with quick assets of $3,383,732, including $1,297,387.31 in demand loans and bills and accounts receivable; $1,240,474.32 in cash and copper on hand at 12½ cents per pound, and $105,250 shares owned in other companies. Total liabilities were $277,908.52. Company holds bonds and options on various properties aggregating $900,000, and during 1907 expended $315,443.55 for development work on properties under option, and made payments on options of $58,911.97, a total of $374,357.52.

Lands include the original mining claims at Bisbee, the Mammoth group, bought 1907, and the 640-acre smelter-site at Douglas, with various other groups of Arizona claims, held under bond and lease.

The Calumet & Arizona mine proper includes 12 claims, patented, area 173 acres, adjoining the Copper Queen, side-line agreements with the Copper Queen insuring freedom from possible litigation, and continuance of the present exceedingly neighborly relations. The mine is opened in limestone, near

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a porphyry contact, with occasional porphyritic intrusions. The surface gives small indications of values, showing but small and infrequent outcrops, the existence of the Irish Mag ore bodies having been inferred from underground work in the adjoining shafts of the Copper Queen, after careful study of the general geological conditions of the district. Ore occurs in highly irregular bodies, the mine showing native copper, cuprite, melaconite, malachite, azurite, chalcocite and chalcopyrite, usually with a talcose gangue, and with considerable hematite and manganese ores, the latter carrying malachite in small disseminated nodules, and frequently averaging 10 to 18% in copper. The ore, which is practically self-fluxing, averages about 2 oz. silver and 0.05 oz. gold per ton, as smelted. The ore bodies are extensively developed, but are not largely blocked out, owing to the constant shifting of the ground, caused by the creeping of the mountain above, as is the case at the neighboring Copper Queen mine, requiring very heavy timbering, with frequent bulkheading, and constant care for all openings, which renders it prudent to keep costs down by blocking out ore but a comparatively short time ahead of actual stoping requirements. Timber is secured from a great distance, and to guard against emergencies large stocks are carried. The mine as a whole is not especially wet. A mine fire, 1907, caused some trouble, but was overcome speedily. New openings, 1907, were 23,016'.

The Irish Mag shaft, sunk on a single 20-acre claim, was the original mine of the Calumet & Arizona. This property has a well-timbered, 4-compartment vertical shaft of 1,298' depth, sunk in hard limestone throughout, except where occasional ore bodies were cut, rendering the shaft safe from drawing. Levels are opened at 100' intervals, from 750' to 1,250' inclusive, the upper levels showing exceedingly rich ore, there being entire stopes assaying up to nearly or quite 40% in copper. In 1907 four new bodies of high grade ore were opened on the 1,150' and 1,250' levels. The Mag shaft has an auxiliary double hoist on the 1,050' level. The shaft has a 78' steel gallows frame and a 114' ore-bin, with a 20x60" direct-acting Nordberg hoist, capable of raising a 3-deck cage at the rate of 2,000' per minute from a depth of 1,600'. This hoist has raised, for some years, about 600 tons of ore daily, from an average depth of 1,000', besides caring for men, timber and tools, and the Irish Mag shaft was operated continuously, for 5 years, without the loss of a day's time, probably establishing a world's record.

The 4-compartment Oliver shaft, 1,150' deep, is bottomed on the same level as the Irish Mag, the collar of the Oliver being 150' lower than the Mag, and 50' higher than the collar of the Lowell shaft of the Copper Queen. The Oliver shaft, developing both of the Senator claims, shows large bodies of high grade ore, having first cut ore at 710', or about 300' higher than ore was found in the Lowell shaft. The lower workings show rich sulphides, with high grade oxidized ores above, there being large stopes of high grade oxidized ores in the upper levels, practically untouched, except for opening work. The Oliver shaft has a 600-gallon Nordberg electric pump, which is giving good service, and on the surface is a powerful Nordberg hoist.

The Buckeye claim has been explored, and slightly developed, by crosscuts from the Oliver shaft, and from the Cole shaft of the Superior & Pittsburg, there being a good body of sulphide ore opened on the 1,050' and 1,150' levels.

The Pride claim has a promising ore body, opened by a drift from the 1,250' level of the Irish Mag shaft.

The Gibraltar claim, which is the southernmost, wedges into the holdings of the Superior & Pittsburg. The Gibraltar has several exploring shafts and trenches, showing iron and a little low grade copper ore of promising appearance, though below commercial tenor.

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The Wagner and Hope claims, lying circa 2,000′ southwest of the Irish Mag shaft, adjoin the Pittsburg & Duluth mine of the Superior & Pittsburg, and have been explored by a crosscut from the Mag that traversed 600′ of Copper Queen ground, stopping about half way across the Wagner and Hope group, showing nothing of especial promise.

The Washington, Angel and Old Republic claims lie on the porphyry side of the gulch, and were secured mainly as a possible smelter-site, then being considered of little promise for mineral, but, in view of developments in the Junction and Calumet & Pittsburg mines of the Superior & Pittsburg, these claims are of possible mineral value.

The surface equipment and machinery plant at the mine is very complete. The original plant was clustered about the Irish Mag shaft, on a steep hillside, where limited room was secured by grading, but later equipment includes extensive buildings at the Oliver shaft and elsewhere. The boiler plant at the Oliver has five 280-h. p. marine boilers, burning crude petroleum. The principal compressor plant at the Oliver has a 35-drill Sullivan-Corliss cross-compound 2-stage air-compressor, with 17x34″ steam cylinder and 20x34″ air cylinder, having a piston displacement of 6,600 cubic feet of free air per minute. There also are 3 class WB2 Sullivan straight-line air-compressors. Much of the ore is so soft that it can be bored with a breast-auger, thus reducing requirements in the way of air for power drills. Electricity is used extensively on surface, and also for pumping. The electric power plant at the Oliver shaft has 300-kw. and 500-kw. Westinghouse-Parsons 2,200-volt, 60-cycle, 3-phase turbo-generators, two 220-kw., 2,200-volt, 60-cycle, 3-phase motors, direct-connected with the steam turbine, a 300-kw. General Electric rotary converter, transforming a 2,200-volt alternating current to a 550-volt direct current, for operating the street-car line to Warren, four 40-h. p. Buffalo vertical engines, direct-connected to four 25-kw., 115-volt Crocker-Wheeler generators for electric light and power for ventilating fans, and various minor electrical machinery. An automatic telephone system, having 25 stations underground and on the surface, is connected with the smelter at Douglas.

The new steel-frame machine shop is divided into two 60x48′ parts, for the machine shop and smithy. Adjoining is a plate shop, 40x128′, of steel frame, with corrugated iron roof and siding. There is a framing mill at the Mag shaft, also a warehouse and office building. A 60x125′ administration building is planned to be erected at Warren, the townsite adjacent to the Calumet & Arizona and Superior & Pittsburg mines. A hospital with an efficient staff is maintained for employes, and a model changing house has hot and cold running water, tub and shower baths and lockers for 500 men. Fire protection is furnished by direct pipe-lines to large storage tanks, giving an effective pressure of 100 pounds, with hose-houses and hose-carts at each shaft, all hose-couplings being made to connect with those of the Bisbee fire department.

The Mammoth group of 35 claims, also known as the Scanlon or Clark-Scanlon property, in the Copper Creek district, 16 miles northeast of Mammoth, Pinal Co., Ariz., was bought September, 1908, when the final payment of $125,000 was made thereon. The Mammoth property has been bored extensively by diamond drills, giving good cores, and has a 2-compartment working shaft, with several levels opened, the workings blocking out considerable high grade sulphide ore. It is said that the company plans a 15-mile railroad from Copper Creek to the Mammoth mine.

The Costello-Casey group, 5 claims, sometimes known as the Collins group, near the Leadville mine, at Pearce, Cochise county, is held under bond, time of final payment having been extended to March 30, 1909. Two shafts are

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sinking, showing considerable good carbonate and sulphide ore, and prospects are promising. Bond on the Leadville property at Pearce was forfeited circa 1907.

The smelter is at Douglas, 25 miles from the mine, receiving ore over the El Paso & Southwestern railway, at a very favorable freight rate. The first stack was blown in Nov. 15, 1902, but in 1907-1908 the works were so thoroughly enlarged and overhauled as to amount to a practical rebuilding, the old equipment having 1,500 tons daily capacity, while the new equipment, when completed, will give 3,500 tons, daily capacity, providing for the smelting of Superior & Pittsburg ores, as well as the reduction of ores of the Calumet & Arizona.

Ore is received at the works in new steel ore-bins circa 200′ in length, with 2 rows of 180 chutes, bins being surmounted by a railway track. The entire plant is served by a standard-gauge railway line, having tracks to each furnace and to every department of the works.

The blast-furnace building, of steel frame, is 50x208′ in size, having a steel dust-chamber, and steel smokestack 200′ high and 16′ in diameter. The old equipment consisted of five 300-ton furnaces, and a sixth furnace, of 500 tons daily capacity, was blown in circa September, 1908. The 5 old furnaces are to be overhauled and lengthened, making each of 500 tons daily capacity, and a seventh 500-ton blast-furnace is to be installed, giving the works a nominal capacity of 3,500 tons daily, though in practice it is likely that one furnace will be held as a spare, giving an actual working capacity of 3,000 tons daily. The management is considering the building of a reverberatory furnace, for treatment of flue dust and slags.

The converter building, widened 15′ in 1905 and lengthened 30′ in 1907, has 4 stands which have been moved to the opposite side of the building in order to give room for 2 additional furnaces. Matte is discharged into tilting wells, and taken thence by 3 electric traveling cranes to the converters, which turn out blister copper of 99.2% tenor, carrying small gold and silver values, which is shipped to the Nichols Copper Co., New York, for refining. A new dust-chamber has been built for the converter flue. The lining plant of the converter department has a silica mill operated by a 180-h. p. motor, and the briquetting plant is operated by a 100-h. p. motor.

The old power-house, 80x160′ in size, was increased, 1907, by the building of a transverse section 100x100′ in size, the new building being divided through the center by a row of columns into 2 bays, each 55′ wide, and each served by a 10-ton hand-power traveling crane. The machinery equipment of the power plant has been greatly enlarged, and includes a 500-kw., 440-volt, 60-cycle, 3-phase Allis-Chalmers-Parsons turbo-generator, a 160-kw. synchronous motor generator set, which can be run to furnish electric energy at various voltages, and with either an alternating or direct current; an 850-h. p. Nordberg steam engine; a 400-h. p. engine running 2 Nordberg air-compressors, with cross-compound steam ends having 22″ and 42″ cylinders and 48″ stroke, and air cylinders of 48x48″, giving a 12-pound blast pressure; 2 Murray-Corliss tandem-compound engines with 14″ and 28″ cylinders and 36″ stroke, direct-connected to 2 Connersville No. 10 blowers; a pump of 5,000 gallons per minute capacity; 2 Prescott compound vertical-beam condensers, having steam cylinders of 14″ and 25″, with 24″ stroke; two 36x24″ vacuum pumps; a direct-acting Prescott pump for circulating water; a Prescott compound duplex 500-gallon mine pump for furnishing hydraulic power for converter stands, and various minor engines, the power-house having machinery with an aggregate of 3,750 h. p.

The boiler-house at the power plant formerly had five 250-h. p. boilers and two 280-h. p. boilers, which were added to, 1907, to furnish power for the new

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plant. Fuel is petroleum, there being four 45,000-gallon oil tanks for storage. Water in ample supply is secured from flowing artesian wells, of 450′ average depth.

Miscellaneous buildings at the works include a new steel-frame machine-shop and steel-frame smithy. There are two 16-room lodging houses, and a considerable number of dwellings for employes.

Average forces, 1907, were 1,028 men, of whom 621 were employed at the mine and 407 at the smelter. Some trouble was had, 1907, with labor unions, but this came to an end by the refusal of the company to submit to the dictation of a miner's union, organized against the wishes of a majority of the mine workers of Bisbee, as proven by a referendum vote, on the Australian plan, in which the proposition to organize was voted down by a majority of 4 to 1, before organization was effected, the Western Federation of Miners refusing to be bound by the vote that it had itself invoked.

Production, 1906, was 36,934,387 lbs. fine copper, 194,451 oz. silver and 4,241 oz. gold, ore yielding 7.91% actual copper extraction. For 1907 production was 30,689,448 lbs. fine copper, with combined gold and silver values of $210,846.12, an average of $13.74 in precious metals per ton of fine copper, secured from 260,815 wet tons of ore, making 232,460 dry tons of ore, giving an average extraction of 6.56% per dry ton, or 5.85% per wet ton, the decrease from nearly 8% extraction in 1906 being caused, not by decreased ore values, but by the treatment of lower grade ores, owing to the high price of copper. Costs, 1906, were 5.71 cents per pound of fine copper, including construction, rendering this one of the lowest cost copper mines of the world; but for 1907, owing to a combination of fortuitous circumstances, costs, exclusive of construction, were about 10.5 cents per pound of copper. The latter figure, however, is much above normal, and cannot be taken as a criterion. The Calumet & Arizona is one of the best among the world's big copper mines, and has a management that is most excellent, from the president of the company down to the heads of departments.

CALUMET & BISBEE DEVELOPMENT CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Frank S. Carlton, president; Wm. R. Oates, secretary. Organized Oct. 20, 1902, under laws of Arizona, with capitalization $400,000, shares $10 par; 15,000 shares issued and fully paid. Lands, 4 claims, at Don Luis, adjoining the Lake Superior & Pittsburg. Has a 960′ main shaft. Idle for several years, owing to lack of funds. Fully described Vol. IV.

CALUMET & BOSTON COPPER CO. **ARIZONA.**

Office: care of J. C Stout, secretary and treasurer, St. Paul, Minn. Mine office: Bisbee, Cochise Co., Ariz. C. W. Ruth, vice-president and manager. Organized October, 1906, with capitalization $500,000, shares $10 par. Lands, 10 claims, area circa 150 acres, on the porphyry side of Tombstone Cañon, having a 400′ tunnel on the Bessemer claim showing ore assaying 2 to 3% copper, also quartz assaying up to $25 gold per ton.

CALUMET & BUTTE DEVELOPMENT CO. **MONTANA.**

Dead. Reorganized, 1907, as Calumet & Butte Mining Co. Formerly at Butte, Silver Bow Co., Mont.

CALUMET & BUTTE MINING CO. **MONTANA.**

Dead. Organized, 1907, under laws of New York, with capitalization $1,500,000, shares $1 par, as successor of Calumet & Butte Development Co. Reorganized circa August, 1908, as Western Copper Co. Formerly at Butte, Silver Bow Co., Mont.

CALUMET-CLIFTON COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office and mine, Clifton, Graham

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Co., Ariz. Jas. Harvey, president; B. B. Adams, treasurer; preceding officers, Edgar N. Hunt, M. M. Gassar, E. C. Blanchard and Benj. M. Crawford, directors. Organized October, 1906, under laws of Arizona, with capitalization $750,000, shares $5 par. Lands, 5 claims, area 100 acres, northeast of the Shannon, having a 75' tunnel in a vein claimed to be 15' wide and to average 30% copper throughout, which is an exaggeration, also 2 shorter tunnels and 2 shallow shafts. Apparently excessive claims were made in the press, without authorization by officers of the company. Has secured assays of 4.6 to 27.6% copper, 5 oz. silver and $4 gold per ton. Idle.

CALUMET & COCHISE DEVELOPMENT CO. **ARIZONA.**

Dead. Liquidated, 1906, with all debts paid. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. IV.

CALUMET CONSOLIDATED COPPER CO. **ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Lands, 40 claims.

CALUMET COPPER CO. **COLORADO.**

Letter returned unclaimed from former office, 409 Tacoma Bldg., Chicago, Ills. Mine office: Turret, Chaffee Co., Colo. Hon. Wm. E. Mason, president; David W. Medbury, secretary; Elmer E. Briggs, general manager; G. W. Mendenhall, superintendent. Lands, 3 claims, known as the Copper King group, on Middle Mountain, showing schistose veins in a formation of micaceous granite, with porphyry intrusions, carrying auriferous and argentiferous copper oxides and sulphides. Development is by incline shafts of 40' and 85' on a 4' vein. Idle.

CALUMET COPPER MINING CO. **ARIZONA.**

Dead. Merged, 1907, in Kelvin-Calumet Copper Mining Co. Formerly at Kelvin, Pinal Co., Ariz.

CALUMET COPPER MINING CO. **WASHINGTON.**

Dead. Property sold, under foreclosure, to Mount St. Helens Consolidated Mining Co. Formerly at Spirit Lake, Skamania Co., Wash.

CALUMET COPPER MINING & SMELTING CO. **COLORADO.**

Office: 2 Toltec Bldg., Denver, Colo. Mine office: Rollinsville, Gilpin Co., Colo. John J. Webber, secretary; J. D. Caldon, engineer. Organized July 16, 1903, with capitalization $1,250,000, shares $1 par. Lands, claimed to be circa 200 acres, 160 acres patented, located at various points in Boulder and Gilpin counties, Colorado. Presumably idle.

CALUMET & DULUTH DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. IV.

CALUMET & GLOBE MINING CO. **ARIZONA.**

Dead. Was organized Jan. 16, 1907, under laws of Arizona, with capitalization $300,000, shares $5 par. J. P. Peterman, president; Col. Paul Peterman, vice-president; Jas. T. Fisher, treasurer; preceding officers, Edw. Lieblein, Frank S. Carlton, D. D. Sullivan and Dr. T. Shields Collins, directors. Lands, 9 claims, 2 fractional, on the southwest side of Lower Pinto creek, having a 390' shaft on the Brewery claim, showing a vein of 170' width, but leached, though possibly carrying commercial ores at depth. Bond and lease were allowed to expire, and company was wound up, 1908.

CALUMET & HECLA MINING CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Mill office: Lake Linden, Houghton Co., Mich. Smelter offices: Hubbell, Houghton Co., Mich., and 1 Austin St., Buffalo, N. Y.

Alexander Agassiz, president; Col. T. L. Livermore, vice-president; Quincy A. Shaw, Jr., second vice-president; Rodolphe L. Agassiz, third vice-president; Jas. MacNaughton, general manager; preceding officers, Francis L. Higginson and Francis W. Hunnewell, directors; Geo. A. Flagg, secretary

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and treasurer; Walter Fitch, general superintendent; Will A. Childs, superintendent; W. M. Gibson, assistant superintendent; Fred S. Eaton, chief clerk; E. S. Grierson, chief engineer; E. D. Leavitt, consulting mechanical engineer; John Knox, chief mining captain; Henry Fisher, acting mill superintendent; Jas. B. Cooper, smelter superintendent at Lake Linden; Morris B. Patch, smelter superintendent at Buffalo; Hon. Chas. Smith, chief mill and smelter clerk at Lake Linden works; Geo. M. Kendall, chief smelter clerk at Buffalo works; Franklin E. Bay, land agent.

Organized 1871, under laws of Michigan, with capitalization $2,500,000, shares $25 par; $12 paid in, and $1,058.50 per share in dividends paid out to end of 1907. Charter renewed, 1900, for 30 years, and amended, 1905, under new laws of Michigan, making the corporation a securities holding company as well as a mining and smelting company. Is a consolidation of the Hecla, Calumet, Portland and Scott mining companies. Fiscal year ends April 30. Annual meeting, third Wednesday in August. Stock is listed on the Boston Stock Exchange, and traded in on the unlisted department of the New York Stock Exchange. Controls various subsidiary corporations, including 3, organized 1905, known as the Frontenac Copper Co., Gratiot Mining Co. and Manitou Mining Co.

Dividends, to Dec. 31, 1907, were $105,850,000, being the largest mining profits ever divided by any incorporated mining company. Dividends were $5,000,000 in 1905; $7,000,000 in 1906, and $6,500,000 in 1907. Two first quarterly dividends of 1908 were $5 each. Ended fiscal year, Apr. 30, 1908, with quick assets of $6,295,717 and liabilities of $1,594,754, giving a surplus of $4,700,964. Net earnings, for fiscal year ending Apr. 30, 1907, were $11,297,390.

Since the change in charter, 1905, permitting the company to acquire and hold stock in other corporations, the Calumet & Hecla has secured control of various other mines and mineral tracts, either by organizing subsidiary corporations, acquiring stock in companies previously independent, purchasing lands outright, or taking options on mining properties of promise.

There are 3 directly subsidiary corporations, these being the Frontenac Copper Co., Gratiot Mining Co., and Manitou Mining Co. The Calumet & Hecla controls the entire stock issue of the Frontenac, 18,000 shares of Manitou out of 20,000 shares issued, and 50,100 shares of Gratiot, out of 100,000 shares issued.

There are various corporations controlled by the Calumet & Hecla through ownership of majority share interests. These include the Centennial Copper Mining Co., in which the Calumet & Hecla owns 46,080 shares out of 90,000 shares issued from the capitalization of 100,000 shares; La Salle Copper Co., with ownership of 160,050 shares out of 302,977 shares issued; Superior Copper Co., with 50,100 shares owned out of 100,000 shares issued; Dana Copper Co., with 35,450 shares owned out of 40,000 shares issued, and St. Louis Copper Co., with 36,400 shares owned out of 40,000 shares issued. The Calumet & Hecla also controls the Allouez Mining Co., through the ownership of 42,978 shares out of 100,000 shares issued, this being not quite a majority interest. A large minority share interest is owned in the Osceola Consolidated Mining Co. The Calumet & Hecla also holds 1,900 shares of stock of the Laurium Mining Co., and 891 shares of stock of the Seneca Mining Co. The various corporations named are described under their respective titles.

The attempt of the Calumet & Hecla to secure control of the Osceola Consolidated Mining Co., at the annual meeting in March, 1907, was met by determined opposition from the Osceola management, which took the fight into the Michigan legislature and into the Federal courts. By reason of litigation, the Calumet & Hecla was unable to gain control of the Osceola

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at the annual meetings, 1907 or 1908, but in October, 1908, Judge Knappen decided in favor of the Calumet & Hecla, and while there will be further legal opposition, it seems probable that the Calumet & Hecla will succeed shortly in securing control of the Osceola.

The landed holdings of the Calumet & Hecla, including property owned outright, property controlled through subsidiary corporations, mining lands under option and miscellaneous lands, in Houghton, Keweenaw and Ontonagon counties, Michigan, amounted, 1907, to 74,841 acres, or 117 square miles. In addition to its corporate interests, direct options have been taken on the White Pine, Nonesuch and other old mines in Ontonagon county, on which more or less exploratory work has been done. An option on the Clark mine expired circa August, 1907.

The Calumet & Hecla mine proper, area circa 2,750 acres, lies in a compact tract in Sections 11, 13, 14, 15, 22, 23 and 24, Town 56 North, Range 33 West, in addition to which the company owns considerable tracts, west of the Tamarack mine, carrying the underlay of the Calumet conglomerate at such stupendous depths that its opening would require a 2-mile vertical shaft, and it is problematical whether these lands ever will become available for mining on the Calumet conglomerate. The lands west of the Tamarack were explored 1904, by diamond drill, in search of a supposed cupriferous conglomerate, but nothing of importance was found.

The mine was opened originally on the Calumet conglomerate, and a parallel mine has been developed on the Osceola amygdaloid bed, while a third parallel mine is in process of development on the Kearsarge amygdaloid.

The Calumet conglomerate has proven unprofitable both to the north and south of the Calumet & Hecla, though workable at the Tamarack mine, which has developed the underlay by vertical shafts. The conglomerate has an average strike of N. 39° E., with average dip of 37° 30′ with the horizon. The bed is of 8′ minimum and 40′ maximum width, with average width of 12′ to 14′, giving circa 2,400 fathoms of stoping ground per acre, equal to about 43,200 tons of stamp-rock. As a rule, the richer portions of the conglomerate are in the central part of the Calumet & Hecla tract. The walls of the conglomerate carry considerable copper, especially the amygdaloidal footwall, and much of the adhering trap rock formerly rejected is now milled. Pillars of 75′ width, left on either side of every conglomerate shaft, contain stamp-rock equivalent to about 18% of the stoping ground available before the robbing of the pillars. The conglomerate mine is opened 6 to 8 years in advance of immediate requirements, and has about 200 miles of shafts, drifts, crosscuts and winzes. About 30,000,000′ of timber is used in the mine yearly. The life of the old conglomerate mine was said, 1907, by President Agassiz, to be about 15 years, at the present rate of ore extraction, but it is probable that the mine will be producing at least limited quantities of conglomerate rock for 20 and perhaps 25 years to come, though 10 years may see the old mine past its crest, by which time other sources of supply, now developing, should enable the company to maintain production at its regular rate.

The Calumet & Hecla has suffered severely from underground fires. The amygdaloidal trap rock carrying native metal cannot burn, like sulphide ore, but the old timbering eventually becomes nearly as inflammable as so much tinder. The really serious mine fires, 5 in number, occurred in 1884, July and November 1887, Nov. 30, 1888, and May 27, 1900. All possible precautions are taken against mine fires, these including the partial fire-proofing of all mine timber with zinc chloride solution, regular sprinkling of all

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shafts, the maintenance of water-pipes and hydrants, fire-hose, chemical engines, an electric alarm system and 18 telephones at various pump stations, from the 8th to the 51st levels, inclusive, in 5 different shafts, so distributed as to be most readily accessible from all parts of the mines. From the first 4 fires the Calumet & Hecla suffered aggregate losses of several millions of dollars, while a number of lives were lost, and 3 valuable shafts were drawn so badly that they were abandoned. The fifth and last fire, in May, 1900, severely tested the mine's fire system, the fire breaking out on Sunday evening, when the mine was deserted by all but a few employes, and gaining great headway before it was discovered. The burning portion of the mine was shut off by closing the fire-doors, and the mine was sealed at surface, by covering the mouths of the shafts with heavy timbers, with dirt tamped tightly into the crevices between. Wherever gas escaped through holes in the earth, dirt was tamped in and luted with water. The fire was extinguished in three weeks, and the South Hecla portion of the mine continued working without interruption. The 5 serious fires, and sundry smaller blazes nipped in their inception, all have been of mysterious origin, and there seem reasons for suspecting incendiarism. Great precautions are taken to prevent unauthorized persons entering the mine, and permission to go underground is given only by the president, in writing, each pass being for a single trip.

The conglomerate property of the Calumet & Hecla is worked as 2 separate mines, known as the Hecla and Calumet branches, the South Hecla being a southerly continuation of the Hecla branch, and the Red Jacket vertical shaft is a portion of the Calumet mine. The Calumet to the north, the Hecla in the centre and the South Hecla at the south, form a continuous mine, developing the Calumet conglomerate by incline shafts, the Red Jacket shaft opening the same bed vertically. The conglomerate, opened for 2 miles along the outcrop, has 11 shafts, 8 being known as single compartment, which means a single hoisting compartment, with 2 shafts having double compartments, and one vertical shaft having 6 compartments. In May, 1908, the Calumet & Hecla operated 318 power drills, this being the largest number in use at any American mine. The 6 shafts have auxiliary electric hoists, in underground stations, with pump actuated by compressed air and electricity.

Iron pillars are used extensively as supports, in crosscuts connecting the Red Jacket shaft with drifts on the bed, and in various incline shafts, to support the hanging wall. Iron, mainly scrap material, such as worn-out skip-rails, cut to 10′ lengths and placed above "I" beams, is used for lagging to some extent. The conglomerate bed in the lower workings is scarcely up to its average value, being wide but low in copper contents, and it is evident from the results secured by the deep shafts in the district, that while the cupriferous stratified beds of Lake Superior may descend to tremendous distances, copper values grow less at depth.

The conglomerate shafts on the outcrop are, as follows, from north to south: Nos. 6 and 5 Calumet have 2 compartments each, No. 5 being bottomed at the 78th level, and it is planned to establish an electric pumping system in this shaft, to drain practically all of the conglomerate workings now unwatered by the Red Jacket shaft, in order to increase the ore-hoisting capacity of the latter. There is a considerable stretch of lean ground from No. 6 shaft to the Centennial boundary.

No. 4 Calumet, with 1 compartment, has a vertical depth of 4,748′, and an actual depth of 8,100′ on the incline of 37° 30′, with a 190′ winze from the bottom, giving a total depth of 8,290′ from the collar of the shaft to the bottom of the winze.

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No. 3 Calumet shaft has been abandoned.

No. 2 Calumet shaft, with one compartment, is 7,000′ deep, practically at the boundary, and it is probable that it will be gutted in the near future.

No. 1 Calumet shaft has been abandoned for some years.

No. 1 Hecla shaft has been abandoned.

No. 2 Hecla shaft, 4,400′ deep, is bottomed at the Tamarack boundary. Stopes are exhausted and the mine is being robbed, lower workings having been gutted up to the 31st level, July, 1908.

No. 3 Hecla, 4,000′ deep, also is bottomed at the Tamarack boundary, and is being gutted.

No. 4 Hecla shaft has been abandoned for some years.

No. 6 Hecla shaft, one compartment, is 6,200′ feet deep, in good ground, and can be sunk to circa 8,500′ depth.

Nos. 7 and 8 Hecla, a double shaft of one compartment each, are 6,300′ deep, in good ground, and can be sunk to about 9,000′ depth.

Nos. 9 and 10 Hecla, 2 compartments, are 6,500′ deep and can be sunk to 8,100′ depth.

No. 11 Hecla, 2,400′ deep, showed very poor ground at the bottom, and gutting was begun several years ago, robbing all pillars from the bottom up. It is probable that this shaft will be abandoned within a comparatively short time.

No. 12 Hecla shaft, at the company's south line, is 6,700′ deep, bottomed in unprofitable ground, and is partly gutted. It is probable that this shaft will be worked out and abandoned circa 1909.

The Red Jacket vertical shaft, permanently bottomed at 4,920′ depth, cuts the lode at 3,287′. Rock temperature was 87° Fahrenheit, reduced to 70° to 80° by connection with No. 4 Calumet shaft, exhaust air from the power-drills aiding in cooling the mine. The Red Jacket was planned to open a mine unconnected with the older shafts, to give reserve stopes in case of fire, but owing to heat and danger, connection was made with the older workings. The Red Jacket shaft is 14′ 6″ by 24′ 6″ within timbers, and is built of brick and cement from collar to the solid rock, and timbered below with Georgia pine. There are 6 compartments, 2 used for hoisting, 2 for water, and 2 for men and supplies. The 2 hoisting compartments, at the eastern end, have cages with 9-ton Kimberly self-dumping skips swung under. The 2 western compartments have double-deck cages for men and material, and the 2 middle compartments have large cylindrical steel bailers, for raising water. It is probable that the bailers will be replaced by an electric pumping plant at No. 5 Calumet shaft, which will permit doubling the present hoisting capacity of 1,800 tons of rock daily, by using 4 compartments for raising ore. Timber for the Red Jacket shaft is lowered through No. 5 Calumet, with which the Red Jacket is connected by a crosscut. The Red Jacket shaft hoists rock from all of the northern shafts below the 56th level, at which point the conglomerate is intersected. The Red Jacket shaft has 9-ton steel storage bins at its various productive levels, which aid in maintaining the uninterrupted hoisting service that is absolutely essential in a shaft of a mile depth. A ventilating chimney at the collar of the shaft does away with ice formerly caused in winter by vapors arising from the shaft. The shaft rockhouse of the Red Jacket is 100x100′ on the ground and 110′ high, with crushers for 2,000 tons of rock daily, and room for doubling the present crushing equipment.

A tract of 200 acres, a quarter-mile wide and 1¼ miles long, lying between the Tamarack and Tamarack Junior mines, carries the underlay of the conglomerate at great depth, and, to obviate sinking a deep and costly

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vertical shaft, this tract is being opened by a blind shaft, which starts 1,500′ east of the Red Jacket vertical and near the bottom of Calumet No. 4 shaft, which abuts on the Tamarack boundary line at a depth of 8,100′. The blind shaft is being sunk 25′ under the footwall, at the same angle as the dip of the conglomerate, thus assuring solidity of walls while saving long and expensive crosscuts to the bed on each level. A "footwall drift" on the 57th level parallels the regular drift at a distance of 25′ in the footwall, between the Red Jacket vertical shaft and the blind shaft, offering an avenue for operation which obviates the confusion certain to result were the regular mine drifts given double duty. The blind shaft starts in the footwall drift under and parallel with the 57th level, and eventually will be about one mile in depth, opening four of the five 40-acre tracts, leaving the fifth and last to be opened by a sub-shaft from the blind shaft, which doubtless will be sunk on the same system. The necessity for this peculiar method of development arises from the fact that the boundary lines of the property run north and south, while the strike of the lode is N. 39° E., giving a plane of dip of N. 51° W. Owing to the incline shafts being sunk on the dip of the lode while the blind shaft must follow the section lines, the latter descends diagonally on the dip of the bed, giving the blind shaft an average dip of about 22° only, although the bed dips at 37° 30′. This unusually flat incline permits the hoisting of rock in tram-cars, which are hauled through the blind-drift and dumped into the steel bins of the Red Jacket shaft for hoisting, thus saving a transfer at the mouth of the blind shaft. The showing in the workings of the blind shaft is satisfactory, the bed averaging about 14′ width, with circa 10′ fairly mineralized. The abandoned workings of the Tamarack Junior mine of the Osceola Consolidated, which adjoins the "five forties," is drained by holes bored by diamond drill from the blind shaft, obviating possible damage by flooding.

The amygdaloid mine of the Calumet & Hecla is opened on the Osceola amygdaloidal bed, which outcrops 730′ east of the Calumet conglomerate, with parallel strike and average dip of about 40°, underlying the entire main tract of the Calumet & Hecla mine. There are 6 shafts in the amygdaloid mine, Nos. 13 to 18 inclusive, numbered from south to north. Shafts are duplicates in size, each having 3 compartments, of which 2 are used for hoisting and 1 for pipes and ladderways. The amygdaloid mine has upwards of 20 miles of workings, and has frequent connections with the conglomerate by crosscuts. The amygdaloid mine was closed 1901, and reopened 1904. In this mine the Osceola bed runs about 35′ in width, with principal values along the foot and hanging, the middle third being lean as a rule. Laterals in the Osceola workings are carried as drift-stopes of 12′ height along the hanging wall. The Calumet & Hecla owns, on its main tract, about 11,000′ of the strike of the Osceola bed.

No. 13 shaft, the southernmost on the Osceola bed, was opened to the 23d level March, 1908.

No. 14 shaft, 3,200′ north of No. 13, reopened 1905, was at the 23d level March, 1908.

No. 15 shaft, 2,600′ north of No. 14, reopened 1906, was at the 16th level March, 1908.

No. 16 shaft, 1,800′ north of No. 15, resumed work 1905, and is the principal productive shaft of the amygdaloid mine.

No. 17 shaft, 1,800′ north of No. 16, was at the 11th level March, 1908.

No. 18 shaft, the northernmost of the amygdaloid mine, started 1907, was circa 300′ deep July, 1908, giving a very good showing of stamp-rock.

The Kearsarge amygdaloidal bed outcrops about 2,200′ east of the Osceola

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amygdaloid and 2,900' east of the Calumet conglomerate, with parallel strike and dip of about 41°, underlying the entire main tract. Work of development was begun August, 1903, and there are 3 shafts, numbered from north to south, each having 3 compartments and being practically duplicates of those on the Osceola amygdaloid. The shafts are "timbered" with steel, brick and concrete, the hanging wall being lined with 3 arches of brick, laid in 3 to 5 courses, thickness being increased with depth, supported by 2 rows of "I" beams which serve also as dividers for the shaft. The Kearsarge lode, as opened by these shafts, is somewhat erratic, though showing considerable stretches of ground that probably will yield 18 to 22 lbs. fine copper per ton, with reasonable selection. The Kearsarge shafts have permanent equipments, with railroad tracks, and are connected with the compressed air mains of the company's system.

No. 19 shaft, about 1,000' south of the Centennial boundary line, is 1,300' deep, and has furnished some stamp-rock to the mill, but was closed down October, 1907.

No. 20 shaft, next south of No. 19, is about 1,300' in depth, and idle also.

No. 21, the southernmost shaft on the Kearsarge bed, is 8,000' south of No. 20, and, at shallow depth, showed well in copper, but deeper workings are not so rich. Work is in progress.

The Calumet amygdaloid, lying between the conglomerate and the Osceola amygdaloid, has been little opened, but might prove payable, if developed, as it shows some rich ground in a crosscut on the 900' level.

The shaft rockhouses at the conglomerate incline shafts, of uniform pattern, were remodeled, 1908, to accommodate 40-ton railroad cars. The old 5-ton skips were replaced, 1907, by 7½-ton skips. Rock is hoisted to the top of each shaft-rockhouse, passing thence over grizzlies that allow the finer rock to fall through, the larger masses being reduced in 24x36" crushers, going thence to 18x24" crushers on the floor beneath. Crushed rock falls by gravity into storage bins, whence it is dumped into cars that take it to the mills, railroad tracks running underneath each rockhouse. The standard equipment includes a 50-h. p. induction motor at each shaft for driving crushers.

The surface equipment at the Calumet & Hecla is the most complete found at any mine in the world. With few exceptions everything is duplicated, to prevent possible delays or suspension, by reason of fire or accident.

The power plants at the main mine on the Calumet conglomerate include 4 large boiler plants and 6 hoisting plants. The hoists of the conglomerate mine are very powerful, ranging in capacity from 1,000 to 8,000 h. p. each. Miners are carried to and from work, in the incline shafts, by man-cars, these being long trucks having tiers of circus seats, replacing skips when needed, being shifted quickly on or off the skip-tracks by large cranes. This method has proven the safest, quickest and cheapest for moving men in and out of deep incline shafts.

At No. 4 Calumet shaft there is a group of the most powerful machinery ever built. The brick engine-house, 62x146', contains the 4,700-h. p. Corliss engine "Superior," with 40" cylinders and 72" stroke; the auxiliary engines "Baraga" and "Rockland," of 2,000 and 600 h. p. respectively; two Rand air-compressors, of 25 and 40 drill capacity, and the engine "Mackinac," a 7,000-h. p. quadruple-cylinder triple-expansion steel giant, operating 4 Nordberg air-compressors with a combined capacity of 650 drills, or about double the requirements of the mine. There also are four 35-drill auxiliary compressors. In the old Leavitt compressor, water was injected into the compression cylinders, while the Nordberg machines deliver the compressed and greatly heated air to a cylindrical steel cooler, 12' in diameter and 30' high, into which water

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is sprayed from above and drawn off at the bottom, this cooling the air to 80° F. The hoist has 4 drums, each 8′ 6″ wide and 20′ 6″ in diameter, operating 4 different shafts, 2 of these drums carrying nearly 2 miles of steel cable each. Power is supplied by batteries of boilers in 2 boilerhouses adjoining, these having a brick chimney 250′ high, with inside diameter of 12′ 6″. Locomotives haul the coal into the boiler-houses, where it is fed to the grates by automatic stokers.

The Hecla engine-house, of brick, 47x80′, flanked by a large boiler-house, contains the 2,000-h. p. compound hoisting engine Frontenac and 2 auxiliary engines of 600 and 900 h. p., also a 30-drill Rand air-compressor and a pair of water-plunger air-compressors with combined capacity of 144 drills—the largest machines of this type ever constructed.

South of the Hecla plant is the G. H. & S. engine-house, having the Houghton and Seneca engines, of 2,000 h. p. each. The Hecla boiler-house has 5 large boilers and a 200′ smoke stack, of 9′ 6″ internal diameter.

The engine-house operating Hecla shafts 7 and 8 contains the engines Hancock and Pewabic, each of 2,000 h. p., which operate 25′ drums by spur gearing, and a 5,000-h. p. Leavitt engine for man-cars. A 50x120′ boiler-house has 10 boilers and a 250′ smokestack of 12′ 6″ internal diameter.

The South Hecla engine-house at shafts 9 and 10 contains the engines Detroit and Onota, of 1,000 h. p. each.

The South Hecla engine-house at shafts 11 and 12 has two 1,000-h. p. Lidgerwood hoists.

The Red Jacket shaft has an 8,000-h. p. quadruple hoist, housed in a 70x220′ brownstone building, and in an adjoining brownstone building, 70x150′, with a 250′ smokestack of 12′ 6″ inside diameter, are ten 1,000-h. p. boilers. At the rear of the engine-house is a 32x412′ brownstone annex, floored with cement and roofed with slate, in which is carried the fleet-gear. In raising 10-ton loads perpendicularly from a depth of one mile, the weight of the cage and steel cable nearly equals that of the cargo of rock, but with the aid of counterbalance the engines can hoist 10-ton loads at a speed of 40 miles per hour, the regular hoisting time being about 90 seconds for the vertical distance of nearly a mile, this including time taken for starting and stopping, an achievement no locomotive could duplicate on a horizontal plane. The engine operates on a system devised by S. B. Whiting, formerly manager of the company. To overcome the dangerous strain caused by unequal wearing, Walker differential rings have been placed on the sheaves, with excellent results, the cables taking 4 complete turns around the driving sheaves.

Equipment at the amygdaloid shafts on the Osceola lode is practically the same at shafts 13, 14, 15, 16 and 17, the new shaft, No. 18, having a combined engine and boiler-house with a small Lidgerwood hoist. Shafts 13, 14 and 15 have large stone engine-houses, with a steel engine-house at No. 16. Shafts 13 to 17, inclusive, have Nordberg first-motion double conical-drum hoists, operating 10-ton skips in balance, good for 5,000′ depth each. All engine-houses have air connections with the main compressor plants at the old mine, and shafts 13, 14, 15, 16 and 17 have permanent shaft-rockhouses of the same general design as at the conglomerate workings.

The machine-shop, 225x250′, largely rebuilt in 1907, has an equipment that is excelled by only a few of the largest shops in the country, including a 25-ton electric traveling crane and mammoth planers, electric power being used throughout. These shops are capable of handling anything and everything in the line of repair work, and also have complete manufacturing facilities for the making of mining, milling and smelting machinery, and have

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turned out hundreds of Wilfley tables and other special machinery, under agreement with the owners of the patents.

The foundry, 78x96', has 2 iron cupolas and a brass foundry, with a 20-ton electric traveling crane.

The pattern shop, just north of the foundry, is of brick and steel, divided into 2 compartments, one for the shop proper and one for the storage of patterns.

The carpenter-shops are of great size, and are equipped with as complete a line of labor-saving machinery as can be found in any general woodworking establishment.

The blacksmith shops are of larger size than may be found elsewhere, except in the works of a few of the very largest manufacturers of machinery, and are equipped with steam hammers, forges, blowers, emery wheels, etc. The Calumet smithy alone sharpens upwards of 50 tons of steel drills daily, requiring the services of a small regiment of drill-boys between the shops and mines. The Hecla blacksmith shop does general blacksmithing and forging for the entire mine, a stone addition of 66x152' having been built to the Hecla shop in 1903. The various shops of the Calumet & Hecla employ upwards of 100 blacksmiths.

A timber mill at the mine mortises and tenons the bed-pieces, legs and stulls of the square sets that are used underground, and furnishes blocks and wedges.

The electric building at the mine is 74x74', of stone, housing the old electric power and lighting plant, but the main electric plant now is at the mills in Lake Linden.

Warehouses include a very large brick building for general supplies, and special warehouses for steel and iron, oil, paint, etc., the main buildings having direct rail connections. There are also barns and a considerable number of miscellaneous structures, required in connection with the operation of the mine. The office building is a large and handsome stone structure, housing the various executive departments and engineering force of the mine. The company's private telephone system has an exchange with about 150 instruments, including a number of deep underground stations, with local and long-distance connections.

The company maintains a large hotel and a fine stone clubhouse for employes, the latter containing bath-rooms, bowling alleys, etc. The changing houses for the miners, at the various shafts, are well equipped with hot and cold running water, bath-tubs, lockers, etc.

The Calumet & Hecla library, of more than 30,000 volumes, contains books, periodicals and newspapers printed in a score of languages, about 30 different nationalities being represented on the company's pay-roll. There also is a combination library and clubhouse at Lake Linden, for stamp-mill and smelter employes.

The company maintains a hospital, for employes solely, built 1898, noted for its complete surgical and laboratory apparatus. Nearly a dozen physicians on the hospital staff are at the call of any employe, or any member of his family that may require medical or surgical attendance.

The company owns about 1,200 dwellings, rented to employes at an average price of 6% on actual cost, plus cost of maintenance, and upwards of 1,200 dwellings are owned by employes on lands leased from the company at low yearly rentals.

There are 8 schoolhouses on the lands of the Calumet & Hecla, most of which were built by the corporation, including a fine manual training school, and a truly magnificent high school building at Calumet.

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On Calumet & Hecla lands there are upwards of 30 churches, occupied by a dozen different denominations. All of these sites were donated by the company, and in most cases substantial aid has been given in their erection and maintenance, entirely regardless of creed.

The company maintains 3 distinct systems of waterworks, one at the mines in Calumet, one at the mills in Lake Linden, and one on the shore of Lake Superior, 4 miles from Calumet, the latter pumping water for domestic uses, against a head of 600', raising about 4,000,000 gallons daily. Electricity was substituted for steam, 1908, at this plant, and the pipe-line is to be continued to Lake Linden, to furnish Lake Superior water for the boilers of the new power plant. At the Calumet dam and mine there are 7 pumps, having a combined daily capacity of upwards of 45,000,000 gallons.

The company maintains a complete fire department, modeled on metropolitan lines, which affords protection to the mine buildings and location, also responding to calls from Red Jacket, Laurium and the other towns that go to make up the mining camp of Calumet, of 40,000 population, that has grown up around this great property.

The Hecla & Torch Lake railroad, owned by the company, connects the mines, mills, smelter and shops by upwards of 20 miles of main tracks, spurs and sidings, reaching every shaft, shop, warehouse, mill and furnace. The 5-ton wooden rock-cars formerly used were replaced, 1908, by 150 forty-ton steel rock-cars, and the line was widened to standard gauge, 1907, by the addition of a third rail. Three new locomotives were bought and the old narrow-gauge locomotives rebuilt to standard gauge in the company's shops.

The stamp mills are at Lake Linden, 4 miles from the mine, on a tract of 998 acres having several miles of frontage on Torch Lake. There are 2 mills, known as the Hecla and Calumet, each originally having 11 Leavitt steam-stamps with 14x21½" cylinders and 24" stroke. A 165x308' steel addition to the Hecla mill, with 6 stamps, was built in 1903 and, upon its completion, the rebuilding of the 2 old mills was begun, each being divided into 2 sections, with one section rebuilt at a time, each section requiring approximately one year for completion, remodeling being completed in 1907. Great as was the cost of this work, the new mills practically had paid for themselves upon completion, through reduced cost of operation and increased saving of copper. While the mills are termed rebuilt, they actually are entirely new mills, standing upon the old sites, practically nothing of the old material having been utilized. The new mills handle rock with about 60% of the wash-water formerly required, thus effecting a double saving, inasmuch as all water used in the mills first must be pumped in, and thereafter raised as sludge, by the sand-wheels, for discharging.

The new mills, built by the Wisconsin Bridge & Iron Co., have heavy steel frames, with concrete foundations, cement floors, corrugated iron siding and Carey roofs of tarred burlap. Foundations are much heavier than in the old mills, and the wash-room below the heads is much greater. Foundations are of very massive piles, spaced 20" apart, with 2 and 3 tiers driven to bed-rock and topped with 6x12" square timber, capped by a 4' 6" bed of concrete. The mills have 29 Leavitt heads and 1 Nordberg steeple-compound head, of which 28 heads are in commission regularly, with 2 in reserve, 20 heads treating conglomerate rock and 6 crushing amygdaloid rock. Stamps are actuated by steam power, except the 6 stamps in the Hecla addition, which have independent 25-h. p. motors each, but the other milling machinery is operated electrically. The Leavitt heads have a daily capacity of about 400 tons of conglomerate, 500 tons of Osceola amygdaloid or 550 tons of Kearsarge amygdaloid.

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The mill equipment includes, below the stamps, Woodbury-Benedict jigs; ten 4-deck Evans-Rawlings round-tables, from which slimes are treated by 96 Wilfley tables; Chilean regrinding mills, Averly grinders and classifiers, there being a total of 220 Wilfleys, which effect a considerable saving of the very fine copper formerly lost, and greatly reduce the water consumption. By special arrangement the Wilfleys were built in the company's shops.

The regrinding plant, built 1908, occupies a steel building 195x340′ in size, and is of circa 1,500 tons daily capacity. Equipment includes 48 Chilean mills, set on massive concrete piers, and 200 Wilfley tables, latter built in the Calumet & Hecla shops. There is an electric traveling crane and a 50′ sand-wheel is to care for the tailings. The experiments in regrinding at the mills proved so successful that the new plant has been built, to treat about 20% of the tailings from the stamp-mills.

As the mills stand on the flat western shore of Torch Lake, but little above water level, tailings speedily filled the shallow lake for some distance off shore, and to waste the sand it became necessary to secure a considerable initial elevation, which is gained by sand-wheels. The material entering the mills as conglomerate rock leaves as coarse sand, to the extent of fully 8,000 tons daily. The sludge is washed through launders to the sand-houses, where it is scooped up by the buckets of the wheels and dumped, high above, into launders running on trestles far out into the lake, these spouting forth miniature brick-red Niagaras. There are two wheelhouses, one for each mill. The Calumet wheelhouse has sand wheels of 40′ and 50′ diameter, and the Hecla wheelhouse, caring for the sands from a much larger mill, has sand-wheels of 40′, 50′ and 64′ diameter, the latter being housed in a three-story steel annex, 65x78′ on the ground and 94′ high. The old wheelhouses are of wood, iron-sheathed. The steel in the annex to the Hecla wheelhouse weighs 490 tons, and the building is equipped with a 45-ton Sellers traveling crane. The sand wheel is to appearance a gigantic bicycle wheel, fitted with a spur gearing where the rubber tire should be. The complete wheel weighs 500 tons, and is mounted upon massive concrete masonry. Four 25-ton iron bed-plates support the pillars carrying the 21-ton Krupp forged steel axle, which is 27′ long and 32″ in diameter with a hollow core of 26″ diameter. Radiating from axle to rim are 2″ steel spokes 32′ long. The rim is in 20 segments weighing 10,700 lbs. each, the inner perimeter of the wheel having 550 buckets, in pairs, each 3′ wide and 4′ 6″ long, and holding 100 gallons, giving the wheel a capacity of 55,000 gallons per revolution. The completed wheel is 10′ wide and 64′ in diameter, driven by gear and pinion, power being furnished by a 700-h. p. dynamo. Nearly two years were required to build and adjust this monstrous wheel. Foundations for another wheelhouse were begun April, 1908, and another sand-wheel of 50′ diameter is to be installed.

The tailings at the Lake Linden mills are the most extensive in the world, containing nearly 40,000,000 tons of stamp-sand, carrying about 8 to 10 lbs. copper in the newer sands, the older tailings having 12 to 20 lbs. of copper per ton, and there probably is fully 250,000 tons of copper in these sands. Extensive experiments at reworking the tailings have been made, from time to time, but without success. By reason of the included copper, which can be extracted only through regrinding, and the rapid oxidation of the metal in the tailings, the problem of economical extraction is not simple, and as yet lacks a solution.

The new boiler-house, of steel frame, 108x220′, with two 200′ self-supporting brick-lined steel smokestacks, is planned for twenty 500 h. p. Babcock-Willcox tubular boilers, with 15 in place. The old boiler-house is to be demolished. The power-house has coal crushers, feeding an endless link-belt system with

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308 steel link buckets, of 60 tons hourly capacity, which takes the coal to overhead bins, from which it is fed to the grates by Roney automatic stokers. Water requirements at the new boiler plant are about 650,000 gallons daily, and water is secured from a reservoir, artesian wells and Torch Lake, going through a Jewell filtration plant of 500,000 gallons daily capacity, in which impurities are precipitated by lime, but the new plant is to take water from a large reservoir, fed from Lake Superior via the Calumet pipe-line.

The new power plant at Lake Linden furnishes electric energy for the mine, as well as for the mills, the electrification of the property having begun in 1904. It is the plan of the company eventually to use electric energy throughout the mine and works, wherever practicable, though in the case of some of the big compounded hoists, a change from steam to electricity would be doubtful economy, as well as necessitating enormous initial outlays. Steady progress has been made in the application of electric energy, and the work will be completed in the near future. Eventually practically all the machinery of the company, except hoists, air-compressors and stamps, will be operated electrically.

The central power station, of steel, is located at the mills rather than at the mine because fuel can be delivered alongside from the largest vessels plying the great lakes, effecting a saving of about 10 cents per ton on transportation cost of coal formerly burned at the mines, with a much greater saving in the case of isolated plants lacking rail connections. There also will be a saving in slack, resulting from one less handling of the coal. Some of the former steam installations consumed as much as 4 pounds of coal per horsepower-hour, while the new electric plant requires approximately 1½ pounds per horsepower-hour. There are numerous other economies resulting from a central electric power plant, especially in labor, the company formerly employing 100 firemen in its various power plants. The coal consumption of the Calumet & Hecla, at its mines, mills and smelters, is about 250,000 tons yearly. Machinery at the power plant includes the old engines Saginaw and Gratiot, the former an Allis-Chalmers twin vertical tandem compound-expansion engine having 17x40x48" cylinders, each engine being direct connected to a 1,000-kw. alternating current generator. The completed plant will have, in addition, the Leavitt engines Owego and Ontonagon, of 3,000 h. p. each, built originally for hoisting purposes, direct-connected to 2,000-kw. generators. There is room for a third 2,000-kw. generator, which will give a total capacity of 8,000 kw., equal to more than 10,000 h. p. The electric equipment of the mills includes 15 motors of 20-h. p. to 250-h. p. each.

Water for the mills is supplied by 5 pumps, of which the Michigan is the most powerful in the world, having a daily capacity of 60,000,000 gallons. The daily capacity of the engines Huron and Ontario is 20,000,000 gallons each, of the Erie 10,000,000 gallons, and of an I. P. Morris pump, 22,000,000 gallons.

Miscellaneous buildings at the millsite include a 50x100′ steel frame smithy, 48x175′ warehouse, machine-shop, carpenter-shop, paint-shop and sundry other shops required in connection with the works.

The Torch Lake smelter is at Hubbell, about a mile south of the mills, on a 30-acre site having ample water frontage, shipping facilities including deep water in front and 3 railways at the rear. The smelter has 4 furnace buildings, each 80x130′, and a 50x70′ blister copper furnace building. Both the reverberatory and blast furnaces have been rebuilt within the past few years, there being 11 reverberatory furnaces, with 93′ stacks. Reverberatories are top-charged, having platforms above on which the mineral is thoroughly dried before smelting. The largest blast furnace is 40x96" at the tuyeres, its comparatively small size being due to the use of reverberatory furnaces

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for the bulk of the smelting work required in the process of reducing the native copper mineral treated. The practice at the smelting plant is fully abreast of the times, in all essentials.

The smelting works have 3 mineral-houses, with a combined storage capacity of 18,000 tons. Calumet & Hecla mineral now carries less than 60% copper, being dressed much lower than formerly, to effect the saving of the very fine copper previously lost in the slimes.

The power plant at the smelter has three 125-h. p. boilers, and a fourth boiler, in the cupola building, generates steam by the combustion of waste gases from the reverberatory furnaces. A small electric plant has an 85-kw. generator, with a 25-kw. generator in reserve.

The smelting works have a 2-story assay office and laboratory, 40x42' with a 14x14' wing, exceptionally well arranged and complete in equipment. There also is an office and a large warehouse for supplies.

The eastern reduction plant, known as the Buffalo Smelting Works, at Black Rock, in the northern part of Buffalo, is located on the Niagara river, with deep water in front and direct rail connections in the yards. The works include the reverberatory and blast-furnace buildings, an electrolytic plant, 2 large mineral storage houses, office, laboratory and coal-sheds. The works are well arranged, but have grown to nearly the capacity of the site, and soon will require more room. A 30-ton electrolytic refinery, originally installed for experimental purposes, has grown to large size, with 700 tanks having multiple arrangement of electrodes, and it is planned to increase its capacity to 20,000,000 lbs. of anodes yearly. Formerly only high grade mineral was shipped to the Buffalo works for smelting, but at present all grades of mineral are treated at both plants, though the mineral from the deeper workings of the Calumet & Hecla, which is decidedly arsenical, is treated exclusively at the Buffalo works, by electrolysis, which effects the saving of considerable silver, formerly lost. The Buffalo plant employs about 150 men.

A fleet of steel steamers and barges is operated by the company, carrying mineral east and bringing back return cargoes of coal, this fleet including the fine steel steamer Geo. A. Flagg, of 3,300 tons register. Sufficient mineral is shipped to the Buffalo works, during the open season of navigation, to keep the plant operating steadily from December till May, during the closed season.

The dock system of the Calumet & Hecla is extensive, including a series of very large coal-sheds at Lake Linden, with one of 200,000 tons capacity, the old sheds being of wood and the new of steel. There is a series of docks at the mills and smelts on Torch Lake, all with substantial wharves having at least 21' of clear water alongside, frequent dredging being required to maintain this depth of clear water, owing to stamp-sand filling in. The wharves were extended, 1904-1905, both at Lake Linden and Hubbell. The 750' coal wharf has 11 Hunt hoists and three 52' movable derricks, one of wood and two of iron.

The Calumet & Hecla owns and operates the ship-canal connecting Torch Lake with the government waterways on Portage Lake, this canal being 21' deep and accommodating the largest vessels plying the great lakes. Tolls, ranging from 10 cents on soft coal to 50 cents per ton on package freight, are charged by the company, on independent cargoes entering Torch Lake through this canal

A sawmill, at the head of Torch Lake, receives logs by rafts, and ships sawed lumber and timber by a branch of the Hecla & Torch Lake railway. The company has sawmills at Ashland, Wisconsin, and Sheldrake, Michigan, both on the southern shore of Lake Superior, the latter having a capacity of 12,000,000' of sawed lumber yearly, with several years' supply of standing

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timber tributary thereto. The company owns extensive tracts of pine, hemlock and hardwood timber along the southern shore of Lake Superior, this land carrying about 500,000,000′ of standing timber. The company also has a long-term timber contract with the Keweenaw Association, Ltd., and buys extensively of jobbers, the requirements for underground timbering alone being about 30,000,000′ annually, in addition to the many million feet of timber and lumber used on surface, at the mines, mills and smelters.

An aid fund for employes, instituted 1877, and managed by directors chosen by the workmen, pays death and disability benefits, enormous sums having been disbursed since the formation of the fund, every dollar going to the sick and injured, or to families bereaved of their bread-winners by accident or disease. Surplus monies accumulated in this fund have been invested in the company's shares, bought on the open market, and these investments have been highly profitable. Disbursements from this fund are $50,000 to $75,000 yearly. For the maintenance of this fund each employe pays 50 cents monthly, and the Calumet & Hecla adds an equal amount. The company is said to have established, 1907, a pension fund for superannuated employes of long and faithful service.

Beginning with the new century, the policy of the Calumet & Hecla has been one of expansion. Almost from its birth it was the greatest copper producer of the world, and the most profitable mine of any metal. The company was progressive, leading all other mines in the introduction of heavy mining machinery and modern methods, but was self-contained and self-sufficient. It was seen, however, in 1901, that the old mine, great as it was, must come to an end sometime, hence a radical change in policy, which included the reconstruction of its mills, many changes in mining practice, and, most important of all, the acquisition of mineral resources outside of the old mine, in addition to the opening of a fine new mine on the Osceola amygdaloid, upon the old tract, and the tentative opening of a mine on the Kearsarge amygdaloid. Some excellent team work, led by Messrs. Agassiz, Livermore and MacNaughton, has been done by the responsible heads of the company, and in consequence the Calumet & Hecla, instead of being the decadent property that it would be in 1909, but for this work, continues well at the front, in both production and earnings. Costs have been reduced largely, and savings effected in innumerable ways. The growth of the property, during the new century, has been well balanced, every department having been brought to a higher degree of efficiency. Operating costs have been largely reduced, without cutting wages, while charging millions of dollars for new equipment direct to operating expenses, and despite the decreasing percentage of copper due to deepened mines, the cost of making a pound of copper was reduced, from almost 11 cents in 1901, to about 8.25 cents in 1906.

The policy of acquiring new mines, either through direct purchase or by control of stock, begun in 1904, has been adhered to consistently, and the Calumet & Hecla now is in control of two promising neighbors to the north, these being the Centennial and Allouez, and, although the Centennial made a failure of working the Calumet conglomerate, it is probable that eventually this bed can be worked profitably, on Centennial ground, by the Calumet & Hecla, though the task would be hopeless if attempted by an independent company. The Calumet & Hecla also is likely to be in control, shortly, of its southern neighbor, the Osceola, which also has extensive mines in the vicinity of the Centennial and Allouez, to the north. The Superior Copper Co., at Houghton, is developing a fine mine on the Baltic amygdaloid, and may be considered a large and permanent asset of the Calumet & Hecla. The La Salle, south of the Osceola, remains in a development stage. In Ontonagon

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county, exploratory work undertaken by the company has given disappointing results. In Keweenaw county, where the Calumet & Hecla owns a tremendous acreage of mineral lands, no mine has been developed as yet, but it is altogether probable that, in the course of time, payable mines will be opened on the lands of the Manitou, Gratiot and Frontenac companies.

The company markets its own copper, and in the course of 40 years of honest dealings, has built up a patronage that is simply unassailable. The advantages resulting from direct contact with consumers are very great, one of the principal benefits, in addition to the friendly relations established by direct communication with consumers, being the closeness with which the company is kept in touch with the copper market, reflected by the exceedingly skillful marketing of the company's products, resulting in high average prices, yet protecting the interests of customers.

The conglomerate rock from the old Calumet & Hecla workings, which yielded 59.93 lbs. fine copper per ton in 1900, returned only 39.68 lbs. per ton in 1907, yet the company made its copper cheaper in the latter year. The mill, at the beginning of the latter half of 1908, was stamping about 8,500 tons daily, of which circa 6,500 tons was conglomerate and 2,000 tons amygdaloid rock, the amygdaloid mine working one-third of the power drills employed. In 1906 the company produced, from Osceola amygdaloid rock, 6,692,458 lbs. fine copper, and in 1907 made 11,145,220 lbs. fine copper from 603,891 tons of Osceola amygdaloid rock stamped, a yield of 18.45 lbs. fine copper per ton, which was most satisfactory. The cost of treatment of Osceola amygdaloid rock, for the fiscal year ending April 30, 1906, was only $1.57 per ton.

Detailed figures of production and dividends by years will be found in the statistical chapter. The statistical confusion so frequently noted in figures of Calumet & Hecla production is caused by the use of four sets of figures of production of refined copper, to say nothing of two sets of figures of output of crude mineral (unsmelted copper), and numerous estimates of more or less authenticity. The four sets of official figures of annual production are for actual output of refined copper, and also quantity of fine copper contained in mineral produced, for the calendar year, and also for the company's fiscal year. Figures used in this publication are those of actual outputs in refined copper by calendar years.

Production, 1906, was 100,023,420 lbs. fine copper, leading the mines of the world, and for 1907 was 83,863,116 lbs. fine copper, while for the first half of 1908 the production was circa 42,000,000 lbs. fine copper, on at practically the same rate as in the preceding year.

CALUMET, HECLA & MUSKAWINK MINING CO.

Office: Cass Ave. and Second St., St. Louis, Mo. Location of property, if any, not known.

CALUMET & JEROME COPPER CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Organized April, 1907, under laws of Arizona, with capitalization $1,500,000, shares $1 par, by Geo. H. Avery, Geo. W. Avery and Joseph Larson. Lands, sundry claims about 2 miles south of the United Verde. Incorporators stand well locally, but no work done on property at last accounts.

CALUMET MINING CO. **COLORADO.**

Office: 2 Toltec Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Rollinsville, Gilpin Co., Colo. Emerson J. Short, president and general manager. Main shaft, 100', is said to show a 2' paystreak of auriferous and argentiferous chalcocite assaying 25 to 40% copper. Idle.

CALUMET MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

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CALUMET & MONTANA DEVELOPMENT CO. **MONTANA.**

Dead. Formerly at Helena, Lewis & Clark Co., Mont.

CALUMET & MONTANA MINING CO. **MONTANA.**

Office: Duluth, Minn. Mine office: Dillon, Beaverhead Co., Mont. Saml. Clark, president; Wm. Buchanan, first vice-president; Gust Levine, second vice-president; John Cox, secretary; Solomon Goldberg, treasurer; preceding officers, Thos. Bastian, J. J. Lefevre and Angus McDonald, directors; Capt. Jas. Lanyon, superintendent. Capitalization $300,000, shares $1 par.

Lands, 6 claims, area 120 acres, in the Copper Queen district, near the Idaho line, including the Dark Horse mine at the head of the Big Hole, having tunnels of 125′ and 160′, and a 2-compartment 200′ shaft, with circa 1,800 of workings, developing a 5′ fissure vein carrying auriferous and argentiferous chalcocite and bornite of excellent grade. Property shows 3 practically parallel fissure veins, of circa 12′, 15′ and 22′ width. Test shipment, to Salt Lake smelter, gave returns of 18% copper, 7 oz. silver and 66 cents gold per ton, and ores shipped, 1907, to Washoe smelter, averaged 21.4% copper, 73 oz. silver and 38 cents gold per ton. Equipment includes two 50-h. p. boilers, a hoist good for 1,000′ depth, and a 2-stage Sullivan air-compressor. Property considered promising.

CALUMET & ONTARIO DEVELOPMENT CO. **ONTARIO.**

Office: Calumet, Mich. Letter returned unclaimed from former mine office, Massey Station, Algoma, Ontario. Lands, sundry claims near the Hermina mine. Idle for several years and apparently moribund.

CALUMET-PINAL MINING CO. **ARIZONA.**

Office: 1267 Broadway, New York, N. Y. Mine office: Red Rock, Pinal Co., Ariz. Chas. Doty, president; G. E. Crawford, secretary; Hon. Nott E. Gould, superintendent. Organized July 3, 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 12 claims, area 240 acres, and a 5-acre millsite, in the Owl Head district, 15 miles northeast of Red Rock. Mine was opened 1879, and worked, in a desultory way, to depth of 85′, producing circa $60,000 worth of ore. The 96′ Yankee Girl shaft is opened in porphyry showing deposits of medium grade ore. The 135′ Cloud Burst shaft develops a vein between porphyry and slate, carrying sulphide ore of good average tenor. Property is considered promising with a good local management.

CALUMET & PITTSBURG MINING CO. **ARIZONA.**

Dead. Merged, 1907, in Superior & Pittsburg Copper Co. Formerly at Bisbee, Cochise Co., Ariz. Very fully described Vol. VII.

CALUMET & SAULT STE. MARIE DEVELOPMENT CO. **ONTARIO.**

Office: Calumet, Mich. Letter returned unclaimed from former mine office, Massey Station, Algoma, Ontario. Fred. Roehm, president; Wm. F. Ashton, superintendent. Lands, near the Hermina, have a 100′ shaft, showing a vein of 14′ reported width, carrying auriferous chalcopyrite. Idle several years and apparently moribund.

CALUMET & SONORA OF CANANEA MINING CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Calumet & Sonora Mining Co.

CALUMET & SONORA MINING CO. **MEXICO.**

Office: 606 Sellwood Bldg., Duluth, Minn. Mine office: La Cananea, Arizpe, Sonora, Mex. Jerome E. Cooley, president; Jas. W. Norton, first vice-president and general manager; B. Silberstein, second vice-president; Hubert V. Eva, secretary; Chas. W. Ericson, treasurer; preceding officers, Wm. D. Underhill and H. E. Prudden, directors; Forbes McRae, superintendent; Thos. M. Daly, assistant superintendent. Organized May 14, 1903, under laws of Minnesota, with capitalization $600,000; capital increased to $3,000,000, shares

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$10 par. Direct title to lands is held through a Mexican corporation, the Calumet & Sonora of Cananea Mining Co., S. A. Annual meeting, second Tuesday in October.

Company began business with 173 acres of land, and has increased its holdings to 1,146 acres, all in the Ronquillo district. Properties are the Buena Vista group of 306 acres, Catalina group of 630 acres, and Ronquillo-Duluth group of 210 acres, principal developments being on the Catalina.

The Buena Vista group, near the Greene-Cananea, has the 100′ Underhill shaft and the 293′ Norton shaft, with a 552′ crosscut tunnel, showing a vein of 57′ width, carrying sulphide ores with talcose gangue assaying 1.25 to 1.75% copper.

The Catalina group has 2 old shafts of circa 75′ each, and a new shaft of 205′ depth, with about 900′ of workings, showing ore, from surface, of good average grade. A 16-ton test shipment returned 3.64% copper, 53% lead, 113 oz. silver and $20 gold per ton.

The Catalina group has a 150-h. p. equipment, and a townsite has been platted adjoining the Bonanza de Cobre mine, with a lumber yard. Company is free from debt, meeting all obligations monthly, and Aug. 1, 1908, had on hand, $13,000 cash. Employs 71 men. Company continued active development during the period of depression, in 1907. Property considered promising and management good.

CALUMET & TEXAS MINING CO. **TEXAS.**

Office: Cedar Rapids, Iowa. Mine office: Carlsbad, N. M. John H. Shary, president and general manager; Wm. Fullerton, secretary and treasurer; W. G. Woerner, general manager. Organized, May, 1901, under laws of New Mexico, with capitalization $250,000, shares $1 par. Lands, 36 claims, area 720 acres, also 640 acres of oil lands, in the Guadalupe Mountains, El Paso county, Texas, 64 miles southwest of Carlsbad, nearest railroad point, showing carbonate ore assaying 20% copper, 5% lead and 1 oz. silver per ton, with a trace of gold, opened by tunnels of 40′, 200′, 210′ and 328′. Has expended about $30,000 and claims to have $500,000 worth of ore developed. A 23-ton test smelter shipment returned 19 to 24% copper. Idle several years.

CALUMET & YAQUI RIVER COPPER CO. **MEXICO.**

Letter returned unclaimed from former office, La Cananea, Sonora, Mex. Mine office: Soyopa, Ures, Sonora, Mex. H. C. Rolfe, president; Geo. H. Nolte, secretary; W. J. Elliott, treasurer. Organized Apr. 28, 1903, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Apparently is successor of Santa Marguerita Mining Co., and bought lands of the Venice Copper Co., 7 miles from Soyopa, area 85 hectares, opened by a 1,200′ tunnel, showing copper sulphides of fair tenor at shallow depth. Is said to have a 50-ton smelter. Presumably idle.

SOCIÉTÉ DES MINES DE CUIVRE DU CAMAQUAM. **BRAZIL.**

Office: Brussels, Belgium. Mine office: Camaquam, Rio Grande do Sul, Brazil. Organized 1900. Lands, circa 80 kilometers from Rio Negro station of the Southern Brazilian Railway, and 3 kilometers from the Rio Camaquam, show an intrusive core of melaphyr, surrounded by conglomerate and sandstone, carrying fissure veins which are narrow but rich in the conglomerate, but leaner in the sandstone, veins averaging about 4′ in width, but lacking regularity, and even continuity. The oxidized zone is shallow, the secondary zone carrying considerable chalcocite and bornite, with gangue of quartz and occasional barite. The ore below the shallow zone of secondary enrichment is mainly chalcopyrite, associated with pyrite and showing occasional particles of chalcocite and dendrites of native copper. Four veins worked average 4′ in width and carry circa 6.5% copper and 30 grams gold per metric ton. Mine

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is opened by 3 adits, having backs of 300′ to 350′, and a fourth adit is planned to be driven 3,300′, to cut additional veins shown at surface.

Equipment includes a fair mining plant with hydro-electric power installation, taking water from a dam 453′ long and 53′ high, holding sufficient water to run the mill for the entire year, as there are long droughts occasionally. All ore is hand-sorted, selected ore assaying about 30% copper. Gangue rock is discarded, and remainder, averaging about 70% after hand selection, is concentrated in an 80-ton mill with hand-jigs to an average of about 28% copper tenor. Smelter has a small matting furnace. Production, 1904, was 90 to 100 tons of 28 to 30% ore monthly, shipped to England for smelting, and about 225 tons monthly of matte of 45 to 50% copper tenor. Production, 1907, is estimated at 2,000,000 lbs. fine copper.

CAMBRIA COPPER CO. **NEVADA.**

Mine office: Aurum, White Pine Co., Nev. Owen Pritchard, superintendent. Lands, 4 claims, area circa 80 acres, known as the Texas group, at Muncey creek, Spring Valley, in the Silver Mountain district, circa 30 miles north of Ely, also 10 miles of water rights on Muncey creek, and 580 acres of ranch lands. Has shipped carload lots of ore to Salt Lake smelter returning 22.55 to 23.4% copper.

CAMBRIAN CONSOLIDATED MINES, LTD. **WALES.**

Dead. Wound up, September, 1904. Formerly at Caerwych, Merioneth, Wales. Described Vol. V.

CAMBRIAN COPPER MINING CO., LTD. **WALES.**

Dead. Voluntarily wound up, February, 1903. Formerly at Caerwych, Merioneth, Wales. Described Vol. III.

CAMBRIAN MINING & MILLING CO. **CALIFORNIA.**

Dead. Formerly at Placerville, Eldorado Co., Cal. Described Vol. VI.

CAMBRIDGE COPPER MINING CO. **NORTH CAROLINA.**

Dead. Formerly at Jamestown, Guilford Co., N. C.

MINAS DE CAMPANARIO. **SPAIN.**

Office: care of Don Antonio Guijarro Orta, Huelva, Spain. Mine office: Valverde del Camino, Huelva, Spain. Lands are a group of 6 properties, area 87 hectares, on which there is a considerable body of low-grade cupriferous iron pyrites.

CAMPECHANA TRIUMVIATE CO. **MEXICO.**

Mine office: León, León, Guanajuato, Mex. Mine has blocked out considerable ore carrying 2 to 3% copper, 2 to 5% lead and about 300 grams silver per metric ton. Is said to have bought machinery for a 50-ton concentrator.

CAMPERDOWN GROUP. **WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. Lands, north of the Cumberland group, on the southern slope of Coad Mountain, are said to have a good showing of copper ore, somewhat resembling that of the Cumberland group. Idle.

SOCIEDAD ANONIMA COBRES DE CAMPÓO. **SPAIN.**

Office: Santander, Spain. Mine office: De Soto, Santander, Spain. Don Alberto Gutierrez, president; Don Luis Torres Quevedo, secretary. Idle.

CAMPO SECO MINES. **CALIFORNIA.**

Owned by Penn Chemical Works.

CAMPRODEN COPPER SYNDICATE, LTD. **SPAIN.**

Offices: 3, Lord St., Liverpool, Eng. Moribund.

CAÑADA DEL ORO MINING & DEVELOPMENT CO. **ARIZONA.**

Letter returned unclaimed from former office, care Maj. W. A. Desbrough, secretary and manager, Tucson, Ariz. Mine office: Oracle, Pinal Co., Ariz. Eugene S. Dives, president; Louisa M. Matos, treasurer; preceding

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officers, A. C. Waters and Uri Embody, directors. Organized 1906, with capitalization $1,000,000. Lands, 23 claims, in the Cañada del Oro district of the Santa Catalina Mountains, showing well defined ore bodies, having 7 shafts and tunnels, with about 1,000′ of openings, showing ore said to give assays of $51.75 to $181 per ton, in lead, copper, silver and gold. Presumably idle.

CANADIAN-AMERICAN MINING CO. **BRITISH COLUMBIA.**

Mine office Gribbell Island, Skeena River division, Cassiar district, B. C. Company succeeded the Eureka Copper Mines, Ltd. Lands, 7 claims, 3 fractional, with geological conditions markedly similar to those of the copper fields of Texada Island. Mine has tunnels of 40′ and 600′, and a 200′ shaft, with 2 levels opened, showing mainly bornite, in crystals of varying sizes, disseminated in garnetite and feldspar, with footwall carrying a little chalcopyrite, as impregnations, to a considerable depth. Ore is auriferous, and of medium copper tenor. Has steam power, employing circa 20 men, and has produced about 2,000 tons. Shipments, 1906, of 940 tons to the Trail smelter returned circa $14 per ton.

CANADIAN CONSOLIDATED MINES, LTD. **BRITISH COLUMBIA.**

Dead. Title changed, 1906, to Consolidated Mining & Smelting Co. of Canada, Ltd. Formerly at Trail, Trail district, B. C.

CANADIAN CONSOLIDATED MINING & SMELTING CO. **BRITISH COLUMBIA.**

Mine office Nelson, Kootenay district, B. C. Lands, 7 claims, 3 fractional, on Forty-nine Creek, bought, 1906, of Eureka Copper Mines, Ltd., having a 150′ shaft showing a considerable body of auriferous copper ore of fair grade. Has steam power. Former owner shipped about 1,000 tons of ore to the Trail smelter.

CANADIAN COPPER CO. **ONTARIO.**

Office: 2402-43 Exchange Place, New York, N. Y. Mine and works office: Copper Cliff, Algoma, Ont. A. P. Turner, president; F. S. Jordan, vice-president; J. L. Ashley, secretary and treasurer; Capt. John Lawson, general superintendent; David H. Browne, metallurgist; Capt. Thos. Travers, mine superintendent; E. W. C. Perry, superintendent of roast-yard; Wm. Hambly, superintendent Creighton mine; C. F. Griswold, superintendent Crean Hill mine. Organized Jan. 6, 1886, under laws of Ohio. Is controlled, through ownership of nearly the entire stock issue, by International Nickel Co.

The Canadian Copper Co. is the world's largest nickel mine, and is a copper producer of present importance and even greater future promise. Ore was discovered 1882, and the first mine opened in 1886. Lands are extensive, including mineral holdings in the districts of Algoma and Nipissing. Protracted diamond drill borings have shown large reserves of ore. Principal ore bodies are irregular contact deposits in basic igneous rocks, mainly diorite and granite, carrying a mixture of chalcopyrite, pentlandite and pyrrhotite, returning 1 to 4% copper and 2 to 6% nickel, with an average of 2 to 2.5% copper and 4 to 5% nickel.

The Creighton mine, employing about 200 men and producing circa 800 tons of ore daily, 1906, has 2 shafts, but extraction is mainly from an immense open pit, circa 225′ wide, from foot to hanging, about 500′ long and 150′ deep. The pit has 13 railroad tracks, converging to an entry on the footwall that leads to an incline shaft. Ore is broken in steps, and thrown to the bottom, where block-holed and trammed to the shaft. Drill borings prove the Creighton ore body to extend some distance west of the pit. A new shaft, No. 2, sunk in the granite, about 500′ west of the old shaft, has 3 compartments, with walls concreted for about 40′ depth from the collar. No. 2 shaft has a rockhouse 42x46′ on the ground and 72′ high, of reinforced concrete to the

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bin floor, above which the walls are of 3" planks, 10' wide, spiked together. The rockhouse equipment includes two 18x30" Blake crushers and a picking belt 3' wide and 50' long.

No. 2 mine, which produced circa 200 tons daily, 1906, was idle, 1907, though kept free of water.

The Crean Hill mine, about 2 miles east of the Victoria mine, has been diamond-drilled extensively, showing a series of lenses of 50' to 80' width, containing a much larger portion of pentlandite than any of the other mines, ore requiring different treatment from the massive ores found at the Creighton and Stobie mines. The Crean Hill is opened by a 4-compartment 300' shaft, sunk at an angle of 57°, and concreted to a depth of 40'. Equipment includes a rockhouse similar to that at the Creighton.

The Stobie mine, in Blezard Township, 4 miles north of Sudbury, has ores similar to those of the Creighton, and is an important producer.

Miscellaneous mines include the Evans, McArthur, McDonald, Clara Bell A and B and various other workings. There is a quartz quarry, about 1½ miles southeast of Naughton, producing about 150 tons of quartz daily, used for fluxing and lining converter shells.

In 1908 the company built large new shops, including a machine-shop, smithy and foundry under one roof, and a large carpenter and pattern shop. There is a fire-proof laboratory building, of concrete and brick, 35x80', 2 stories high, with one of the best equipments to be found at any metallurgical plant. At the Creighton and Crean Hill mines there are 36x80' change-houses, with concrete floors, brick walls and tile roofs, having separate lockers for each man, with enameled basins and shower baths.

Electric power is used throughout the mine and works. The development of power is through a subsidiary corporation known as the Hüronian Company which has a hydro-electric installation at High Falls, on the Spanish river, utilizing an effective head of 85' with total available energy of about 14,000 h. p., of which about half is now developed. The power-house at High Falls is 55x106', of brick and concrete. Installation includes two 3,550-h. p. turbines, with speed of 375 revolutions per minute, each direct-connected to a 2,000-kw., 2,400-volt, 3-phase, 25-cycle generator, with space for 2 additional units, of which one is under construction. The transmission line, of about 30 miles length, has double sets of poles, spaced at 130' intervals, carrying 6 bare No. 1 copper wires. At Copper Cliff there is a 100x200' sub-station, where the current is stepped down to low voltage, and distributed to various motors about the mines and works.

The Creighton mine has an air-compressor with piston efficiency of 1,635 cubic feet of free air per minute, driven by a 300-h. p. 550-volt constant-speed induction motor. The Creighton mine is operated exclusively by electricity for hoisting, crushing and other work.

Water for general use and fire protection is stored in a 60,000-gallon steel tank.

A private railroad line, connecting the principal mines with the roast-yards and works, has two 80-ton locomotives, hauling 50-ton drop-bottom dump-cars, and a brick roundhouse.

Ore is heap-roasted, in yards near the town of Copper Cliff. Roast-heaps of circa 5,000 tons size are built up by unloading raw ore from wheelbarrows. The company has experimented extensively with the size and shape of roast-heaps, obtaining best results from heaps requiring about 3 months' roasting. Roasted ore is loaded from heaps by steam-shovels and taken to the smelter by rail.

The smelter, at Copper Cliff, 6 to 20 miles from the various mines, is of

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2,000 tons daily capacity. These works were perhaps the first to use the Bessemer process for treating nickel ores. The new plant has taken some ideas from the Tennessee Copper Co., but none from the Mond Nickel Co., mixed charges of raw and roasted ores being a modification of the Tennessee process. A limited amount of custom smelting is done, but no mispickel is treated.

The smelter, which is served by electric locomotives, has 35x700′ ore-bins, of 15,000 tons capacity, and a blast-furnace building 85x375′ in size, with five 400-ton blast-furnaces, each 50x204″ at the tuyeres, with 2 tiers of water-jackets, the lower being 8′ 6″, and the upper tier 6′ in height, furnace having a total height of 35′. Slags flow from the back of the settlers into 22-ton cast-iron slag-pots, which are made in sections, with 4 side pieces and a separate bottom piece.

A new converter building, built 1907, is 60′ from the cupola building and parallel therewith, having a 60x280′ main structure, with a shed 35x280′ for matting, casting and sculling, and at one end is the relining department, 60x112′ with a 35′ shed on each side, having a continuation of the crane-run of the main building, with storage for material, etc., entire length of the converter building being 522′. The structure is of steel frame, with corrugated sides and roof, having two 50-ton Morgan electric traveling cranes, of 55′ 8″ span, and a 20-ton auxiliary hoist. Matte from settlers in the blast-furnace department is poured into cast-steel moulds, 5′ in diameter and 5′ deep, and taken by electric crane to the converters, there being 10 stands, with 10-ton shells, 84x120″, of the Anaconda type. First fusion product of the blast-furnaces is a matte of 30 to 35% tenor in combined nickel and copper, the second fusion product, from the converters, being an 80% nickel-copper matte. Stands are controlled electrically from 2 pulpits, each handling 5 stands, each stand having a 30-h. p. induction motor, with solenoid brake. Blowing is precisely the same as in treatment of ordinary copper matte, except that the blast is cut off as soon as the iron is fully eliminated. The copper and nickel behave as one metal, similarly to copper alone, up to the final elimination of sulphur and iron. Matte is taken from the converters in clay-lined ladles, by crane, and poured into moulds under the shed roof. Slag from converters is poured into steel slag-pots, lifted by crane to slag-cars and taken to the slag-casting machine, which consists of a circular steel framework, of 58′ diameter, on a circular track, carrying cast-iron moulds, forming a continuous flat ring. The moulds, 4x12x30″, holding 150 pounds of slag each, are mechanically rotated under the stream of slag. The cast bricks are allowed to cool before the moulds reach a hand-controlled tripper, which reverses the moulds, dropping the bricks into a hopper, a chute from the hopper discharging the slag-bricks into a skip, that carries them up an inclined track to a 500-ton steel bin above the charging tracks leading to the blast-furnaces.

The lining department has a silica mill and extensive bins for storage of material, linings being tamped by machine.

The 80% nickel-copper matte from the converters is shipped to the Orford Copper Co., New Brighton, N. Y., where it is smelted with sodium sulphite, effecting the separation of the combined nickel and copper, and the resultant copper product is refined electrolytically.

The smelter power plant, in a 101x158′ building, includes a complete steam plant, held in reserve for emergencies, but regular operation is by electric power throughout. The power plant includes 3 Nordberg radial-valve blowing engines, rope-driven by induction motors arranged to work at 3 speeds, to give full control of volume of air for the furnaces. The converter

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blast is furnished by a Nordberg air-compressor with capacity of 12,600 cubic feet of free air per minute, reduced to 12 pounds pressure.

A separate refining plant, built on the site of the old Orford refining works, treats cobalt-silver-nickel-arsenic ores from the mines of the Cobalt district, producing speiss containing cobalt, nickel and silver, which is sent to the Orford works for parting and refining.

Production, 1905, was 4,743 short tons of nickel, a decrease of 2,255 tons from 1903, and 4,326,000 lbs. fine copper, as against 8,010,000 lbs. fine copper in 1903. Production was materially larger, 1906-1907, and the normal capacity of the company, beginning 1909, may be rated at about 20,000,000 lbs. fine copper and 40,000,000 lbs. nickel yearly. The new plant of the Canadian Copper Co. is one of the best planned and most complete in existence, and the management of the company is excellent.

CANADIAN MINING & DEVELOPMENT CO. — **MONTANA.**

Dead. Formerly at Basin, Jefferson Co., Mont.

CANADIAN SMELTING & REFINING CO., LTD. — **ONTARIO.**

Office: care of Frank Arnoldi, president, Toronto, Ont. Works office: Sault Ste. Marie, Algoma, Ont. G. W. Monk, vice-president; E. Douglas Warren, secretary and treasurer; Otto Stahlmann, manager. Organized under laws of Ontario, with capitalization $2,500,000, shares $1 par. Plans erecting a 125-ton smelter to treat copper and nickel ores.

CANADIAN SMELTING WORKS. — **BRITISH COLUMBIA.**

Owned by Consolidated Mining & Smelting Co. of Canada, Ltd.

CANANEA-ARIZONA CONSOLIDATED COPPER CO. — **ARIZONA & MEXICO.**

Office: 1511 First National Bank Bldg., Chicago, Ills. Letters returned unclaimed from former mine offices, Globe, Gila Co., Ariz., and La Cananea, Arizpe, Sonora, Mex. S. W. Osgood, president; Chas. E. Noble, vice-president; Jas. W. Luther, secretary; preceding officers, Arthur T. Sexton, O. M. Cone, John F. Donovan, F. Silverstein, J. Leathead and Jas. Jay Sheridan, directors. Organized 1907, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands include the Bisbee Extension mine, area 37 acres, near the Greene Cananea; circa 100 acres in the Sierra Manzanal, southeast of La Cananea, and the Copper Basin group, near the Black Hawk mine of the Arizona Commercial, at Globe. Idle and apparently moribund.

CANANEA-BISBEE DEVELOPMENT CO. — **MEXICO.**

Office: care of Hayden, Stone & Co., 87 Milk St., Boston, Mass. Mine office: La Cananea, Arizpe, Sonora, Mex. P. J. T. Haney, president and general manager; C. E. Watson, superintendent. Organized Dec. 21, 1906, under laws of Maine, with capitalization $300,000. Was promoted by W. B. Thompson. The Cananea property, supposed to carry the extension of the Massey ore body of the Greene-Cananea, has 3 shafts. Lands at Bisbee, having 8 shafts, deepest 165', each showing ore of about 2% copper tenor, were surrendered, late 1907, and apparently Cananea lands have been thrown up also. Idle and apparently moribund.

CANANEA CENTRAL COPPER CO. — **MEXICO.**

Office: Lyceum Bldg., Duluth, Minn. Mine office: La Cananea, Arizpe, Sonora, Mex. Capt. Jas. Hoatson, president; Chas. A. Duncan, first vice-president and treasurer; G. Ashley Tomlinson, second vice-president; preceding officers, Thos. F. Cole, Chester A. Congdon, Wm. J. Olcott, Jos. B. Cotton, John D. Ryan and Col. Wm. C. Greene, directors; Dr. L. D. Ricketts, general manager; Frederic R. Kennedy, secretary; Danl. R. Smith, assistant secretary; Wm. G. Hegardt, assistant treasurer. Organized Aug. 6, 1906, under laws of Minnesota, with capitalization $10,000,000, shares $10 par; issued, $6,000,000.

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The Cananea Central Copper Co. owns the entire capital stock of the San Pedro Copper Co., S. A., organized under laws of Mexico, which holds claims as follows: American, Copper Belt, Bryan, Seguro, Square, eastern part of Massey No. 2, and El Oriente.

The Cananea Central Copper Co. owns 268,120 shares of the issued capital stock of the Cananea-Duluth Copper Co., which has an issued capitalization of 269,186 shares, leaving only 1,066 shares outstanding, and it is probable that the Cananea-Duluth Copper Co. will be wound up as soon as the small balance of stock outstanding can be secured, and its property absorbed by the Cananea Central. It is said that the Cananea Central paid $450,000 for the Cananea-Duluth.

The Cananea-Duluth Copper Co. owns the entire capital stock of the Cananea Development Co., S. A., a Mexican corporation owning Los Dos Naciones claim, at Cananea.

Financial statement of the Cananea Central, of date Dec. 31, 1907, showed cash on hand, $61,882.10, with loans of $619,267.52 to the Greene-Cananea Copper Co., Cananea Consolidated Copper Co., S. A., Cananea-Duluth Copper Co. and San Pedro Copper Co., S. A. Liabilities included bills payable of $102,267.52.

Lands are 3,708 acres, including the holdings of subsidiary companies. Col. Wm. C. Greene turned over a large portion of this land to the Cananea Central, the lands from Col. Greene including properties granted the Sonora Copper Co., S. A., on May 4, 1904, which concessions were allowed to expire May 17, 1906. The land was denounced immediately thereafter by Col. Greene, personally, and turned over to the new company, presumably for the benefit of the Cananea Consolidated, in exchange for $2,000,000 stock in the Cananea Central, which was said to have been given, October, 1906, to the Greene Consolidated.

Litigation relative to stock in the Cananea Central, between Messrs. Thos. F. Cole, Col. Wm. C. Greene, Col. Epes Randolph and Lycurgus Lindsay, was settled, late 1907.

The Cananea Central Copper Co. is controlled, through the ownership of about 90% of the total stock issue, by the Greene-Cananea Copper Co., and, owing to the fact that the properties of the Cananea Central and its subsidiary corporations are operated as a portion of the Greene-Cananea, the mines are listed and described under the title of Greene-Cananea Copper Co.,

CANANEA CONSOLIDATED COPPER CO., S. A. MEXICO.

Office and mine: La Cananea, Arizpe, Sonora, Mex. Thos. F. Cole, president; Dr. L. D. Ricketts, general manager; E. J. Campbell, treasurer; Chas. A. Duncan, assistant treasurer. Organized Sept. 30, 1899, under laws of Mexico, with capitalization 20,000 pesos, shares 100 pesos par. Entire stock issue is owned by the Greene Consolidated Copper Co., the Cananea Consolidated merely being the operating company having direct title to the lands of the Greene Consolidated. Is operated as a close corporation and gives out no information. Mines and smelters of this company, formerly described under title of Greene Consolidated Copper Co., are described, in this volume, under title of Greene-Cananea Copper Co., the operating company that is in control of the Greene Consolidated.

Although the Cananea Consolidated is supposed to be merely the operating company, and the Greene Consolidated was supposed to own the entire stock issue of the Cananea Consolidated, there seems to have been either a lax system of bookkeeping, or else a juggling of accounts between the Cananea Consolidated and the Greene Consolidated, as 200,000 shares of Cananea Central stock, supposed to have been turned over to the Greene Consolidated, ap-

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parently never was owned by the Greene Consolidated, but belonged to the Cananea Consolidated. This stock, if sold at $20 per share, as publicly asserted, would have placed $4,000,000 cash in the treasury of the Cananea Consolidated. The 200,000 shares of stock in question was preferred, being issued fully paid, the balance of stock being issued $5 paid and subject to $5 in assessments. The 200,000 shares of stock in question was taken over from the putative owner by Messrs. Thos. F. Cole, John D. Ryan, Col. Wm. C. Greene, Henry H. Rogers, Wm. G. Rockefeller and Cleveland H. Dodge, as individuals, presumably at the stated price of $20 per share.

The 51% of stock of the Sierra Madre Land & Lumber Co., given, 1906, as an asset of the Greene Consolidated, never was opened by the Greene Consolidated, but was owned by the Cananea Consolidated, which sold the stock back to Col. Greene, who apparently was unable to pay for it. The sale price was secured by 75% of the stock of the Sierra Madre company, which apparently has been forfeited by reason of non-payment of notes to the Cananea Consolidated or Greene Consolidated, by Col. Greene, hence apparently the Cananea Consolidated or Greene Consolidated now holds 75% of the stock of the Sierra Madre Land & Lumber Co., which has very extensive tracts of valuable timber lands in northern Mexico, with several sawmills.

The Cananea Consolidated Copper Co., S. A., has authorized bonds at the rate of $10,000 per kilometer at 6% for a 52-kilometer railroad, to be secured by a 20-year first mortgage on the railroad, principal and interest being guaranteed by the Greene Consolidated.

Col. Wm. C. Greene turned over about 4,000 acres of mineral land to the Cananea Central, which originally was part of the concessions granted the Sonora Copper Co., S. A., in 1904, allowed to lapse May 17, 1906, and immediately thereafter denounced by Col. Greene privately, and turned over to the Cananea Central, presumably for the benefit of the Cananea Consolidated, in exchange for $2,000,000 stock in the Cananea Central.

The mines and works of the Cananea Consolidated are described under title of the Greene-Cananea Copper Co., in connection with the properties of the Cananea Central Copper Co.

CANANEA DEVELOPMENT CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Is a subsidiary corporation of the Cananea Central Copper Co.

CANANEA & DULUTH DEVELOPMENT CO. **MEXICO.**

Dead. Succeeded, circa 1906, by Cananea-Duluth Mining Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

CANANEA-DULUTH MINING CO. **MEXICO**

Office: Hibbing, Minn. Mine office: La Cananea, Arizpe, Sonora, Mex. Geo. McMillan, president; Walter J. Power, vice-president and general manager; S. L. Proctor, treasurer. Capitalization $500,000, shares $1 par. Is controlled by the Cananea-Central Copper Co., which owns $208,128 stock, out of issued capital of $209,206. Company probably will be wound up as soon as small balance of stock outstanding can be retired, and property is described under title of Greene Cananea Copper Co.

CANANEA-EASTERN MINING CO. **MEXICO.**

Office and mine: La Cananea, Arizpe, Sonora, Mex. J. J. Williams, president; E. P. Draper, secretary; M. J. Thomas, treasurer; N. J. Nash, superintendent. Organized Sept. 9, 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands were 149 pertenencias in 2 groups, but 490 hectares, in the Ajo Mountains, were sold, 1907, to the Fay-Cananea Mining Co., payment being in stock of latter. Apparently the Cananea-Eastern has

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some lands remaining, as in May, 1908, it was planned to do some diamond drilling on copper claims in the Ajos.

CANANEA & GLOBE EXPLORATION & DEVELOPMENT CO. ARIZONA & MEXICO.

Office: 522 Bradbury Bldg., Los Angeles, Cal. Mine offices: Globe, Gila Co., Ariz., and Baca Bldg., La Cananea, Arizpe, Sonora, Mex. Robt. Mitchell, president and general manager; Henry J. Stevens, vice-president; Geo. A. Fitch, secretary; J. C. Britt, superintendent. Capitalization $15,000,000. Is controlled by Geo. Mitchell. The Five Points Copper Mining Co., controlled by stock ownership, holds the Globe lands, which include the Clark, Lockwood and Van Wagnen groups, 34 claims, near the Gibson Copper Co. at the head of Pinto Creek, 14 miles west of Globe. Company also holds the Peabody group of 5 claims, near the Superior mine, at Superior, Pinal county, Arizona. Also has lands in the Cananea district, and is said to have purchased the South Cananea tract. The Superior property has a 3-compartment shaft, claimed to be 665' deep, which seems doubtful, and is stated to be in rich ore and to be driving a tunnel to connect with shaft. Begun grading, 1906, for a 300-ton smelter, on the North Dominion property, 2 miles north of Globe, but did not get beyond the grading stage. Apparently moribund.

CANANEA MANZANAL MINING CO. MEXICO.

Mine office: La Cananea, Arizpe, Sonora, Mex. Organized circa July, 1907, under laws of Arizona, with capitalization $1,000,000, by W. J. Downing and B. H. Yeager.

CANANEA MIDLAND COPPER CO. MEXICO.

Office: Tucson, Ariz. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Chas. M. Shannon, president and general manager; M. P. Wright, vice-president; Frank J. O'Brien, secretary and treasurer; preceding officers, Geo. Gruning, F. O. Havener, Alfredo May and L. J. F. Lange, directors. Organized January, 1907, under laws of Arizona, with capitalization $2,000,000, shares $10 par; issued, $120,000. Lands, 230 acres, said to be near the Cananea Central. Idle since organization, but company plans raising funds by stock sales and beginning development.

CANANEA NORTHERN MINING & DEVELOPMENT CO. MEXICO.

Office: care of Guy Neely, Bisbee, Ariz. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Organized 1907, and is operated as a close corporation. Lands, circa 500 acres, north and northwest of the Bonanza de Cobre mine.

CANANEA NUEVA MINING CO. MEXICO.

Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Marshall P. Wright, president. Is said to be controlled by the Lewisohn interests. Lands, circa 1,200 hectares, about 2 miles northwest of the Puertecitos mines of the Greene-Cananea, on the line of the Cananea road to Imuris, having 5 shafts, deepest 112', showing ore from depth of about 40', giving average assays of about 17% copper. Suspended operations May, 1908.

CANANEA ORE CO. MEXICO.

Office: 1206-24 Broad St., New York, N. Y. Mine office: La Cananea, Arizpe, Sonora, Mex. Organized March 22, 1906, under laws of Maine.

CANANEA-PITTSBURG MINE. MEXICO.

Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. E. M. DeMaine, manager. Lands are in the vicinity of the Fay-Cananea, in the Sierra Azul, east of La Cananea.

CANANEA-SONORA DEVELOPMENT CO. MEXICO.

Mine office: La Cananea, Arizpe, Sonora, Mex. J. E. Thompson, presi-

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dent. Organized circa 1907, with capitalization $500,000. Lands are sundry claims in the Sierra Manazanal, to the southeastward of La Cananea.

CANANEA WESTERN COPPER CO. MEXICO.

Mine office: La Cananea, Arizpe, Sonora, Mex. J. T. Wilkie, general manager; preceding officer, M. McDonald; Donald Gillis, T. Pittman, J. R. Martin and J. T. Wilkie, directors. Capitalization, $3,000,000. Supposedly controlled by Chas. Schwab. Lands, 398 hectares, 7 miles west of La Cananea, slightly developed, showing promising ore indications.

CANANEA WEST MINING CO. MEXICO.

Dead. Succeeded circa April, 1907, by Cananea Western Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

CANAS MINES, LTD. MEXICO.

Office: 33 Eldon Street House, London, E. C., Eng. Mine office: Zimapán, Hidalgo, Mex. Sir J. Rivett-Carnac, Bart., chairman; F. H. Baxter, secretary and treasurer. Organized Dec. 23, 1896, under laws of Great Britain, with capitalization £75,000, shares £1 par; issued, £66,607. Lands, sundry silver and copper claims, area 66 acres, circa 15 miles from Zimapán, bought for £65,000 in shares from the Mines Contract Co., Ltd. Presumably idle.

CANBELEGO COPPER MINING CO., LTD. AUSTRALIA.

Office: Cobar, N. S. W., Australia. Mine office: Canbelego, Canbelego Co., N. S. W., Australia. Lands carry considerable standing timber, available for fuel and mining use. Property has 2 parallel veins, with aggregate width of about 40', showing stretches of good ground, succeeded by poor patches. To Apr. 1, 1908, had shipped 76 long tons of ore, yielding 17 long tons fine copper.

CANBELEGO NORTH COPPER MINING CO. AUSTRALIA.

Mine office: Canbelego, Canbelego Co., N. S. W., Australia. Property adjoins the Canbelego Queen.

CANBELEGO QUEEN CO., LTD. AUSTRALIA.

Dead. Liquidated October, 1907. Lands were 60 acres, adjoining the Canbelego North. Formerly at Canbelego, Canbelego Co., N. S. W., Australia.

CANDELARIA MINING & EXPLORATION CO. MEXICO.

Dead. Lands sold to Mexican Standard Mining Co. Formerly at Hidalgo del Parral, Chihuahua, Mex. Described Vol. V.

CANTON MINE. GEORGIA.

Mine office: Pierceville, Fannin Co., Ga. Has micaceous schist, impregnated with chalcopyrite. Idle for many years.

CANTON MINING CO. NEVADA.

Dead. Was succeeded by McKinley Mining & Smelting Co., which was succeeded by McKinley Consolidated Mines Co., which was succeeded by Willard-Ely Copper Co., which was succeeded by Consolidated Copper Co., the history of the property thus constituting a notable series of successes. Formerly at Ely, White Pine Co., Nev.

CANYON COPPER CO. ARIZONA.

Office and mine: Grandview, Coconino Co., Ariz. Jno. H. Page, president and general manager; H. H. Smith, secretary and treasurer; John Curran, mine superintendent. Organized 1902, under laws of Arizona, with capitalization $600,000, shares $10 par, buying lands of Last Chance Mining Co. Lands, 10 claims, area 200 acres, also a 10-acre millsite, in the Grand Cañon of the Colorado river. Has contact deposits between limestone and porphyry, said to give average assays of circa 30% copper, from cuprite, melaconite, malachite, azurite and chalcopyrite. In 1904 produced circa 350,000 lbs. fine copper and in 1906 made 26,798 lbs. fine copper and 324 oz. silver. Property considered promising. Suspended operations October, 1907.

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CANYON GOLD & COPPER CO. **MONTANA.**

Office: Helena, Mont. Letter returned unclaimed from former mine office, Canyon Ferry, Lewis & Clark Co., Mont. Canoll & Martin, managers; A. W. Martin, superintendent. Property has been a small shipper of smelting ore, averaging about 22% copper, with fair gold values. Idle several years.

CANYON MINING CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Ariz. Organized, circa 1905, as successor of the Black Canyon Copper Co., Ltd., which failed. Presumably idle.

MINA CANZA. **PERÚ.**

Office and mine: care of A. Garland y Ca., owners, Canza, Ica, Perú. Is an old property, once a considerable producer. Numerous cupriferous veins, in igneous rocks, carry bodies of ore that are oxides and carbonates above and sulphides below, 3 principal veins being opened to depths of 700′ on the Adelaide, 1,000′ on the Consolador, and 500′ on the Tapadita, the latter mine having been the largest producer in the past. Idle.

SOCIETA DELLE CAPANNE VECCHIE e POGGIO BINDO. **ITALY.**

Dead. Formerly at Massa Marittima, Grosseto, Tuscany, Italy. Mine now owned by Societa Anonima delle Miniere de Montecatini.

CAPE BRETON COPPER CO., LTD. **NOVA SCOTIA.**

Office: 308-58 State St., Boston, Mass. Mine office: Coxheath, Cape Breton Co., N. S. John C. Watson, president; Isaac P. Gragg, secretary; J. Dorr, treasurer. Capitalization $2,000,000. Property is the old Coxheath mine and adjoining lands, 10 miles from Sidney, Cape Breton, showing several cupriferous veins, of which the principal, averaging 10′ width, traverses felsite and diorite, carrying argentiferous and auriferous chalcopyrite, in a silicious gangue, ore averaging about 4.5% copper. Deepest shaft, 420′. Idle for some years.

CAPE BRETON PROSPECTING, MINING & DEVELOPMENT CO. **NOVA SCOTIA.**

Office: Sidney, N. S. Mine office: Inverness, Cape Breton Co., N. S. F. W. Morley, president; W. F. Dennison, vice-president; A. N. McLennan, secretary and treasurer; preceding officers, C. V. Wetmore, Dr. A. McLennan, Dr. C. E. McMullen and Hon. D. McNeil, directors; H. N. Borden, mine superintendent. Organized under laws of Nova Scotia, with capitalization $500,000, shares $1 par. Property is sundry mineral lands, including the Scottsville mine, which shows copper ore. Presumably idle.

CAPE COPPER CO., LTD. **CAPE COLONY & NEWFOUNDLAND.**

Office: 9 Queen Place, London, E. C., Eng. Mine office: O'okiep, Little Namaqualand, Cape Colony. Works office: Briton Ferry, Glamorganshire, Wales. Edmund A. Pontifex, chairman; preceding officer, T. Russel Kent, John E. Champney, John Taylor and T. Blair Reynolds, directors; John Taylor & Sons, managers; Percy John Frank, secretary. Organized Apr. 30, 1888, under laws of Great Britain, as a reconstruction of the Cape Copper Co., Ltd., organized 1863, with capitalization of £750,000, in £150,000 cumulative 6% preference shares, par £2, and £600,000 ordinary shares, par £2; issued, £690,000. Dividends have been as follows: 13s. in 1901; 5s. in 1903; 8s. 6d. in 1904; 9s. in 1905; 13s. in 1906; 19s. in 1907; 16s. 6d. in 1908. Annual accounts are made up to April 30th at the Cape, and to August 31st in London, and are submitted in December. Separate accounts are kept for the Tilt Cove mine. Profits for fiscal year 1907 were £343,384, a gain of £79,822.

The Tilt Cove mine in Newfoundland is held on a 99-year lease, expiring 1989, at an annual rental of £4,400, plus one-half of net profits. The Tilt Cove is separately described under title of its owner, the Tilt Cove Copper Co.,

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Ltd. Net profits of the Tilt Cove mine, 1906, were £99,340 7s. 10d., divided equally between the Cape Copper Co., Ltd., and the Tilt Cove Copper Co., Ltd.

The company has 3 properties under option in America, and one in India, on all of which exploratory work is in progress.

The Cape Copper, Co., Ltd. is entitled to one-half the net profits of the Briton Ferry Chemical & Manure Co., Ltd., which takes the sulphur fumes given off by the company's works at Briton Ferry, profits from this source, 1906, having been £1,299.

The company has 4 producing mines and 3 mines under development, in addition to various idle mines and prospects, in the vicinity of O'okiep, the older including the O'okiep and Spektakel mines, opened 1852. Ores are mainly chalcopyrite, with limited quantities of bornite and chalcocite, intimately associated with pyrite, showing occasional cuprite and malaconite, with a little malachite, azurite and chrysocolla near surface. The ore bodies are irregular, massive deposits of pyritic ore, associated with basic igneous intrusives in granite and gneiss.

The O'okiep, long the principal producer, has dwindling ore reserves, estimated, 1907, at 12,000 long tons of 20% ore, and, in 1907, produced 11,827 long tons of ore of 17.4% copper tenor, a decrease of 3,204 tons. The O'okiep East mine shows a limited amount of low grade ore.

The Nababeep mine, opened 1890, includes the Nababeep South, now the company's principal producer, in 1907 yielding 51,507 tons of 4.7% ore, as against 58,151 tons of ore of the same tenor in 1906. Reserves are estimated at 180,000 long tons of ore, of 50% copper tenor. The Nababeep North mine is nearly worked out, yielding, 1907, only 2,092 long tons of ore, of 5.39% average tenor. Several trial shafts have been sunk in the neighborhood of the Nababeep South, 2 showing copper bearing ground, but no important ore body has been developed.

The Narrap mine is a new property, under development, which, in 1907, yielded 1,238 tons of 4% ore. The property is developing fairly, showing reserves of about 25,000 long tons of ore of 4 to 5% tenor. An aerial tram is being installed, to connect the Narrap with the smelting works.

The Spektakel is an old mine, opened 1852, which has been idle for some years. Its ore bodies occur in both the granite and basic intrusive rocks.

Miscellaneous properties include the Kopperberg mine, which is idle, the Coetzee mine, which has been abandoned and plant removed to the Flat mine, 4 miles north of Nababeep, which is being reopened; the Carolusberg East mine, and the Springbok mine. On the whole the prospects of opening large new mines in the vicinity of O'okiep do not seem especially reassuring.

The machinery plant at the O'okiep mine has been electrified, the old steam plant being held in reserve for emergencies.

In addition to a tram-line connecting the smelter with the principal mines, the company owns a 100-mile railway, running from O'okiep to Port Nolloth, where there are docks, wharves, cranes, tugs and lighters for the receipt and dispatch of freight. Local traffic of the railroad, 1907, was 94,988 long tons. Negotiations are under way for the sale of this railway to the government of Cape Colony.

The reduction works at the mines include small smelters at O'okiep and Nababeep. Two blast-furnaces at the O'okiep works were rebuilt, 1907, and the Nababeep furnaces were rebuilt 1908. Production of the local smelters is a matte of about 48 to 50% copper tenor, shipped to the Briton Ferry works for refining.

The Briton Ferry smelter, which is the largest in Wales, in addition to treating the company's own ores does a general custom business, smelting the

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ores of the Namaqua Copper Co., Ltd., under contract, in 1906, treating 13,879 long tons of Namaqua ore and 883 tons of Namaqua matte of 54% copper tenor. The Briton Ferry works are located on the Great Western and Rhondda railways, also having canal connection with Swansea, receiving ores mainly by rail. The works have revolving cylindrical calciners up to 80′ in length, heated by gas, and four 70-ton blast-furnaces, making matte. Ores are smelted, without calcining, in reverberatories, to a 76% white metal, which is refined by the Nicholls direct method, by which some of the white metal is calcined and mixed with uncalcined white metal, the consequent reaction eliminating the remaining sulphur. Tilt Cove sulphide ores are burned in kilns, for their sulphur contents, fumes going to an acid plant, which makes circa 30,000 tons of chamber acid yearly. The works have a double concentric chimney of steel and concrete, and a telpherage plant for handling material. In 1906 the Briton Ferry works produced the equivalent of 10,212 long tons of fine copper, of which 733 tons were turned out as bluestone.

Production of fine copper, for calendar year 1905, was 16,358,720 lbs. The Cape Copper Co., Ltd., is an old producer, with an honorable record, and it is to be hoped that the company may succeed in its efforts to locate and develop new and profitable mines, to replace its waning properties in South Africa.

CAPE D'OR COPPER DEVELOPMENT CO. **NOVA SCOTIA.**

Mine office: Cape d'Or, Cumberland county, Nova Scotia. Long idle.

CAPE NOME COPPER MINING CO. **MONTANA.**

Office: 328 Dixon Block, Missoula, Mont. Mine office: Clinton, Missoula Co., Mont. F. C. Webster, president; F. H. Woody, vice-president; H. T. Wilkinson, secretary, treasurer and general manager; Ole Ericson, superintendent; preceding officers and A. L. Coffey, directors. Organized November, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par; issued $893,600. Annual meeting, first Monday in June.

Lands, 3 claims, patented, area 40 acres, in the Clinton district, showing 4 fissure veins in granite, of which 3 are under development, one, of 8′ average width, traceable 800′, being opened by 4 crosscut tunnels, longest 340′, and by 4 tunnels of 75′, 850′, 500′, and 450′, and shafts of 40′, 70′, and 500′, with 3,050′ of workings. Company plans crosscutting for ore on the 500′ level. Equipment includes a 120-h. p. steam plant with a 40-h. p. Lidgerwood hoist and a 12-drill Ingersoll air-compressor. There are 6 buildings, including a 35x50′ machine shop and 2 small smithies. Property considered promising.

CAPILLITAS COPPER CO., LTD. **ARGENTINA.**

Office: 6 Princes St., London, E. C., Eng. Mine office: Cerro de Capillitas, Tucumán, Argentina. Works office: Muschaca Quebrada, Catamarca, Argentina. Geo. Grinnell-Milne, chairman; J. G. Tait, secretary; D'Arcy Weatherbee, general manager; T. Beckett, mine superintendent; C. H. Jones, metallurgist; R. Underhill, engineer. Organized Nov. 25, 1901, under laws of Great Britain, with capitalization £670,000, shares £1 par; issued, £600,000, in £150,000 cumulative 7% preference shares, £150,000 cumulative ordinary shares, and £300,000 deferred shares. Accounts for year ending June 30, 1906, showed total expenditures to date of £47,867, after deducting £20,161 from receipts of production.

Lands are extensive, including the Capillitas and Atajo groups of mines, and the Pilciao and Constancia smelters, bought for £95,000, also miscellaneous lands, fairly timbered. The Capillitas group, of about 20 properties, in the district of Andalgalá, in the eastern part of Catamarca, shows 12 veins, principal development by former owners having been on the Restauradora, Rosalia, Carmelita, La Grande and Ortiz mines, reopened, under present management, by 2 tunnels under the old workings of La Grande, and by one tunnel in

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the Restauradora. The Atajo mines are 6 miles northwest of the Capillitas group. Company claimed ore from development work averaged about 15% copper, with good gold and silver values, but the smelter returned an average of only 7% copper, 8 oz. silver and 0.7 oz. gold per long ton. These mines have been worked, spasmodically, by local capital, since circa 1850. The Restauradora mine has upwards of 3 miles of workings, with a vein of 18" to 6' width, ore occurring irregularly, in chutes, being chalcopyrite, associated with pyrite, containing considerable chalcocite and bornite.

Property is located in an extremely rugged mountain country, necessitating former shipment of ore to smelters by pack-mules, mines being 8,000' above sea-level, and more than 6,000' above the temporary works at Pilciao. Nearest railroad station is Chumbicha, 165 kilometers distant, over exceedingly rough and dusty roads, on which a traction engine was tried, but stuck in the sand. The Argentine government promised, years ago, to extend the Córdoba Central railroad to Andalgalá, but the line failed to materialize. To cover the worst stretch between the mines and smelters, a single line aerial tram was ordered, from Bullivant & Co. The line is 22 miles in length, with longest span of 2,765' and highest span of 625'. Plant weighs circa 2,000 tons, and was designed to carry 40 tons of ore hourly, at a speed of 2.5 meters per second, with buckets of 500 kgs. capacity. The tramway was started Apr. 1, 1907, after almost interminable delays in delivery of material, but did not succeed in filling the 600-ton bins at the smelter until May, when one blast-furnace was blown in, beginning semi-pyritic smelting, with 5% charcoal charges, but experiencing unusual difficulties. Much trouble was had with the tram-line from buckets falling off. Experts from the designers were sent to Argentina, but failed to remedy the trouble. Instead of a rated capacity of 150 tons daily, the maximum quantity of ore transported in one day was 50 tons, and the average, for several months, was about 15 tons daily. The tram-line leaves a 20-mile gap between Pilciao and Maschaca, over which transportation is by carts.

The smelter has two 50-ton water-jacket blast-furnaces, with dam, filter and tanks, water being supplied through an 8½-kilometer pipe-line. The old Constancia smelter has 2 reverberatory furnaces. The new smelter gave much trouble in operation, but was amply capable of caring for all ore the tramway could bring. First-fusion product was a 30% matte, resmelted to 50% copper tenor, which was packed and carted 120 miles, over a desert, to the nearest railroad station. Production, 1907, was circa 350 tons of 50% matte, equal to circa 400,000 lbs. fine copper, secured with a force of 125 men at the mine and 50 at the works. At the end of 1907 company claimed to have reserves of 58,000 long tons of ore, estimated at 8.5% copper tenor, though Mr. Wetherbee had advised previously closing down the property, by reason of the small amount of ore in sight, and poor transportation facilities. The board refused to act on Mr. Wetherbee's advice, and ordered a continuation of the work, but by the end of 1907 all good ore in sight had been gouged out, and, lacking funds to continue systematic development, work was suspended and machinery packed at the end of 1907, permission to close for 2 years, pending the completion of the promised railroad, having been obtained from the Argentine government. French shareholders were disgusted, with good reason, and sent a committee to investigate.

Given adequate transportation facilities, sufficient mine development and a modern smelting plant, the Capillitas properties might be made profitable, but, as matters stand, the property is practically worthless. The management made large promises, none of which were redeemed, and has boggled its work, making a lamentable mess of the job. Bankruptcy apparently is inevitable.

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CAPITOL CONSOLIDATED MINING CO. **MONTANA.**

Letter returned from former mine office, Helena, Lewis & Clark Co., Mont. Lands, 4 miles south of Helena, known as the Copper Chief group, show a 20" vein giving assays up to 14% copper, 35% lead, 175 oz. silver and $7 gold per ton.

CAP SHEAF COPPER & GOLD CO. **BRITISH COLUMBIA.**

Dead. Formerly at Van Anda, Texada Island, B. C.

CARACAHUI MOUNTAIN COPPER CO., LTD. **MEXICO.**

Office: Kansas City, Mo. Mine office: Llano, Magdalena, Sonora, Mex. Lands, 50 hectares, circa 10 miles south of Llano, between the Calumet & Sonora and Sonora Copper Co., showing 8 parallel veins, in a cross-section of circa 250', with about 500' of workings, showing cuprite, malachite and chalcocite.

MINAS DE COBRE DE CARAHYBA. **BRAZIL.**

Mine office: Praba Jaguarary, Bahia, Brazil. Dr. José Gonçalves da Silva, owner. Mine, on the São Francisco river, was opened in 1783, and is perhaps the most important copper mine of Brazil. Pits and shafts of 1 to 28 meters depth show copper oxides. Ores apparently are distributed over a large extent of territory, but depth reached has been insufficient to determine the extent of the oxidized zone or the nature of the ores below.

MINA CARAMBOLA. **MEXICO.**

Office and mine: care of D. Pablo Palacio, owner, Indé, Durango, Mex. Lands, 18 pertenencias, in two groups, opened by La Chusa shaft, 15 metres, showing a 10' vein of auriferous coper ore, carrying 4 to 30% copper and 30 oz. silver per ton. Average assay values range from 3.5% copper and 300 grams silver, in the argentiferous ore, to 14.5% copper and 100 oz. silver in the best copper ore. Early in 1906 was shipping 20 to 30 tons of ore daily.

CARBON COUNTY GOLD MINING & MILLING CO. **WYOMING.**

Mine office: Morgan, Carbon Co., Wyo. Ores carry gold, silver, lead and copper. Has steam power and a 10-stamp mill. Presumably idle.

CARDEÑAS COPPER CO. **ARIZONA.**

Dead. Absorbed, circa 1903, by Anita Consolidated Copper Co. Formerly at Williams, Coconino Co., Ariz.

MINAS CARDENILLO y ARMADILLO. **MEXICO.**

Mine office: Tuxpam, Santiago Ixcuintla, Tepic, Mex. Fernando Diaz, owner; A. C. Gonzales, manager. Mines have silver-copper ores, with steam power, employing circa 50 men, at last accounts.

CARDIFF MINING & MILLING CO. **UTAH.**

Office: care of Hugh A. McMillan, secretary and treasurer, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Fred W. Price, president and general manager. Organized 1906, under laws of Utah, with capitalization $50,000, shares $1 par. Property is the Mountain Chief group, near the Columbus Consolidated, on the divide between the Big Cottonwood and Little Cottonwood districts. Mine has a 270' shaft, showing a fair ore body, and has shipped some ore to Salt Lake smelter ranging up to 2% copper, 3% lead and 65 oz. silver per ton, with a little gold.

CARIBBEAN MINING CO. **COLORADO.**

Office: Holyoke, Mass. Mine office: Ophir, San Miguel Co., Colo. Ores carry gold, silver, lead and copper. Has water power and a 20-stamp mill. Presumably idle.

CARIBOU GOLD & COPPER CO. **IDAHO.**

Office: care of Frank A. Putnam, Gray, Idaho. Organized September, 1903, with capitalization $2,500,000, shares $10 par, to develop claims 65 miles

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southeast of Idaho Falls, in Bingham county, Idaho, said to have an 8′ vein, traceable 3,000′. Idle for some years and apparently moribund.

COMPAÑIA MINERA CARIDAD y ANEXAS. **MEXICO.**

Office: care of Adolph Marx, president, Mexico, D. F. Mine office: Guachinango, Mascota, Jalisco, Mex. Otto Vorath, manager. Capitalization, 200,000 pesos. Lands, 180 hectares, on the Rancho Pánuco, showing highly argentiferous and auriferous copper ores. Made small shipments, 1907, to Aguascalientes smelter.

CARIDAD COPPER MINING CO., LTD. **SPAIN.**

Office: 20 Lawrence Lane, Gresham St., London, E. C., Eng. Mine office: Lozoyuela, Madrid, Spain. Robert Summerside Simpson, chairman; Geo. Thompson, secretary. Organized Feb. 15, 1899, under laws of Great Britain, and capitalization increased, 1901, to £350,000, shares £1 par; issued, £75,492. Lands, 325 acres, including the Caridad, San Antonio and Descuido mines. Idle some years.

MINA CARISA. **MEXICO.**

Office and mine: care of Carlos Blake, owner, Autlán, Jalisco, Mexico. Lands, 30 pertenencias, circa 30 miles west of Autlán, showing a 30′ vein, carrying auriferous and argentiferous chalcopyrite. Has about 400′ of openings. Presumably idle.

CARISA COPPER & GOLD MINING CO. **UTAH.**

Dead. Succeeded, 1907, by Carisa Gold & Copper Mining Co. of Maine. Formerly at Mammoth, Juab Co., Utah. Described Vol. VI.

CARISA GOLD & COPPER MINING CO. OF MAINE. **UTAH.**

Office: 161 Main St., Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. Henry G. McMillan, president; Henry Newell, vice-president; E. B. Critchlow, secretary and treasurer; W. N. Roseberg, superintendent. Organized 1907, under laws of Maine, with capitalization $500,000, shares $1 par, as successor of Carisa Gold & Copper Mining Co., which was organized 1901, under laws of Utah, with same capitalization. Old company levied assessments of $30,000 and paid a $30,000 dividend, 1902. Lands, 8 patented claims, area 57 acres, adjoining the Centennial-Eureka, said to show 6 veins as fissures in limestone and as contact veins between limestone and quartzite, 3 of which, more or less developed, of 4′ average width, are said to give average returns of circa 5% copper, 3 oz. silver and $2 gold per ton, from oxidized ores. Mine, as sampled by Newton A. Dunyon, gave average assays of 4.51% copper, 3.54 oz. silver and 0.037 oz. gold per ton. Has shipped ore to smelter ranging up to 11% copper tenor. Some copper ore was found, 1907, on the Spy side of the mine, and an effort is being made to locate the continuation of the ore bodies from the adjoining Colorado mine. Estimate of 80,000 tons of ore blocked out for stoping was an exaggeration, though considerable low grade concentrating ore is in sight. Mine is very pockety, but carries occasional very rich pockets. Has 3 shafts, including the 350′ Cornish shaft and the 800′ Spy shaft, also a 7,000′ tunnel with about 5 miles of workings. Formerly was under the management of Hon. Harry S. Joseph, who did good development work. Stock was rigged unmercifully, early 1906, when a 2-cent monthly dividend was promised by new management, but not paid; and a 1-cent dividend, that was paid, apparently was disbursed simply to promote stock sales. Company's estimate of production of 1,200,000 lbs. fine copper for 1906 was grossly exaggerated. At last accounts property was being operated in a small way, under the leasing system. Mine apparently of some value, but company not regarded favorably.

CARLISLE COPPER CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Montana.

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CARMACK GOLD & COPPER MINING CO. **WASHINGTON.**

Letter returned unclaimed from former office, Arcade Bldg., Seattle, Wash. Mine office: North Bend, King Co., Wash. G. W. Carmack, president; L. O. Lane, secretary. Organized 1899, with capitalization $500,000, shares 25c par. Lands, 6 claims and a millsite, with good water power available for development, on the south fork of the Snoqualmie river, 22 miles northeast of North Bend. Has 375′ of openings, showing veins of 12″, 30″ and 12′, latter with a 1′ to 3′ paystreak, giving fair assay values in gold, silver, lead and copper. Idle.

CARMAN CONSOLIDATED COPPER CO. **MEXICO.**

Office: Hibbing, Minn. Operating office: Douglas, Ariz. Walter J. Power, president; John T. Casey, vice-president and general manager; J. F. Ross, secretary and treasurer; preceding officers, J. S. Martindale, C. B. Bell, Homer Prickett and F. S. Douglas, directors. Organized, circa 1906, with capitalization $500,000, shares $2.50 par. Holds title to lands through Compañia de Oro y Plata, S. A., organized under laws of Mexico. Lands, in northern Sonora, are 9 groups of 351 pertenencias, area 877 acres, adjoining Las Chispas mines, showing several strong veins, with 1,911′ of workings. The Carmen and Don Placido groups have dumps carrying about 1,100 tons of ore, said to average 4.65% copper, 62.2 oz. silver and 0.21 oz. gold per ton. The Blanca Rosa group gives average assays of 16.8% copper, 77 oz. silver and 0.42 oz. gold per ton. The Maria group gives average assays of 3% copper, 107 oz. silver and 1.32 oz. gold per ton. Los Tores group gives average assays of 4.2% copper, 29% lead, 38 oz. silver and 0.03 oz. gold per ton. Various ore shipments to El Paso smelter have given returns ranging from $82.98 to $4,575.79 per ton. Property considered promising.

MINAS DEL CARMEN. **CHILE.**

Mine office: Pueblo Hundido, Chañaral, Atacama, Chile. Simon Baldivieso, owner; Adriano Fernandez, manager. Lands, 15 hectares, including El Carmen, Carmela, Cardúmen, Nuevo, Araucana, Quiñazo, Locura, Lautaro and other mines. Property shows 2 main veins in syenite, the Veta Manto ranging 4 to 12 meters in width, with a minor vein of 2 to 3 meters width, both having north and south strike, with dip of 40°. Ore occurs in lenticular chutes, the oxidized zone of 100 meters depth carrying oxides, carbonates and silicates, with an abundance of native copper at approximately 200′ depth in the Carmen mine, with secondary sulphides at a vertical depth of circa 110 meters, followed by chalcopyrite, associated with arsenopyrite, disseminated in a gangue of iron oxide, limestone and decomposed porphyry.

El Carmen, the principal mine, is opened by 2 shafts, 190 meters apart, sunk at an angle of 45°, to depths of 85 meters and 250 meters, the vein ranging 3 to 12 meters wide, with an average width of 5 meters. The other mines are opened by shafts. The properties, as a whole, show reserves of about 75,000 tons of ore, of 5 to 15% copper tenor. Property has, in reserve, on dumps, about 7,000 metric tons of ore of 6 to 12% copper tenor, and about 30,000 metric tons of 5% ore.

Equipment includes a good steam plant, and forces are about 100 men. Ore is selected before smelting. Production, 1903, was circa 6,000 metric tons of ore of 12% ore, yielding circa 1,600,000 lbs. fine copper.

MINAS DEL CARMEN AMPLIACION. **MEXICO.**

Mine office: Cerralvo, Cuarto, Nuevo León, Mex. Marciano E. Villareal, owner and manager. Ores are argentiferous copper and lead sulphides. Presumably idle.

CARMEN COPPER CO. **MEXICO.**

Office: 52 Front St., New York, N. Y. Mine office: Mineral del Carmen, El Oro, Durango, Mex. H. Van Leer, general manager. Property is El Car-

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men mine, carrying silver and copper ores. Has steam power and a mill of 100 metric tons daily capacity, employing about 150 men at last accounts.

CARMEN COPPER MINES, LTD. **CHILE & NEWFOUNDLAND.**

Letter returned unclaimed from former office, St. George's House, Eastcheap, London, E. C., Eng. Mine office: Cerro Blanco, Copiapó, Atacama, Chile. Alfred Hambley Rowe, chairman; John Pye, secretary. Organized June 28, 1900, under laws of Great Britain, with capitalization £125,000, shares £1 par; issued, £75,307. Absorbed the Newfoundland Copper Co., Ltd., 1901, thereby securing the Little Bay and Lady Pond copper mines, in Newfoundland, now idle. The Little Bay mine, operated 1878-1892, has a main shaft of 1,350′ and a small smelter, and was a small but steady copper producer, when worked, but has been idle several years.

Chilean property includes the Perseverancia mine, at Guanaco, Taltal, the Carmen Bajo, in the Capiapó district, and the Bella Vista, Aguardos and other mines, in Coquimbo. The Copiapó properties have been idle some years, and only light exploratory work has been done at the other mines. Apparently out of business.

GUILLERMO CARMONA. **CHILE.**

Office and mine: Higuera, La Serena, Coquimbo, Chile. Mines include La Estrella de Maria, San Tomás and Santiago. Production, 1903, was circa 250 metric tons of ore averaging about 10% copper tenor.

CARNARVON ASSOCIATED GOLD & COPPER MINES, LTD. **WALES.**

Office: care of Paddison, Trevor & de la Chapelle, 34 Gresham St., London, E. C., Eng. Organized Jan. 31, 1903, under laws of Guernsey, with capitalization £10,000, shares 10s. par. No business done. Moribund.

CARNATION MINING CO. **ARIZONA.**

Mine office: Parker, Yuma Co., Ariz. Lands are in vicinity of Empire Flats, on the Colorado River. Idle.

CARN BREA & TINCROFT MINES, LTD. **ENGLAND.**

Office and mine: Carn Brea, R. S. O., Cornwall, Eng. Frank Harvey, J. P., chairman; T. Forster Brown, consulting engineer; John Trevathan, secretary; Capt. J. Penhall, general manager. Organized May 24, 1900, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £136,366. Property is tin and copper mines at Redruth and Illogan, Cornwall, formerly making nearly 1,000 tons of copper yearly, but present annual output averages about 50,000 lbs. fine copper only, tin being the principal product. Output, 1906, was 672 long tons of copper ore averaging 4% copper, equivalent to about 60,000 lbs. fine copper.

CARNEGIE COPPER CO. **VIRGINIA.**

Letter returned unclaimed from former office, Carnegie, Pa. Mine office: Red Oak, Charlotte Co., Va. Wm. H. McLain, superintendent. Has auriferous and argentiferous copper ores, slightly developed.

CARNEY COPPER CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Jos. L. Martin, president; W. G. Greenough, secretary and treasurer; Joseph Carson, superintendent; preceding offices, C. D. Miller and Hans J. Rice, directors. Organized 1906, under laws of Idaho, with capitalization $1,500,000, shares $1 par. Lands, 11 claims, 3 fractional, well timbered, and a water-right, area circa 175 acres, on the north slope of Stevens Peak, about 4 miles from Mullan. Mine has 2 tunnels, No. 2 being 710′, also several open cuts and pits, showing ore of about 3% copper tenor. Jos. Carney, former owner of lands, has brought suit for $50,000 damages and annullment of deed, claiming that purchasers got him drunk and kept him drunk two months. If verdict rendered for plaintiff, court should allow a reasonable offset for value of whiskey consumed.

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CARNEY COPPER CO. **MICHIGAN.**

Office: care of John O. Broden, president, Norway, Mich. Mine office: Carney, Menominee Co., Mich. Antoine Anheier, superintendent. Organized 1904, under laws of Michigan, with capitalization $20,000. Has an 88' shaft, showing ore in bottom assaying 1.4% copper. Idle.

GEORGE E. CARNE y OTRO. **CHILE.**

Mine office: Cobija, Tocopilla, Antofagasta, Chile. Property is the Buena Vista mine, idle some years.

CAROLINA COPPER CO. **NORTH CAROLINA.**

Office: 15 Atwater St., W., Detroit, Mich. Mine office: Cullowhee, Jackson Co., N. C. Lewis C. Waldo, president and treasurer; Thomas A. Cox, vice-president and superintendent; Hugh M. McCormick, secretary; preceding officers, Stephen H. Knight, Geo. W. Clark, Thomas W. Newton, Chas. E. Bredin, David E. Thomas and Edwin P. Snider, directors. Organized Oct. 12, 1901, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $1,585,000. Lands, 1,450 acres, freehold, including the Wayehutte mine, showing 4 veins, of 27' estimated average width, carrying mainly chaleopyrite, with estimated average values of 3% copper, 4 oz. silver and $1 gold per ton, opened by a 55' shaft and a 200' tunnel. Lands, also include an undeveloped water power. Cloud was removed from title August, 1907. Idle for several years.

CAROLINA GOLD & COPPER CO. **NORTH CAROLINA.**

Dead. Formerly at New London, Stanley Co., N. C., and Gap Creek, Ashe Co., N. C. Fully described Vol. VI.

CAROLINA KING MINING CO. **NORTH CAROLINA.**

Mine office: Virgilina, Halifax Co., Va. Organized 1903, taking over property of the Copper World Mining Co., and the Danville & Virginia Copper Mining Co. Lands, in Person county, North Carolina, just south of the Virginia line, include the Copper World mine, having 2 shafts, deepest 100', in a vein of fair width, showing chalcocite, also carbonate and oxide ores, assaying 15 to 65% copper. Idle.

CARP LAKE MINING CO. **MICHIGAN.**

Office: Cleveland, Ohio. Mine office: Ontonagon, Ontonagon Co., Mich. H. L. Payne, general manager. Organized 1858, under laws of Michigan, and reorganized June, 1878, with capitalization $500,000, shares $25 par. Lands were 1,087 acres, in Town 51 North, Range 43 West, near Lake Superior, but part of holdings have been sold to Porcupine Mountain Copper Co. Property shows native copper, occurring as irregular streaks of high mineralization, ranging up to 40% in copper tenor, native metal occurring in exceedingly thin flakes in strata ranging from fine conglomerate to coarse sandstone. Main bed, of about 7' width, apparently is not an extension of the Nonesuch lode, as the strata do not resemble each other physically, though carrying copper in a markedly similar manner. Lands have an excellent water-power available from Carp Lake. The mine, opened 1858, has several shallow shafts and a 1,250' tunnel, and once had a mill with 20 gravity stamps. Idle some years. Very fully described Vol. II.

SOCIEDAD ANONIMA MINAS DE CARRACEDO. **SPAIN.**

Office: Bilbao, Spain. Mine office: Vañes, Palencia, Spain. Property was undergoing development, in a leisurely manner, at last accounts, and presumably is idle.

CARRANZA-LAFONE COPPER MINING & SMELTING CORPORATION, LTD. **ARGENTINA.**

Dead. Property sold, 1904, to Capillitas Copper Co., Ltd. Formerly at Cerro de Capillitas, Tucumán, Argentina.

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CARRERAS HERMANOS. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Principal property is the Santa Rosa mine, 280 meters deep, opened 1868, on 2 successive conglomerate strata, carrying 3 to 4% native copper. Has a concentrator known as the Bella Vista, product being exported to Europe through port of Mollendo, Perú, as barillas de cobre of 82% average copper tenor. Production is 7,000 to 8,000 long tons of mineral bruto yearly, equivalent to circa 600,000 lbs. fine copper, estimated by Bolivian government to cost 7.5 bolivars per quintal of 80% copper tenor. Employs circa 300 men.

CARRIE COPPER CO. **ARIZONA.**

Dead. Formerly at Globe, Gila Co., Ariz.

CARRINGTON UNITED MINES CO. **AUSTRALIA.**

Mine office: Charters Towers, Queensland, Australia. T. A. Waters, manager. Lands, 30 miles from Charters Towers, show ore said to average about 10% copper, 1 oz. silver and 0.4 oz. gold per long ton, with an average value of £8. Has a smelter with 3 small reverberatory furnaces. Production, 1907, was 103 long tons ore smelted, yielding 23,520 lbs. fine copper, 89 oz. silver and 39 oz. gold. Production was reported, March, 1908, as circa 800 tons of ore monthly. Smelting costs are very high.

SOCIEDAD DE MINAS y FUNDICIONES DE CARRIZAL. **CHILE.**

Office: Catedral 2409, Santiago de Chile. Mine offices: Cerro Blanco, Freirina, Atacama, Chile, and Carrizal Alto, Atacama, Chile. Works office: Canto de Agua, Freirina, Atacama, Chile. Samuel Gonzalez-Julio, chairman; M. Tirapegui and Alberto Fabrés, vice-chairmen; L. Tirapegui, secretary; Wm. H. Martin, general manager. Organized June, 1898, under laws of Chile, with capitalization 2,100,000 pesos, shares 100 pesos par. The Carrizal Share Trust, Ltd., is a heavy shareholder. Dividends have been as follows: 22½% for fiscal year 1899; 14% for 1900; 6.5% for 1901; 6.5% for 1902; 7% for 1905; 26% for 1906; 10% for 1907. For fiscal year ending Oct. 31, 1906, net profits were 732,948 pesos.

Lands are 4 groups, including 14 mines, many of which are idle, mainly in the Carrizal Alto district.

The Amarilla mine, at Cerro Blanco, opened 1867, has a main shaft of 800 meters vertical depth. Ores in upper workings show considerable silver, with little at depth. Country rocks are porphyry and limestone. The Amarilla mine, with extensions, in 1907 employed 130 men and produced 7,996 metric tons of ore averaging 14% copper, equivalent to circa 2,450,000 lbs. fine copper.

The famous Carrizal Alto group includes the Armonia and Santa Margnerita mines, the former, 1,200′ deep, having been a notable producer for many years.

The mina Socavon, at Carrizal Alto, has a vein with strike of nearly north and south and dip of 60° to 80°, in granite. Ores, to depth of 70 meters, are oxidized and associated with iron oxides, below which occurs chalcopyrite disseminated in pyrite. Extreme depth is 281 meters, with horizontal workings 250 meters in length.

The Astillas mine, in the Carrizal Alto district, opened 1878, has a 260 meter main shaft. The Jarillas or Bronces mine, opened 1881, has a 408 meter shaft. The Jarillas and Astillas mines, in 1903, jointly produced, with a force of 67 men, 3,483 metric tons of 6% ore, equal to circa 450,000 lbs. fine copper.

Smelter, known as the Chañarcitos, on the Carrizal & Interior railway, has 6 reverberatories and a 42x84″ blast-furnace using semi-pyritic smelting. Fuel is imported coke, and about two-thirds of the mineral treated is calcined. The converter department has 5 shells, and slags average about 0.5% copper. Smelters employ 80 men, at average daily wages of 1.92 pesos, and in 1903 the reduction of one metric ton of ore required 1.56 workmen-days, with consump-

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tion of 453 kgs. coal, giving a total cost of 12.325 pesos for labor and fuel, with total smelting costs of 20.64 pesos per metric ton. Smelter in 1903 treated 18,497 metric tons of ore, producing there from 4,957 metric tons of matte, of 48% average tenor, with a net production of 2,379,360 lbs. fine copper.

CARRIZO COPPER CO. **MEXICO.**

Office: 711 Missouri Trust Bldg., St. Louis, Mo. Mine and works office: Ayutla, Autlán, Jalisco, Mex. Col. Kent E. Keller, president and general manager; Whitney Gilbreath, vice-president and treasurer; Jos. T. Schneider, secretary; preceding officers, F. M. Steere, S. E. Walker, Dr. W. H. Perry and Harry B. Keller, directors; Albert L. Waters, resident manager; Chas. H. Williams, mine superintendent; John T. Delaney, mill superintendent; T. A. Dickson, smelter superintendent; Salvador Quintero, engineer. Organized Sept. 15, 1904, under laws of Maine, with capitalization $1,000,000, shares $1 par; issued, $800,000. Had, September, 1908, about $40,000 cash and bills receivable, with liabilities of only current expenses. Annual meeting, second Tuesday in January.

Lands, 204 hectares, also a 50-acre millsite, 70-acre smelter site and circa 10,000 acres miscellaneous lands, mainly well timbered, including the 7,500-acre Palmito ranch. Property includes the mines and mill formerly owned by the Ayutla Copper Co., adjacent to the Carrizo. Lands show andesite, with porphyry and diorite intrusions, with 30 known ore bodies, 12 of which have been more or less developed, these occurring as fissures in andesite, carrying ore chutes of 2′ to 12′ width, 60′ to 600′ long, traceable 3 miles. Principal property is an antigua, known to have been worked from 1700 to 1860, reopened Dec. 1, 1906. Property formerly was worked for native copper and cuprite, shown at and near surface. The oxidized zone, showing practically all the common oxides and carbonates, to a depth of about 100′, is followed by chalcopyrite, with occasional chalcocite.

Workings include the San Felipe shaft of 350′ depth, the Zapatero of 115′, the Chico of 140′ and Medrano of 140′, and other shafts of 90′, 65′, 60′, 50′, 65′ and 40′, with various prospecting pits and shafts. Mine also has tunnels as follows: No. 1, of 497′; No. 2, of 535′; No. 3, of 110′; Vesuvio, 200′; Inyo, 160′; Los Reyes, 220′, and Chico, 526′. Mine has 4,458′ of workings, and is conservatively estimated to show 67,000 tons of ore, with 50,000 tons blocked out for stoping. The ores average about 5.5% copper, 5 oz. silver and $1 gold per ton, silver values increasing with depth.

Equipment includes a 200-h. p. steam plant, furnishing 75 h. p. for the mines, 40 h. p. for the mills and 85 h. p. for the smelter, with an available water power, at Carrizo, rated at 330 h. p., and machinery for a 230-h. p. installation on the ground. Mine has two 25-h. p. hoists and a 3-drill Leyner air-compressor. Buildings, 19 in number, include a 30x36′ carpenter-shop, 14x20′ adobe smithy, machine shops, engine-houses and dwellings.

The company has given some consideration to the matter of building a 35-mile narrow gauge railway, through a fairly easy country.

The 100-ton wooden concentrator, 60x100′, has a 6x15″ Sturtevant crusher, 2 rolls, 1 Harz jig, 1 Barton table, 2 Wilfley tables, 2 Card tables and 1 slime table. Machinery is on the ground for a new 150-ton mill, to be erected 1909.

The smelter, on a 40-acre site just north of Ayutla, 1½ miles from the nearest mine, receiving ore by cart and pack trains, is rated at 75 tons capacity, and in a trial run, June, 1908, treated 90 tons daily. The smelter has a Colorado Iron Works 42″ hexagonal blast-furnace, with fine-pipe hot-blast attachment, turning out matte carrying circa 50% copper, 40 to 400 oz. silver and 0.1 to 1 oz. gold per ton, sent to the Aguascalientes works for refining. Fuel is Pocohontas coke, costing, laid down, $19 gold per long ton, and a little

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local charcoal may be used. Smelter is planned to do a general custom business, with company furnishing about 60% of the ore treated, and is expected to be blown in during the winter of 1908-1909. The works include a small sampling mill and laboratory, and are lighted by electricity.

Miscellaneous improvements include a 4,000′ sawmill and a 6-ton ice-plant. Company plans steady mine development, construction of ore-bins and an aerial tram, doubling the mining equipment and adding a 150-ton blast-furnace to the smelter. About 200 men are employed. Property considered promising and management good.

CARR MINE & COLORADO CO., LTD. **COLORADO.**

Dead. Wound up April, 1903. Formerly at Black Hawk, Gilpin Co., Colo.

CARROLL GOLD & COPPER CO. **ARIZONA.**

Mine office: Humboldt, Yavapai Co., Ariz. A. J. Carroll, president; H. H. Cloud, vice-president; Hon. C. P. Hicks, secretary; preceding officers, A. J. Head and G. E. Barth, directors. Organized June 2, 1906, with capitalization $750,000, shares $1 par. Lands, 5 claims, area 85 acres, in the Agua Fria district, 6 miles east of Humboldt, showing strong surface indications of copper, opened by a 240′ tunnel showing a vein of 2′ to 8′ width, stated by president to assay a few thousand dollars per ton, which obviously was a slip of the pen, meant for a few dollars per ton, as the company has not made other claims to the possession of any considerable quantity of developed ore of high grade. Has shipped a little ore giving returns of 14% copper.

CARTER COPPER CO. **VIRGINIA.**

Dead. Name changed, 1903, to Manassas Gap Copper Mines. Formerly at Reager, Rappahannock Co., Va.

GUILLERMO CARVALLO. **CHILE.**

Mine office: Los Loros, Quillota, Valparaiso, Chile. Works office: Llai-Llai, Quillota, Valparaíso, Chile. Operates the Santa Maria and Santa Elena mines, having a vein up to 4 meters in width, with approximately north and south strike and dip of 45°, opened to depth of 60 meters, carrying sulphide ores with calcite gangue. Smelter, known as the Fundicion Llallai, has 1 reverberatory furnace, using English coke costing 21 pesos per ton, 1 ton of coke being required to smelt 3 tons of ore, slags running about 0.5% copper. Product is ejes, of about 50% average copper tenor. Production, 1903, was 3,000 metric tons of ore averaging about 8% copper, making 496,035 lbs. fine copper.

CASA GRANDE COPPER & GOLD MINING CO. **ARIZONA.**

Dead. Succeeded by Producer Mining & Smelting Co. Formerly at Casa Grande, Pinal Co., Ariz.

CASA GRANDE DEVELOPMENT CO. **ARIZONA.**

Office: Duluth, Minn. Mine office: Vekol, Pinal Co., Ariz. Henry B. Hovland, president; preceding officer, Lemuel C. Shattuck, Hoval A. Smith, Samuel Kaufman and Edw. N. Breitung, directors; Chas. S. Norris, manager. Capitalization $500,000, shares $10 par.

Lands, 6 miles west of Vekol and circa 38 miles southwest of Casa Grande, are held under 30-month bond and lease, from United-Arizona Copper Co., Ltd. Property shows blanket veins in limestone superimposed on quartzite adjacent to granite-porphyry, and fault veins in limestone. Mine, known as the Reward, opened circa 1893, and idle since circa 1901, until taken over by present company, is opened on the upper bed of 8′ to 10′ thickness, carrying ore assaying up to 12% copper, with good silver values and a little gold. Main shaft, 600′ deep, is opened on the 400′, 500′ and 600′ levels. Property produced, in the past, a little copper, under great disadvantages. Water is secured from an 800′ artesian well. The smelter, built 1892, has a 30-ton water-jacket blast-furnace, too small and antiquated for present use. Shipped, 1907, some high grade ore to El Paso smelter.

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CASA GRANDE MINING & SMELTING CO. **ARIZONA.**

Dead. Was a swindle perpetrated by Douglas, Lacy & Co., of New York. Formerly at Casa Grande, Pinal Co., Ariz. Described Vol. VI.

CASANO COPPER MINING & SMELTING CO., LTD. **SPAIN.**

Mine office: Cabrales, Oviedo, Asturias, Spain. Organized July 28, 1902, under laws of Guernsey, as a reconstruction of the Oviedo Mines Development Syndicate, Ltd., with capitalization £150,000, shares £1 par; issued, £38,989. Was formed to acquire an option to purchase 15 mining claims, area 738 acres. Idle.

FUNDICION DE CASAPALCA. **PERÚ.**

Owned by Backus & Johnston.

CASCADE COPPER MINING CO. **WASHINGTON.**

Dead. Merged, circa 1902, in Mt. St. Helens Consolidated Mining Co. Formerly at Spirit Lake, Skamania Co., Wash.

CASCADE COPPER MINING CO. **WISCONSIN.**

Office: care of Walter Fowler, manager, West Superior, Wis. Organized circa 1898, with capitalization $250,000, shares $25 par. Lands, 425 acres, in Section 23, Town 48, Range 10, west of the Brule river, in Douglas county, Wisconsin. Idle for some years and apparently moribund.

CASCADE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. V.

CASCADE COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Office: Victoria, B. C. Mine office: Alberni, Vancouver Island, B. C. Hon. Erick B. McKay, president; Lawrence Manson, vice-president; W. J. Dowler, secretary and treasurer; preceding officers, H. H. Jones and W. H. R. Whitney, directors. Organized under laws of British Columbia, with capitalization $250,000, shares 25 cents par.

Lands, on the northern shore of Uchuckelsit Harbor, an arm of the Alberni Canal, show an 8′ diabase dyke traversing limestone, impregnated with chalcopyrite and pyrite, selected samples assaying 5.5% copper, 0.12 oz. silver and 0.6 oz. gold per ton, with occasional assays up to 28.3% copper. Development is by several shallow shafts and short tunnels, with 2 opencuts on adjoining outcrops. Mine has a 600′ three-rail gravity tramway, leading from the shaft to a 150-ton bunker on a wharf at tidewater. Has shipped a little ore of fair tenor.

CASCADE GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Ashland, Ohio. Mine office: Chelan, Chelan Co., Wash. E. J. Worst, president; D. F. Brubaker, secretary; B. H. Palmer, treasurer. Organized 1901, under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, known as the Davenport mine, near the head of Horseshoe Basin, are somewhat difficult of access. Mine has a 500′ tunnel, cutting 2 small veins, and sample smelter shipment of 1 ton gave returns of $69 in copper, lead, silver and gold. Presumably idle.

CASCADE MINING CO. **NEW MEXICO.**

Office and mine: Santa Fé, Santa Fé Co., N. M. Geo. M. Kinsell, president; J. W. Mayes, vice-president; Dr. Chas. A. Whedon, secretary and treasurer; preceding officers, A. D. McInturff and J. A. Burlington, directors. Organized circa October, 1907. Lands are in the Pecos National Forest Reserve, near Santa Fé.

CASCADES CONSOLIDATED COPPER CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. John T. Baker, president and treasurer; W. S. Russell, vice-president and secretary. Organized 1902, under laws of Wyoming, with capitalization $1,250,000, shares $1 par, succeeding the

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Cascades Copper Co. Lands, 15 claims, unpatented, including the Pasadena and High Five groups, circa 5 miles from Encampment, having a 100′ shaft, showing a 20′ vein, and a 900′ tunnel cutting several small veins carrying auriferous and argentiferous copper ores.

CASCADES COPPER CO. WYOMING.

Dead. Succeeded, 1902, by Cascades Consolidated Copper Co. Formerly at Encampment, Carbon Co., Wyo.

CASCADIA MINING & DEVELOPMENT CO. WASHINGTON.

Office: 1 Canterbury Bldg., Portland, Ore. Mine office: Spirit Lake, Skamania Co., Wash. E. A. Sessions, president; W. A. Gray, vice-president; G. W. Simpson, secretary and treasurer; C. E. Luckel and J. A. Gray, directors. Organized March 12, 1907, under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 16 claims, area 320 acres, also 5 millsites, in the Mount St. Helens district of Skamania and Lewis counties, including the Polar Star mine, opened by tunnel, showing quartz veins traversing syenite, carrying mainly chalcopyrite, with some galena and tetrahedrite, associated with pyrite, giving assays of 8 to 25% copper and $5 to $15 gold per ton, with trivial silver values.

CASHIER COPPER MINING CO. ARIZONA.

Mine office: Mayer, Yavapai Co., Ariz. Hon. M. P. Snyder, president and treasurer; G. W. Bedbury, vice-president and general manager; Wm. A. Eckerley, secretary. Organized January, 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Is controlled, through ownership of majority of stock, by Arizona Diamond Drill Mining Development Co. Lands, 8 claims, area 152 acres, in the Agua Fria district, 5 miles northeast of Mayer, showing country rock of Yavapai schist carrying lenticular veins of copper ore with silicious gangue, lenses following the planes of schistosity.

CASHIER GOLD MINING & REDUCTION CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. Wm. Auger, superintendent. Lands include the Brooklyn mine, developed to depth of 800′, carrying auriferous and argentiferous chalcopyrite and tetrahedrite, principal values being in silver, running up to circa 700 oz. per ton. Has steam power and is a small but steady producer, partly from work of lessees. Employs circa 30 men.

CASH MINE CO. ARIZONA.

Mine office: Groom Creek, Yavapai Co., Ariz. Harrington Blauvelt, general manager, at last accounts. Has auriferous copper ore and argentiferous lead ore. Mine has 2 shafts, with steam power and a 10-stamp mill.

CASH MINING & MILLING CO. COLORADO.

Dead. Apparently succeeded by American Queen Mining Co. Formerly at Gold Hill, Boulder Co., Colo.

ANTONIO GÓMEZ CASTELLANOS. MEXICO.

Office and mine: Compañía 48, Zacatecas, Zac., Mex. Property includes La Cobriza and La Iguana mines, carrying gold, silver and copper ores, and employing about 35 men, at last accounts.

CASTELLANOS y CA. CHILE.

Mine office: Combarbalá, Coquimbo, Chile. Production, at last accounts, was about 75 tons fine copper yearly, shipped as matte. Presumably idle.

MINA CASTILLO DEL BUITRON. SPAIN.

Owned by Compañía del Ferrocaril y Minas del Buitron.

SOCIEDAD ESPAÑOLA MINAS DEL CASTILLO DE LAS GUARDAS. SPAIN.

Office. Apartado 162, Bilbao, Spain. Mine office: Castillo de las Guardas, Sevilla, Spain. Juan Alonso Allende, president; Victoriano Galdiz, vice-president; Francisco De Záraga, secretary; Antonio Gonzalez Nicolás, managing

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director; Ramón de Urritía, engineer. Organized July 12, 1901, under laws of Spain, with capitalization 7,500,000 pesetas, shares 500 pesetas par.

Lands, 153 hectares, on which considerable development has been secured, 23 kilometers from Zalamea La Real, having a private railroad of 15.5 kilometers running from Castillo de las Guardas to Estación Ronquillo, on the Ferrocaril Sevilla y Cala. The company maintains a school for employes. Property considered promising.

CASTLE DOME COPPER CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Globe, Gila Co., Ariz. John R. Ryan, president; Geo. Hall, Jr., secretary; Bat. Quello, treasurer; preceding officers, Michael Richetta, Adolph F. Heidkamp, Paul Schneller, Jacob Utti, Matt Drazick and Thos. Hoffman, directors. Organized under laws of Arizona, and reorganized, Apr. 3, 1908, with capitalization $600,000, shares $10 par.

Lands, 12 claims, area circa 240 acres, 17 miles west of Globe, near the Continental mine of the Old Dominion, on the eastern side of Pinto Creek, with deepest workings of 300′, in schist and diorite.

CASTLE DOME DEVELOPMENT CO. **ARIZONA.**

Dead. An honest mining failure. About $30,000 was expended on development work and notices were issued, November, 1907, that money paid in would be refunded shareholders by the promoters. Formerly at Globe, Gila Co., Ariz.

CASTLE DOME EXPLORATION & REDUCTION CO **ARIZONA.**

Office: care of B. L. Worthen, president, Tucson, Ariz. Mine office: Yuma, Yuma Co., Ariz. Chas. F. Flack, secretary and treasurer; Jas. H. Bennett, general manager. Capitalization $500,000, shares $10 par. Lands, 17 claims, area 320 acres in the Castle Dome Mountains, circa 30 miles northeast of Yuma. Occasional small shipments have been made to smelters in San Francisco, during the past 25 years, these ranging from 37 to 52% copper; 50 to 70 oz. silver and $8 to $20 gold per ton. Development is by 10 open-cuts, and shallow shafts, deepest only 80′. Property shows a wide mineral zone, carrying ore bodies in schist, with a porphyry contact to the north, and quartzite and limestone to the south. Idle and apparently moribund.

CASTREJÓN HERMANOS. **MEXICO.**

Office and mine: Huacana, Ario, Michoacán, Mex. Property is the China mine, a small producer of copper for some years. Employs circa 25 men.

CASTRO-GRECIAN MINING CO. **UTAH.**

Office: care of Dr. P. Kassmikos, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah L. C. Moore, secretary and treasurer. Organized 1905, under laws of Utah, with capitalization $1,500,000, shares $1 par. Company is composed exclusively of Greek residents of Utah. Lands, sundry claims at Bingham, near the United States mines, also miscellaneous claims in Carbon, Emery and Wasatch counties, Utah. Latter lands apparently sold, circa September, 1905, to Uintah Mining, Milling & Development Co. In June, 1907, was planning to begin development.

CATALINA COPPER CO. **MEXICO.**

Office: Bisbee, Ariz. Mine office: La Cananea, Arizpe, Sonora, Mex. Organized February, 1904, with capitalization $500,000, shares $10 par. Lands are circa 30 miles south of La Cananea. Idle and apparently moribund.

CATALINA COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Tucson, Pima Co., Ariz. Fully described Vol. V.

CATARACT COPPER MINING CO. **MONTANA.**

Office: 308 The Bourse, Philadelphia, Pa. Mine office: Basin, Jefferson Co., Mont. Carl G. Weidinger, president; Samuel B. Vrooman, vice-president; Hon. Marcus L. Hewett, second vice-president and general manager; John H.

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Cromie, Jr., secretary; J. L. Ketterlinus, treasurer; preceding officers, Dr. Otis K. Newell and Carl F. Boker, directors; Leverett S. Ropes, superintendent. Organized May 14, 1901, under laws of South Dakota, with capitalization $2,500,000, shares $5 par.

Lands, 21 claims, area 420 acres, also 300 acres of placer claims, in the Cataract district, circa 12 miles from Basin, including the Bullion, Buckeye, Gray Eagle, Cataract, Yellow Gambler, Timbuctoo and Goldbug claims, several of which were worked in early days for gold. Country rock is granite, with intrusive porphyritic dykes, carrying fissure veins, ore being mainly cupriferous pyrite, with some tetrahedrite, having a gangue of quartz and silicious altered granite. Zone of oxidation is shallow.

Property has 2 veins, one known as the Bullion having been traced circa 8,000′, and proven for nearly 3,000′, this being 10′ to 20′ wide, with 7′ to 8′ of commercial ore, and a 2′ paystreak of smelting ore, the Bullion mine having nearly 2 miles of workings. Development is by 4 tunnels, including the Crystal tunnel of 1,100′ and the No. 3 tunnel, which apparently has shrunk from claimed lengths of 5,000′ and 3,600′, down to 1,212′ length.

The Buckeye mine is said to show a 20′ vein of ore of concentrating grade, with a 4′ paystreak of smelting ore. The mines, as a whole, are claimed to have circa 1,000,000 tons of low grade ore in sight, averaging about 2% copper, with gold and silver values.

Equipment includes a power plant with 6-drill air-compressor, and necessary mine buildings.

The concentrator, of 150 tons nominal daily capacity, and actual capacity of about 100 tons, seems to have been built wrong, and has given considerable trouble.

The 250-ton smelter has a 44x144″ Colorado Iron Works water-jacket blast-furnace, taking blast heated to 800° F. in a "U" stove, a 150-h. p. engine, Connersville blower and a small electric plant. The smelter is very poorly located for economical receipt of coal and fluxes.

A trial run of 6,000 tons of ore, 1905, gave a 10 to 15% matte, with average extraction from ore of 2.29% copper, 18 oz. silver and $7.60 gold per ton.

The company has been in financial straits almost since organization, and has redeemed none of the extremely liberal promises made from time to time. The promoter of the company, Marcus L. Hewett, is said to have made individual profits of $75,000 from the sale of the company's stock. The local management is good.

CATARACT COPPER MINING CO. **WYOMING.**

Dead. Was a twin of the Cascade Copper Mining Co. Formerly at Encampment, Carbon Co., Wyo.

CATAS VIEJAS COPPER CO. **MEXICO.**

Office: 211 Binz Bldg., Houston, Texas. Mine office: Tepezalá, Ocampo, Aguascalientes, Mex. A. L. Hays, president; G. H. Barnes, secretary and treasurer.

CATAS VIEJAS MINING CO. **MEXICO.**

Office: Iron Block, Milwaukee, Wis. Organized under laws of Arizona, with capitalization $250,000, shares $1 par. Claims to have lands somewhere in Mexico, but location not learned, despite requests. In December, 1906, advertised that every share then bought doubtless would be worth $25 within 1 year, but this was a very bad guess. Apparently a wildcat.

SOCIÉTÉ DES MINES DE CUIVRE DE CATEMOU. **CHILE.**

Office: 50 Blvd. de la Senne, Brussels, Belgium. Mine offices: El Solado, Putaendo, Aconcagua, Chile, and Nogales, Valparaiso, Chile. Works offices:

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Nilgue, Estación Chagres, Putaendo, Chile, and Melon, Quillota, Valparaiso, Chile. Max Lyon, president; preceding officer, Comte Leopold-Fernand-Balny d'Avricourt, Comte Hubert Delamarre, Octave Maggiar, Emil Parif, Eugene Renevey, Ernest Stouls, D. Ghesquierre, Adam Collignon, A. L. Pearse, Georges Renevey, L. Consio and R. Franklin, directors; Guillaume Wouters, secretary; H. Macnutt, general manager; F. C. Vigeon, superintendent; J. R. Starkey, mill superintendent. Organized June 2, 1899, under laws of Belgium, with capitalization 5,000,000 francs, shares 500 francs par, divided into 10,000 preference shares at 8%, and 35,000 ordinary shares without stated value. Debentures, 2,500,000 francs authorized, at 5%; issued, 1,070,000 francs. Annual meeting, last Friday in June

Lands, 155 claims, with sundry miscellaneous tracts, held in fee and under government concessions, including a hacienda of 7,500 hectares, giving total landed holdings of about 30,000 acres, in the districts of Putaendo, Los Andes, Melipilla, La Ligua, Quillota and El Nilgue.

The local management reports that ores carry an average of 6% copper, but a director stated, 1903, that the average would be only about 3.5% copper and 2 oz. silver per ton. Veins carry the usual oxidized ores near surface, in a comparatively shallow surface zone, succeeded by chalcocite, bornite and chalcopyrite.

El Solado mine, opened 1841, at Putaendo, one of the Nogales group, shows a series of veins with approximately north and south strike and dip of 45° east, between trachyte and feldspar-porphyry. There are 15 known veins, with average width of 5′ to 7′, composed mainly of quartz, impregnated with copper sulphides, while several veins carry oxidized copper ores, with gangue of aluminous silicates. This series of veins frequently is faulted, with throws of 1 to 2 meters, and there is another series of dykes and veins crossing at approximately right angles to the dip, but with parallel strike, which is unusual, dykes being partly decomposed porphyry, carrying occasional oxidized ores and aluminous silicates. These veins have been worked extensively in the past, showing many antiguas, and average 7 to 8% in copper tenor. Development is mainly by tunnels, greatest vertical depth obtained being 80 meters, and old workings are about 150 meters in length. This mine shows some immense chambers, one being called the cathedral, in recognition of its vast size. The Mantos Rojos of the Nogales group, opened 1820, has 2 blanket veins, of 5′ to 7′ thickness, composed of calcareous matter impregnated with chalcopyrite to an estimated average of about 4% copper. These blanket veins have been worked on a large scale, since circa 1835, and, while low in grade, the ores are especially suitable for fluxing purposes, and, by reason of the vast size of the ore bodies, the Mantos Rojos offers great possibilities of future production.

Miscellaneous mines include El Cobre de Melon, in the Quillota district, opened 1886; El Nilgue mine, in the department of Putaendo, opened 1886; Las Maquinas de Catemú mine, in the department of Putaendo, opened 1870; La Esmeralda mine, opened 1860; La Constancia and La Democracia mines, circa 10 kilometers from the smelter, carrying blanket veins; the Marquesa, Malva, Tabourina, Caracoles, Almendro y Pleito, La Poza and other properties, in various stages of development,, some of considerable promise.

La Poza smelter, at Chagres, is 12 kilometers from Chagres station, on the Andes railroad. These works include a concentrator, of modern design and equipment, having mainly American machinery. The mill, of 60 tons rated capacity, has 7 Wilfley and Ferrari tables, and slime tables. La Poza smelter, of 400 tons daily capacity, has two old 75-ton rectangular water-jacket blast furnaces, and new blast-furnaces of 36x96″ and 36x120″ dimensions at the tuyeres, turning out 45% matte. The converter department has five 57x77″

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shells, with 12 tuyeres each, of the Copper Queen type, turning out Chile bars carrying 99.7% copper and 32 oz. silver per ton. There is a 40-ton briquetting plant, and the converter department has a quartz mill. Power is furnished by a 165-h. p. Pelton water wheel and 175-h. p. engine. Furnace blast is supplied by No. 6 Connersville blowers, and converter blast is furnished by a Riedler air-compressor, with capacity to reduce 20,000 cubic feet of free air per minute to 15 lbs. pressure. Fuel is coke, one ton of coke smelting 5.21 tons of ore, ores treated being highly silicious, with slags averaging 0.4 to 0.5% copper. In 1903 La Poza smelter treated 19,063 metric tons of ore, of 6% average tenor, obtaining therefrom 1,046.25 metric tons fine copper, employing 90 men, at average wages of 2 pesos daily.

El Cobre del Melon smelter, 16 kilometers from Estación del Melon, on the Calera & Cabildo railway, has a 36x84" Allis-Chalmers cylindrical water-jacket blast-furnace, making ejes, which are sent to La Lota and La Poza smelters for conversion. Ores smelted at this plant carry excess of silica and alumina, and are deficient in sulphur, necessitating the free use of low grade cupriferous pyrite and limestone, for fluxing. Fuel is very expensive, coke costing 43.5 pesos per metric ton, and English coal 31 pesos per ton, one ton of fuel smelting about 3.5 tons of ore. Equipment includes a Pelton water wheel, 60-h. p. locomotive and Green No. 6 blower. A 4-kilometer aerial tram is proposed to the Nogales group. In 1903 these works employed 40 men, at average wages of 2 pesos daily, treating 8,882 metric tons of ore averaging 6% copper, producing therefrom 928 tons of ejes, of 45.5% tenor, carrying 422,240 kgs. fine copper. It is planned to greatly enlarge this smelter by adding a 48x120" Allis-Chalmers blast-furnace, converter plant, Babcock & Wilcox boilers, Corliss engine and Riedler air-compressor, increasing the smelting capacity to 40,000 metric tons of ore yearly.

Los Mantos mines are capable of a large output, and the management is progressive. Production, 1903, was 15,851 metric tons of ore averaging 5.5% copper. With improvements at the smelters the capacity of the property should be increased to nearly or quite 6,000 metric tons of fine copper yearly. Production, 1905, was 4,401,270 lbs. fine copper.

SOCIEDAD NACIONAL DE MINAS i FUNDICIONES DE CATEMU i MELON. — **CHILE.**

Office: Valparaiso, Chile. Organized Sept. 7, 1906, under laws of Chile, with capitalization 2,000,000 pesos, shares 50 pesos par. Obviously is closely related to Société des Mines de Cuivre de Catemou, and probably is the Chilean incorporation of that company.

SOCIEDAD MINERA DE CATIGUA. — **CHILE.**

Office: Santiago de Chile. Mine office: Tarapacá, Tarapacá, Chile. Organized Dec. 13, 1906, under laws of Chile, with capitalization £230,000, shares £1 par.

CAUCASUS COPPER CO., LTD. — **RUSSIA.**

Office: 3 Bond Court House, Walbrook, London, E. C., Eng. Mine office: Dzansul, Kutais, Russia. A. A. Swan, chairman; preceding officer, J. Douglas, J. Colquhoun, M. Grancini, E. V. Lockhart and J. N. Sparks, directors; John F. Allan, general manager; W. R. Van Liew, smelter superintendent; H. H. Knox, consulting engineer; John Tripp, secretary. Organized Oct. 4, 1900, under laws of Great Britain, with capitalization £500,000, shares £1 par. Debentures, £500,000, at 6%. Property was bought for £398,988. Company, to October, 1907, had expended £247,150 on development and improvements.

Lands are 6 groups, including the Dzansulski copper and silver-lead mines, in the Murgne Gorge, Artvin district of the government of Kutais, in the Russian Caucasus. Mine is developed extensively, company estimating reserves

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at 5,600,000 long tons, of 3.1% copper ore, practically in sight. Ore is chalcopyrite, with a silicious gangue, occurring in a mammoth lense of 50 to 100 meters width, with about 300 meters length. Mine is worked open-cast, and ore is trammed to the mill.

The mill, nominally of 500 tons daily capacity, planned as the first unit of a 1,000-ton mill, has electric power, with automatic operation throughout. The ore slimes badly in concentration, and is so high in silica and so deficient in iron that heavy fluxing is necessary, in a district where fluxing ores are secured with difficulty. Wet concentration having proved unsatisfactory, the process was changed. Equipment includes Blake crushers and series of grinding rolls, with screens, ore being taken by belt conveyers to the roasters. The process of reduction in use requires the fine crushing of ore, which is minutely subdivided, followed by roasting to change the iron sulphides to iron oxides, after which the ore goes to a Wetherill magnetic separation plant which carries over the iron oxide, taking with it the copper, giving a concentrate of about 12% copper tenor. The mill has given considerable trouble in operation, but apparently will be adjusted, eventually.

The old works had a small smelter, which was increased to 300 tons capacity, and rebuilt, 1907-1908, to 500 tons daily capacity. Production, 1904, was 1,946,360 lbs. fine copper, and for fiscal year 1905, was 511,920 lbs. fine copper. Property is considered valuable, though as yet it cannot be called a success.

CAVE CREEK MINING CO. **ARIZONA.**

Mine office: Cave Creek, Maricopa Co., Ariz. G. J. Corsot, president; Frank Doursler, secretary. Has authorized a $40,000 bond issue. Lands, 4 claims, area 80 acres, and 5-acre millsite, formerly held by Mormon Girl Mining Co., showing two 4′ contact veins, between granite and slate, claimed by former owners to give average assays of 6 to 8% copper, 4 to 15 oz. silver and $4 gold per ton, which was a grievous overestimate, from silicious oxides and carbonates, and copper silicates. Development is by 500′ shaft and a 400′ tunnel. Has steam power and several mine buildings, also a 25-ton mill with 5 stamps and a 20-ton Huntington-Heberlein mill, and a 25-ton leaching and cyanide plant. Idle at last accounts.

MINA DA CAVEIRA. **PORTUGAL.**

Mine office: care of Crookson & Hawkins, owners, Grandola, Portugal. Was undergoing development at last accounts.

CAVIN MINING & MILLING CO. **CALIFORNIA.**

Office: Stockton, Cal. Mine office: Raymond, Mariposa Co., Cal. E. W. King president and general manager. Lands, 12 claims, having tunnels of 40′ to 650′, and 6 shafts, of 50′ to 175′ depth. Has shipped a little ore.

SOCIEDAD EXPLOTADORA DE CAYLLOMA. **PERÚ.**

Office: Valparaiso, Chile. Mine office: Arequipa, Perú. Organized May 23, 1906, under laws of Chile, with capitalization £32,000, shares £1 par.

CEDAR CANYON SMELTING & REDUCTION CO. **WASHINGTON.**

Mine office: Springdale, Stevens Co., Utah. W. Sheck, general manager. Lands, on the Columbia river, west of Springdale, show copper sulphides. Company is said to plan a 50-ton mill.

CEDAR FOREST GOLD & COPPER CO. **ARIZONA.**

Dead. Formerly at Kingman, Mohave Co., Ariz. Described Vol. VI.

CEDAR MINING CO. **UTAH.**

Mine office: Milford, Beaver Co., Utah. Lands, 12 miles from Milford, have a 275′ shaft showing argentiferous copper ores with values mainly in silver.

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CEDAR VALLEY GOLD & SILVER MINING CO. **ARIZONA.**

Mine office: Cedar, Mohave Co., Ariz. Philip P. Baker, superintendent. Lands include the Arnold, Silver Queen and other claims. Ores carry gold, silver and copper. Has steam power and a 15-stamp mill. Presumably idle.

CELTIC COPPER CO. **ARIZONA.**

Office and mine: care of Archibald Morrison, Clifton, Graham Co., Ariz. Lands, 16 claims, area 320 acres, circa 15 miles from Clifton, opened by a 65′ shaft. Shipped, 1907, circa 200 tons of sulphide ore of about 19% copper tenor. Presumably idle.

CENTENNIAL-BINGHAM MINING CO. **UTAH.**

Dead. Succeeded, Feb. 11, 1904, by South Columbus Mining Co. Formerly at Park City, Summit Co., Utah.

CENTENNIAL COPPER MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. MacNaughton, general manager; preceding officers, A. Agassiz, F. W. Hunnewell, Quincy A. Shaw, Jr. and R. L. Agassiz, directors; John Pentecost, mining captain.

Organized 1896, under laws of Michigan, as successor of Centennial Mining Co., with capitalization $2,500,000, shares $25 par; issued, $2,250,000, with $19.50 per share paid in. Last assessment, 1905, was $4. Is controlled, through ownership of circa 46,000 shares, a majority of the stock issued, by the Calumet & Hecla Mining Co. Old Colony Trust Co., Boston, registrar. Annual meeting, first Tuesday in April.

The company's floating debt, amounting to $335,894.24 on Jan. 1, 1905, was met, partially, by the sale of the mill, for $300,000, to the Lake Milling, Smelting & Refining Co., which corporation the Centennial owns jointly with the Allouez Mining Co. Company ended 1907 with accounts payable of $31,366.58.

Lands, circa 670 acres, being Section 12, Town 56 North, Range 33 West, also a triangular patch of about 30 acres, at the southeastern corner of the main tract, bought to secure the outcrop of the Kearsarge lode, and including about 10 acres, bought, 1905, of the Old Colony for the surface plant. The first work was done, 1863, by the Schoolcraft Mining Co., which failed to open a paying mine, and was reorganized, 1876, as the Centennial Mining Co., and again reorganized, 1896, with present title. Expenditures of upwards of $1,500,000 were made, mainly by the old companies, in unsuccessful efforts to open a paying mine on the northern extension of the Calumet conglomerate. Seven shafts, 3 of considerable depth, were sunk on this bed, No. 3, the deepest, being bottomed at 3,200′. The Centennial lands are in the great mining camp of Calumet, and are available for building purposes. Two additions have been platted, and the lots sold at good prices. Only surface rights are sold, mineral being reserved.

The present company did a few months' work, in 1897, on the old conglomerate shaft, then turned attention to the Osceola lode, deepening 2 shallow shafts to 1,050′ and 1,150′ depth respectively, shafts being 17x12′ inside of timbers, sunk at 38°. The Osceola lode, where opened on the Centennial tract, averages about 15′ width, but is lean.

Work on the Kearsarge lode was begun September, 1899. Owing to the outcrop of the Kearsarge occurring on the 30-acre tract bought of the Osceola, with only 100′ right-of-way connecting it with the main tract, it was necessary to open the mine on the Kearsarge lode in a peculiar manner, by 2 shafts. These are but 90′ apart, on surface, and continue parallel, on the dip of the lode, until the 13th level, when the main tract is reached, after which No. 2 shaft diverges from No. 1 at an angle of 15° on the plane of the lode, 300′

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being taken by the curve. This method of opening gives short drifts until the shafts enter the main Centennial tract. Each shaft is 17x18′ inside of timbers, with 3 compartments, sunk at an angle of 39° with the horizon, through an overburden of about 100′ depth. The Kearsarge lode averages about 16′ in width, and showed fair copper values in the upper levels, followed by a comparatively barren zone until the 14th level, when there came a gradual improvement. The mine has large ore reserves opened, and should get the rich Volverine ore chute at depth.

No. 1 shaft, 3,070′ deep, can be sunk circa 12,000′ before reaching the boundary. No. 1 has a steel shaft-rockhouse, with 3,000-ton bins and a 32x72″ Nordberg duplex hoist, with double conical drum, good for depth of 6,000′, operating 5-ton skips.

No. 2 shaft, circa 3,100′ deep, cut down, 1907, to 3 compartments, shows good ground from the 28th to the 31st levels, inclusive. Equipment includes a cylindrical steel shaft-rockhouse with 1,000-ton bins, and a 32x60″ Sullivan duplex straight-face hoist, with 2 drums of 14′ diameter and 15′ 6″ winding face, grooved for 1⅜″ cable. The hoist is fitted with devices to prevent overwinding, and is calculated to raise 5-ton skips at the rate of 4,000′ per minute, operating under 150 lbs. steam pressure.

The principal mine buildings are of Lake Superior redstone, finished ashlar, and include duplicate engine-houses for the 2 shafts. The new compressor house, 32x78′, has a 70-drill Laidlaw-Dunn-Gordon 2-stage compound air-compressor, and the old compressor house, 32x46′, has 35-drill Nordberg and 20-drill Rand air-compressors, with a Dean jet condenser in the basement. A 54x58′ boiler-house has four 125-h. p. Burt locomotive-firebox boilers, and a 125′ brick-lined self-supporting steel smokestack of 7′ diameter. A 16x46′ frame pumphouse, with corrugated iron roof, has a fire-pump, fire-hose and hose-carts. The combination machine-shop and smithy is 50x108′, with steel truss roof, having traveling cranes, with railroad track from end to end. Miscellaneous buildings include a 36x50′, carpenter shop, 30x40′ warehouse, 30x40′ office building, and a 25x50′ changing house with hot and cold water, baths, lockers, etc. There also is a large number of dwellings for employes, the surface plant being well planned and substantial.

The mine is served by the Copper Range and Mineral Range railroads, and has a private line connecting the shops and shafts.

Rock is stamped by the mill of the Lake Milling, Smelting & Refining Co., which is separately described. The Centennial employs about 400 men.

Production was begun July 5, 1904, and output of fine copper has been as follows: 641,294 lbs. in 1904; 1,446,584 lbs. in 1905; 2,253,015 lbs. in 1906 and 2,373,572 lbs. in 1907. Rock hoisted, 1907, was 225,271 tons, of which 200,040 tons were milled, discard being 11.2%, producing 3,604,970 lbs. mineral, which averaged 65.842% fine copper, the production of copper per ton of rock stamped, 1907, being 0.593%, or only 11.86 lbs., as against 0.679%, or 13.58 lbs., in 1906, a very discouraging showing. For the first half of 1908 about 87,000 tons of rock were stamped, a decrease of about 5,000 tons, yielding circa 1,670,000 lbs. of mineral, an increase of about 70,000 lbs. Production, October, 1908, was at the rate of about 15,000 tons of rock monthly, and production of copper for 1908 should prove slightly larger than in the preceding year. The mine was looking somewhat better, late in 1908. Costs per ton, less construction, have been as follows: $3.54 in 1905; $2.21 in 1906, and $2.34 in 1907.

It is possible, and even probable, that the Calumet conglomerate may be worked to advantage, eventually, under the management of the Calumet & Hecla, though this would not be possible were the Centennial an independent company. It is possible that something may be done also with the Osceola bed, on the Centennial tract.

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CENTENNIAL-EUREKA MINING CO. **UTAH.**

Office: 50 Congress St., Boston, Mass. Operating office: 508 Dooly Bldg., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Wm. G. Sharpe, president; Alfred F. Holden, managing director; preceding officers, Wm. H. Coolidge, Robert D. Evans, Clarence A. Hight, J. J. Storrow and Sidney W. Winslow, directors; F. Winthrop Batchelder, secretary and treasurer; C. E. Allen, superintendent. Organized 1876, under laws of Utah, and reorganized, 1899, under laws of Maine, under same title, with capitalization $5,000,000, shares $25 par; issued $2,500,000. Company is controlled by the United States Mining Co., which holds all but circa 100 shares. National Shawmut Bank, Boston, registrar. Annual meeting, third Wednesday in April.

Lands, in the Tintic district, include the Centennial, Eureka, Tintic, Dove, Swan and Pelican groups. A suit over land, against the Bullion Beck & Champion Mining Co., was dismissed, 1908. Mines are extensively developed, producing ore of 2 grades, the oxidized ores carrying high values in gold and silver, while the low grade deposits, though of enormous extent, carry only small gold and silver values. The east fissure has upwards of 500,000 tons of ore blocked out, and reserves, 1905, were estimated by J. Parke Channing at 600,000 tons, carrying average values of $11.88 per ton.

Forces are circa 300 men. Production, 1907, was 2,310 carloads of ore, or about 80,000 tons. Property is valuable and under good management.

CENTENNIAL MINE. **COLORADO.**

Office and mine: Georgetown, Clear Creek Co., Colo. David Kennedy, general manager; S. G. Evans, superintendent. Lands, circa 640 acres. Has cupriferous gold and silver ores in a 30' paystreak, assaying up to 24% copper, 5 to 150 oz. silver and 3 to 5 oz. gold per ton. Has steam power.

CENTENNIAL MINING CO. **MICHIGAN.**

Dead. Reorganized, 1896, as Centennial Copper Mining Co. Formerly at Calumet, Houghton Co., Mich.

CENTRAL ALASKA GOLD & COPPER CO. **ALASKA.**

Dead. Succeeded, 1907, by Chisna Consolidated Mines Co. Formerly at Landlock, Prince William Sound, Alaska. Described Vol. VI.

CENTRAL BLACK HILLS COPPER CO. **SOUTH DAKOTA.**

Office: 701 New England Bldg., Cleveland, Ohio. Mine office: Custer, Custer Co., S. D. O. L. Olmsted, president; Chas. Waite, vice-president and manager; W. H. Buffum, treasurer; Alex Cameron, Jr., secretary. Organized July, 1902, under laws of South Dakota, with capitalization $1,500,000, shares $1 par; was practically reorganized, and management changed, April, 1907.

Lands, 6 claims, area 600 acres, also a 40-acre millsite, and 80 acre miscellaneous lands, in the Pennington district, showing 2 contact veins, between slate and quartzite, of 18' claimed average width, opened by shafts of 103' and 110', and by tunnels of 102' and 225', showing malachite, azurite and chalcopyrite said to give average assays of 6% copper, 2 oz. silver and $4 to $200 gold per ton. Ore was expected by old management to average about 3% copper in actual treatment, which probably was an overestimate. Has a 200-h. p. steam plant, and a mill with 2 crushers and 4 jigs, and a 100-ton leaching plant, also a sawmill. Property shows large bodies of low grade ore that possibly might be leached to advantage. Idle.

CENTRAL CHILI COPPER CO., LTD. **CHILE.**

Office: 15 Angel Court, Throgmorton Court, London, E. C., Eng. Mine and works office: Panulcillo, Ovalle, Coquimbo, Chile. Eugene A. J. Goldschmid, chairman; Bertrand C. Hinman, managing director; Harris K. Masters, general manager; Herbert Brownhead, secretary; Thos. Higgins, smelter superintendent; H. M. McLaughlin, engineer. Organized Jan. 10, 1898, under laws of Great Britain, as a second reconstruction of the Panulcillo Copper Co., Ltd.,

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with capitalization increased, November, 1905, to £500,000, shares £1 par; issued, £312,468. Debentures outstanding, £8,075, at 4%, convertible into fully paid shares at option of holder. Net earnings, 1905, were £10,932, and 1906 were £24,913. Dividends were 6d. in 1900; 6d. in 1901, and 1s. in 1907.

Lands, 56 hectares, at Panulcillo, including the Panulcillo and San Gregorio groups, showing strong lenses of ore up to 150′ in width, with generally north and south strike and dip of about 45°, worked to depth of 200 meters and length of 1,500 meters. Ore is mainly chalcopyrite, associated with pyrite in limestone gangue, with malachite, azurite and chalcocite produced in commercial quantities.

The Condesa mine, 3 kilometers from Panulcillo, has a 5′ vein, with nearly north and south strike, and is opened to depth of circa 100′ only. Production, 1903, was about 600 metric tons of 6% ore.

The Cocina and Inagotable mines, at Ferro Negro, show lenses up to 70′ in width, with dip of about 45°. Production, 1903, was only 1,200 metric tons of 5.5% ore, but probably was very much larger in 1907, the Cocina group of 4 mines being said to show nearly 2,000,000 long tons of ore.

The Nisfiles mine has a stockwork, opened by 3 tunnels to depth of circa 300 meters, and produced, 1903, circa 2,500 metric tons of 4.5% copper ore.

The 400-ton smelter, connected with the Panulcillo mine by tram, is equipped with 3 calcining furnaces, 2 reverberatory furnaces and three 42x84″ blast-furnaces. The company's ores, being rich in sulphur, permit their smelting in connection with silicate custom ores. The works have a converter department, with quartz mill and crushers for linings, power being furnished by three 160-h. p. boilers, three 60-h. p. engines and 2 Connersville blowers. Fuel is imported coke, costing 40 pesos per ton, and imported English coal, costing 23 pesos per ton, one ton of coke smelting 7.7 tons of ore.

Labor is somewhat scarce, forces employed being about 250 men at the mine and 200 men at the works, at average wages of 1.5 pesos daily.

Production, 1905, was 4,596,480 lbs. fine copper, and for 1906 was 4,159,680 lbs. fine copper. The mines, though low in grade, are carefully handled, by a prudent management, and the smelter is modern and profitable.

CENTRAL CONSOLIDATED COPPER CO. **MEXICO.**

Office: Hibbing, Minn. Operating office: Douglas, Ariz. Letter returned unclaimed from former mine office, Fronteras, Arizpe, Sonora, Mex. Organized 1907, succeeding La Union Consolidated Copper Co. Lands, 240 hectares, including La Reina de Cobre group, in the Tordillo district of the Ajo Mountains, circa 25 miles west of Fronteras. Mine has a 100′ shaft showing a 13″ vein said to give average assays of 13 oz. silver and $12 gold per ton. Shipments of 230 tons taken from depth of 40′ returned 6% copper, 3.5 oz. silver and $7 gold per ton. Property considered promising. Idle at last accounts.

CENTRAL COPPER CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Patrick Rose, treasurer; F. L. Toombs, manager; W. J. Powell, mine superintendent. Capitalization $100,000, shares $1 par. Lands, 3 claims, between the Union and Gibson, on the divide between Mineral Creek and Pinto Creek, having a 160′ shaft cutting a 4% ore body with paystreak of 30% copper tenor.

CENTRAL COPPER MINING SYNDICATE. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Lands, 80 acres, circa 3 miles north of the Queen Bee mine, prospected during 1907, showing ores giving fair assay values in gold, silver and copper. Presumably idle.

SOCIEDAD MINERA CENTRAL DE COLLAHUASI. **CHILE.**

Office: Santiago de Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized Feb. 14, 1906, under laws of Chile, with capitalization 90,000 pesos, shares 15 pesos par.

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CENTRAL GOLD & COPPER CO. **NEW MEXICO.**

Dead. Formerly at Mineral Hill, San Miguel Co., N. M.

LA GRAN FUNDICION CENTRAL MEXICANA. **MEXICO.**

Is the Aguascalientes plant of the American Smelting & Refining Co.

CENTRAL MINE. **MICHIGAN.**

Owned by Frontenac Copper Co.

CENTRAL MINING CO. **MICHIGAN.**

Dead. Property sold, circa 1905, to Frontenac Copper Co., and final dividend in liquidation, 98 cents per share, paid March, 1908, and company wound up. Company paid total dividends, 1864-1908, of $2,049,600. Formerly at Central Mine, Keweenaw Co., Mich. Described Vols. I. and II.

CENTRAL MINING CO. **WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. Jas. LeFevre, general manager. Lands, sundry claims developed by a 60′ shaft showing ore assaying 3 to 16% copper.

CENTRAL MINING & DEVELOPMENT CO. **ARIZONA.**

Mine office: Winkelman, Pinal Co., Ariz. Irvin Jordon, president; C. H. Werner, vice-president; preceding officers, T. B. Enochs, J. A. McCabe and Dr. A. F. Angeni, directors; V. K. Heinberg, secretary; F. B. Garden, superintendent. Organized July 13, 1906, under laws of Arizona, with capitalization $10,000,000, shares $1 par. Lands, 9 claims, one fractional, area 175 acres, a millsite and a 160-acre ranch. Lands include the Two Queens mine, 7 miles from a railroad, having 4 nearly parallel veins and a cross vein, one vein showing surface ore claimed to assay $200,000 gold per ton, which is too good to be true. Mine has shafts of 21′, 38′, 50′, 155′ and 184′, and a 440′ tunnel, showing ore with quartz gangue, from which selected samples have given high assay values in gold and silver, with a little copper. Has a 25-h. p. gasoline hoist and an air-compressor. Despite the marvelous assays, 3 small smelter shipments, 1907, gave returns of only $36.53 per ton. Company was promoted by Frank H. Horn, of Kansas City, Mo., but he dropped out and entire management was changed, September, 1908.

CENTRAL SIBERIA, LTD. **SIBERIA.**

Office: Dashwood House, London, E. C., Eng. Marquis of Winchester, chairman; E. A. Maund, managing director; Wm. Owen, secretary. Organized Dec. 6, 1906, under laws of Great Britain, with capitalization £100,000, shares £1 par; issued, £90,000. Property consists of sundry options on mineral properties, including copper deposits circa 40 miles from Verchneoodinsk, Transbaikal, Siberia, on the Siberian railway between the Selenga and Chilek rivers, showing quartz veins carrying native copper and carbonate ores.

CENTRE STAR CONSOLIDATED MINING CO. **BRITISH COLUMBIA.**

Mine office: Rossland, Trail district, B. C. E. B. Kirby, manager. Organized January, 1906, as successor of Centre Star Mining Co., and is controlled, through stock ownership, by Consolidated Mining & Smelting Company of Canada, Ltd. The Centre Star Mining Co. paid, 1895-1904, dividends of $210,000.

The mine has a 3-compartment main shaft, with dip of only 17°, having 14 levels opened, at intervals of 125′ to 175′ on the slope, which is sinking for the 16th level, which will give a total depth of 2,400′, rendering it the deepest in Canada. Drifts, where possible, are run along the footwall. Ore and country rock stand well, requiring practically no timbering, and the mine is not especially wet. There are loading pockets at each level. Veins range from 6″ to 40′ in width, with pay shutes extending, in some cases, from wall to wall, and forming local enrichments, walls being very indistinct, ore shading into the country rock. There are several veins, the most important being the Centre Star, on which the mine is opened mainly, this being a large shear-zone fissure,

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carrying chalcopyrite disseminated in pyrite and pyrrhotite, with occasional arsenopyrite, having good gold values and small silver values. The lowest levels show good ore. The Centre Star is connected with the War Eagle mine on the 9th level.

Electric power was substituted, 1906, for steam. Equipment includes a 52x56′ engine-house with a 28x60″ Nordberg hoist having drums of 10′ diameter and 5′ face, with hoisting capacity of 135 tons per hour from a depth of 3,000′, raising 4½-ton skips in balance, at a speed of 2,500′ per minute. A 650-h. p. Westinghouse induction motor drives a 40-drill air-compressor, and there is a 24x36″ Jenckes-Farrel crusher, with capacity to reduce 100 tons of ore per hour to 6″ size.

The company employs about 400 men. Figures of production are not given out for the property individually, but output, 1904, was 77,892 tons of ore averaging 0.72% copper, 0.35 oz. silver and 0.3 oz. gold per ton, yielding 1,121,644 lbs. fine copper, and present production is larger.

CENTRE STAR MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Succeeded, January, 1906, by Centre Star Consolidated Mining Co. Formerly at Rossland, Trail district, B. C.

CENTURION ARIZONA MINING CO. **ARIZONA.**

Mine office: Willcox, Cochise Co., Ariz. Lands, circa 2 miles northwest of Dragoon station, are said to have a 17′ vein carrying high grade cuprite, azurite and malachite, assaying up to 30% copper, opened to shallow depth only.

CENTURY DEVELOPMENT CO. **NORTH CAROLINA.**

Office: 52 Broadway, New York, N. Y. Mine office: Centre, Guilford Co., N. C. W. B. Feakins, president; Frank F. Hesse, secretary and treasurer; Chas. E. Dickens, superintendent. Organized under laws of Maine, with capitalization $300,000, shares $10 par; issued, $138,000. Bonds, $10,000 authorized, at 6%; issued, $5,000. Annual meeting, third Tuesday in December.

Lands, 92 acres, freehold, known as the North Carolina or Fentress mine, said to have produced considerable ore of 14 to 20% copper tenor previous to the American Civil War. Property shows 3 contact deposits, between granite and diorite, reported by company as of 7′ average width, but otherwise stated as of 3′ to 4′ width, with outcrop traceable for 3 miles, having an ore chute of 80′ to 90′ in length, carrying auriferous chalcopyrite and pyrite, with quartz gangue, values being mainly in gold. Management reports average assays of 8% copper, 3 oz. silver and up to $12 gold per ton. Mine has shafts of 269′, 80′, 55′, 303′ and 175′, and a 431′ tunnel, with about 3,000′ of workings. Property was opened circa 1840, closed 1856, reopened 1900. Has a 250-h. p. steam plant, with a 50-h. p. hoist and 10-drill air-compressor. Has 7 buildings, including a machine-shop, carpenter-shop, smithy, etc. Stampmill, 28x40′, of wood, has 10 stamps, built by the Mecklenburg Iron Works, and a Blake crusher. Company plans deepening the new incline shaft by 300′.

CENTURY MINING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo.

CERMA DEVELOPMENT CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Ft. Huachuca, Cochise Co., Ariz. Organized, 1903, to develop a group of 47 claims in the Huachuca Mountains. Idle and apparently moribund.

COMPAÑIA EXPLOTADORA DE MINAS DE CERRO BLANCO. **CHILE.**

Office: Valparaiso, Chile. Mine office: Copiapó, Chile. Organized July 22, 1901, under laws of Chile, with capitalization 195,000 pesos, shares 130 pesos par.

COMPAÑIA MINERA DE CERRO BLANCO. **CHILE.**

Office: Valparaiso, Chile. Mine office: Copiapó, Atacama, Chile. Organ-

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ized Feb. 14, 1900, under laws of Chile, with capitalization 150,000 pesos, shares 100 pesos par.

CERRO COLORADO MINING & MILLING CO. **ARIZONA.**

Office and mine: 82 Pennyton St., Tucson, Ariz. Daniel J. Sully, president; Elias S. Gifford, vice-president; Chas. E. Udall, general manager. Organized 1905, with capitalization $5,000,000, shares $1 par. Lands, 72 claims, unpatented, also 5 millsites, in the Cerro Colorado district, circa 45 miles from Tucson, the nearest railroad point, including the old Silver Queen mine, formerly a considerable producer of copper. Mine has a 520′ shaft, showing streaks of rich copper ore on the 350′ level, ore being mainly argentiferous tetrahedrite, with about 2,000′ of workings. Has a steam plant with 3 hoists, air-compressor and 10 power drills. Property considered promising, but handicapped by poor transportation facilities, though a little high grade ore has been shipped. Property attached for debt, August, 1908, and company apparently in a bad way.

CERRO COPPER CO., LTD. **PERÚ.**

Office: 21 Ironmonger Lane, London, E. C., Eng. H. J. Page, secretary, Organized Oct. 27, 1900, under laws of Great Britain, with capitalization £101,000, shares £1 par; issued, £16,416. Has abandoned the copper property formerly held in the Cerro de Pasco district of Perú.

COMPAÑIA MINERA CERRO DE LA GLORIA. **CHILE.**

Office: Santiago de Chile. Mine office: Caochapoal, O'Higgins, Chile. Organized Nov. 28, 1906, under laws of Chile, with capitalization 2,160,000 pesos, shares 25,000 pesos par.

CERRO DEL COBRE MINING CO. **MEXICO.**

Office: care of Dr. C. D. Warner, Coldwater, Mich. Letter returned from former mine office, Alamos, Sonora, Mex. Geo. L. Beach, secretary and treasurer. Organized under laws of Arizona, with capitalization $10,000,000, shares $10 par. Lands, 435 acres, circa 9 miles from Alamos, having several shallow shafts bottomed in ore, mainly sulphide. Property has been worked on a small scale for some years, furnishing considerable fluxing ores for reduction of silver ores of the district, and also ore for production of a little copper used by natives for making domestic utensils. Test shipment of 100 tons returned circa 20% copper, 1.7 oz. silver and $4.03 gold per ton.

COMPAÑIA SOCAVONERA DEL CERRO DE PASCO. **PERÚ.**

Mine office: Cerro de Pasco, Junín, Perú. Organized 1906, under laws of Perú, for the purpose of completing sundry old tunnels at Cerro de Pasco, and working the highly argentiferous copper ores of the oxidized zone of the district.

SOCIEDAD CERRO DE PASCO. **PERÚ.**

Dead. Property taken over by Cerro de Pasco Mining Co. Formerly at Cerro de Pasco, Junín, Perú.

CERRO DE PASCO MINING CO. **PERÚ.**

Office: 5-15 Broad St., New York, N. Y. Peruvian general office: Lima, Perú. Mine office: Cerro de Pasco, Junín, Perú. Works office: La Fundicion, Tiñahuarca, Junín, Perú. Railway office: Oroya, Junín, Perú. Roscoe H. Channing, Jr., general manager; H. Esk Moller, treasurer; F. W. MacLennan, mine superintendent; S. J. Gormly, smelter superintendent; Frank Klepetko, consulting engineer. Organized June 6, 1902, under laws of New Jersey, with capitalization $10,000,000. Is closely connected with the Cerro de Pasco Investment Co. and the Cerro de Pasco Copper Co., and is controlled by Jas. B. Haggin, J. Pierpont Morgan, D. O. Mills, H. McK. Twombly and other wealthy residents of New York. Owns entire stock issue of the Cerro de Pasco Railway Co., and entire stock issue of Sociedad Minera Copay-Cocha.

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and entire stock issue, excepting founders' shares, is owned by Cerro de Pasco Investment Co.

Lands, 941 claims, and 70,000 acres miscellaneous lands, including copper claims in the Morococha and Yauli districts, and about 400 acres of land that includes three-fourths of the rich Cerro de Pasco district, with a smelter site and extensive coal tracts north of Cerro de Pasco.

Cerro de Pasco lies 14,300′ above sea-level, rendering physical labor very fatiguing. The population of the town is about 15,000. The surrounding country is bleak, and all food and supplies must be brought in from considerable distances. The year is divided into two periods, the wet and dry, the wet season being from November to April. The summers are not hot, owing to the great altitude, and the winters are not cold, owing to the low latitude. Snow and hail fall at any time, summer or winter, but rarely remain on the ground as long as 48 hours, even in winter. The fluctuation between mean summer and winter temperatures is about 20° Fahrenheit, only.

Silver was discovered at Cerro de Pasco A. D. 1630, and the production of the district, to the close of the Nineteenth Century, is estimated at 450,000,000 ounces, secured from about 40,000,000 tons of silver and copper ore, nearly all extracted by hand labor, and carried 3 to 6 miles on the backs of llamas, to primitive smelters, whence the silver bullion was transported, by llamas, 200 miles to Lima, until circa 1870, when a railroad was completed to Oroya. Formerly only the richest copper ores were worked, ore shipped ranging 25 to 40% in copper tenor, after careful hand selection.

Authorities disagree hopelessly as to the geology of the district, but in an area approximately one mile wide and nearly 2 miles in length, there is ore on nearly every claim, proving Cerro de Pasco one of the richest mineral fields of the globe. Ore bodies outcrop prominently, as crestones, or ridges, and carry gold, silver, copper, galena, zinc and cobalt. The oxidized zone carries considerable gold, running as high as 1 to 2 oz. per ton, occurring in rich but erratic chutes. The high silver values usually extend to about 100′ depth only, occasionally running up to thousands of ounces per ton, in decomposed quartz, followed by highly argentiferous copper ores, which, in turn, at a little greater depth, are succeeded by ores low in silver, but richer in copper, all of the copper ores being more or less argentiferous, being estimated to have averaged 15 to 35 oz. per ton in the old workings. Primary ores below the water level are bornite and chalcopyrite, associated with pyrite, tetrahedrite, arsenopyrite and sphalerite, containing little silver and only traces of gold. There are occasional veins of high grade silver-lead ores, and occasional sphalerite up to 8% in zinc tenor, but not enough to give any particular trouble. Practically all of the copper ores are bismuthiferous, hence refractory in reduction. The ores carry about 35% silica and 14 to 30% iron, the excess of silica requiring considerable limestone for fluxing.

The property of the Cerro de Pasco company includes hundreds of old mine workings, some opened to 300′ depth, though the majority are under 100′. The surface of the property shows scores of tajos, big pits resulting from the caving in of old open-cast workings, some of these being nearly or quite 300′ deep. The property lies in a basin, and the mines are very wet, especially below a depth of 400′, but unwatering by tunnel is impracticable, unless by a very long drainage tunnel. There have been three attempts at drainage tunnels, the only one of importance having been the Rumaillana tunnel, begun 1887, by Henry Meiggs, and discontinued, because of his death, at a distance of 1,000′. Meiggs held a concession from the Peruvian government for 25% of the gross values extracted by mines drained through this tunnel, which concession passed later to a company that cleaned out the old heading and drove the tunnel to a length of 1,466′. There is a possibility of

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litigation between the Cerro de Pasco and the owners of this tunnel, in case the work is completed.

The company has disregarded the hundreds of old workings, except as throwing light upon the geology of the district, and has opened a new mine, by 2 tunnels, of about 2 miles length each, and by 5 new shafts, these being the Diamante 2-compartment shaft of 400′; the Peña Blanca 2-compartment shaft of 400′; the Carmen 2-compartment shaft of 450′, and the Noruega 2-compartment shaft of 350′, all 4 shafts being connected. The 4-compartment Esperanza shaft is planned to do the hoisting for the entire mine, and is to have a steel headgear and electric hoists, with shops and power plant grouped near by. Waste is used for filling, timber being very expensive, and used only for lining shafts and timbering important tunnels. The mines are equipped with powerful pumps. Estimates of ore in sight vary from 2,000,000 to 75,000,000 tons, the latter figure being ridiculously excessive, and not countenanced by the management, but there unquestionably are large reserves of ore blocked out, these including first grade ore of 8 to 10% copper tenor, with good silver values; second grade ore of 5 to 6% copper tenor, with fair silver values, and low grade ore of uncertain copper tenor, though probably workable, in the main.

In addition to the regular mining work, considerable prospecting has been done, and many diamond drill borings have been made, adjoining the main tract of the Cerro de Pasco and in the adjoining coal fields.

The reduction works, at La Fundicion, near Tiñahuarca, 9 miles from the mines, are connected therewith by rail. All buildings are of steel frames, covered with corrugated iron. The plant treats a small quantity of custom ores, and has a sampling mill with crushers, rolls and chain-bucket elevators. The works are terraced throughout, permitting the handling of material by gravity, and are built on the unit plan, so that their capacity may be doubled, or, if desired, quadrupled, at later date.

The furnace building has twelve 2,000-ton flat bottomed steel ore-bins, with lining of double thickness of 2″ plank, being filled from railroad tracks above, and loading into charging cars run alongside. Charge cars are drawn by small locomotives, on a narrow-gauge track running on either side of each furnace, 2 cars constituting a charge. There are four 56x180″ water-jacket blast-furnaces, with brick-lined hearths and crucibles, discharging into five 16′ settlers. The furnaces, in October, 1908, were treating an aggregate of 600 tons of ore per day, but are of about 300 tons actual daily capacity each. Slag is granulated by running water. The smelter building has a steel stack, 220′ high and 20′ in diameter. There is one reverberatory furnace, and 5 additional reverberatories are to be in operation, early 1909. There are two 18′ six-hearth McDougal calcining furnaces, and 8 are to be added early 1909. It is also planned to build a new dust-flue, dust-chamber and a 240′ steel stack.

The converter department, in a separate building, has 4 stands, with twelve 84x180″ shells, and 3 stands are to be added, early 1909. The converter, of the upright pattern, is tilted hydraulically, and blister copper is poured into moulds on a low car under the converter stand, cars being shifted hydraulically. The converter slags pour into ladles, and thence into iron moulds, slags being crushed in 2 slag mills and discharged into bucket elevators, going to a storage bin on the feed-floor, for resmelting. The converter department has quartz mills for linings, and 2 large storage bins for material. Product of the converter is 99% blister copper, in cakes, shipped for refining to Baltimore.

The power plant includes a boiler-house with sixteen 250-h. p. Babcock & Willcox boilers, an engine-house having a 600-h. p. Nordberg cross-compound

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engine, direct-connected to a 440-kw. Westinghouse generator, two 475-h. p. Nordberg engines direct-connected to two 250-kw. generators, a 750-kw. Westinghouse alternator and dynamo, and 2 smaller dynamos furnishing electric power and light. There are 3 No. 11 Connersville blowers, driven by a Nordberg cross-compound engine, a large Nordberg air-compressor for converter blast, and an air-compressor for the pneumatic operation of furnace doors, etc. The power plant was practically duplicated, 1908, as a precaution against accidents.

Miscellaneous buildings at the works include an iron foundry with a 25-ton cupola and overhead electric traveling crane, patterns shops, 100x300' warehouse, machine shop, carpenter shop, smithy, laboratory, office building and dwellings for employes.

The altitude of the smelter is 14,300', and ores being refractory and labor inefficient, no little trouble was experienced in the earlier stages, but the difficulties encountered at the beginning have been overcome, gradually, and at the end of 1908 the works were giving fairly satisfactory service, with every prospect of still better work in 1909.

The company furnishes its own fuel, owning extensive beds of bituminous coal, of rather indifferent average quality, though with some coal of coking grade. The principal coal mines are located at Goyllarisquisca, Quishuarcancha and Vincuscancha. A 21-mile branch line of the railway terminates at Goyllarisquisca, the Vincuscancha coal mine being about midway, and it is proposed to install an aerial tram to connect with the Quishuarcancha, at present accessible only by wagons and pack animals. There are large reserves of coal of fair quality at Goyllarisquisca and Quishuarcancha, and production, at the end of 1908, was about 700 tons daily, of which 200 tons were used raw at the mines and on the railroad, 500 tons going to the coal washers near the smelter, the washed product being used for steam purposes and for coking. The coke plant, near the smelter, has seventy 75-ton beehive ovens, making a satisfactory coke for blast-furnace use, no coke being imported. The coal contains 50 to 60% fixed carbon, 20% volatile matter and about 13% ash, with considerable sulphur disseminated throughout. The company's brick plant has proven an important success, as imported brick of all kinds are very costly, and the local plant is turning out fire and silica brick of very fine quality, from clays found in the mines, and common building brick are made from a clay-pit near the Vincuscancha mine. This plant will begin the manufacture of tile and tile pipe, in 1909.

A limestone quarry, 12 miles from the works, furnishes fluxing material, and the company also has a silica quarry, for material required in lining converter shells.

The Cerro de Pasco railway, owned by the company, operates under a government concession, the main line of 83 miles running from Cerro de Pasco to Oroya, where connection is made with the Central Railway of Perú, which runs 130 miles to Callaó, the latter line being one of the most notable in the world, having cost $43,000,000, and gaining nearly 3 miles vertical elevation, reaching the highest altitude of any railroad on the globe, after surmounting almost incredible obstacles, having an average grade of 2.5%, with no less than 57 tunnels, including the Galera tunnel of 1 kilometer length, which cuts through a ridge of the Andes. The Cerro de Pasco railway has a 21-mile branch to the coal fields, and, with all spurs, sidings and yards, has about 125 miles of track, of standard gauge. The main line has an average grade of 1.5%, with a maximum grade of 3%, and cost upwards of $2,000,000. Equipment includes 13 locomotives, in addition to 6 light switching engines at the smelter, and 59 steel ore and coal gondolas, with a total of 247 forty-ton cars, rolling stock being of the best American manu-

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facture. The railroad is on a paying basis. The Peruvian government was said, 1908, to have awarded, to Albert McCune, a contract for the construction of the Cerro de Pasco & Ucayali railroad, to open a district supposed to be immensely rich in minerals.

The company has built expensive and thoroughly comfortable hotels, club-houses and dwellings for its employes, and has furnished facilities for riding and hunting, and in consequence no longer has difficulty in securing and retaining competent mining and smelting men, many of whom have their families with them. Although the altitude is high, any person of normal good health need have no fear of ability to live comfortably in the rarefied air of Cerro de Pasco. Wages range $2.50 to $4 per day for white labor, and 60 to 75 cents per day for native labor, the latter being tractable, and, for some purposes, fairly efficient. The company employs a total force of about 6,000 men.

The Cerro de Pasco undoubtedly is the most expensive copper proposition ever developed, and the total investment is said to be, to date, nearly $23,000,000. Production, 1906, was 3,389,787 lbs., and 1907 was 20,258,689 lbs. fine copper, while for 1908 the output was circa 30,000,000 lbs., and for 1909 should be nearly or quite 45,000,000 lbs. The management is experienced and capable, and its courage and financial resources have been demonstrated by the tremendous investment made. There were many discouragements met in the earlier stages, but in the main these have been overcome, one by one, and while there are some problems remaining, the progress already made warrants the expectation that all difficulties will be met and conquered. The property is one of vast possibilities, and the prediction of an ultimate annual production of 100,000,000 lbs. fine copper seems warranted, though some years will be required to reach this figure.

CERRO DE PASCO TUNNEL & MINING CO. **PERÚ.**

Office: 45 Wall St., New York, N. Y. Mine office: Cerro de Pasco, Junín, Perú. Eleanor Rawls-Reader, president and general manager; Chas. A. Neville, vice-president; H. H. Leahy, secretary and treasurer; preceding officers, A. B. Rawls-Reader, Fred Tate and S. G. Harris, directors; Carroll D. Galvin, consulting engineer; Jos. E. Chastaine, assistant secretary. Organized Aug. 8, 1902, under laws of Maine, with capitalization $2,000,000, shares $2 par, half in 7% cumulative preferred and half in common stock. Annual meeting, third Monday in January. Management paid a 7% dividend, 1905, on preferred stock, money for which probably came from stock sales. Controlled the Copper Basin Mining & Smelting Co., of Nevada, which lost its lands and is worthless, through ownership of majority of stock. Peruvian lands are 9 groups, area circa 2,000 acres, about half in the Yauli district and half in the Acari district, also the Rumaillana or Meiggs tunnel, in the Cerro de Pasco district. Tunnel, begun 1877, is 3 meters wide and 2.75 meters high, of 2,800 meters projected length, of which only about 270 meters were completed in 1900. Tunnel concessions carried rights to 20% of all mineral extracted by various owners of mines drained, and 40% of all mineral extracted by tunnel-owners. Company was promoted by Eleanor Rawls-Reader, who is largely exploited in the press, and at last accounts, Oct. 5, 1908, landlord was endeavoring to collect, by legal proceedings, $195 for 3 months arrears of rent. Is not regarded favorably.

MINA CERRO DO GARALDO. **BRAZIL.**

Mine office: Cacapava, Rio Grande do Sul, Brazil. Lands, 4 kilometers northeast of Cacapava, show ore outcropping at the summit of a steep hill, slightly developed by 6 very shallow shafts, bottomed in micha-schist impregnated with chalcocite.

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MINA CERRO MARTINO. **BRAZIL.**

Mine office: Cerro Martino, Rio Grande do Sul, Brazil. Property, located 140 kilometers from Rio Negro station, and 130 kilometers from Cachoeira, on the Uruguayana railway, shows conditions somewhat similar to those at the Camaquam mine, but melaphyr is much more in evidence, with much less conglomerate, latter shading into coarse sandstone, with dip of about 40°, veins crossing these at approximately right angles. Copper occurs mainly as chalcocite, with gangue of pyrite and heavy spar, assaying 17 to 25% copper.

CERRO MURIANO MINES, LTD. **SPAIN.**

Office: 9 Queen Street Place, London, E. C., Eng. Mine office: Manriques 9, Córdoba, Sevilla, Spain. Wm. Frecheville, chairman; John Taylor & Sons, managers; Richard Eshott Carr, agent; Henry F. Collins, superintendent; F. H. Williams, secretary; Jos. Tamblyn, mining captain. Organized May 7, 1903, under laws of Great Britain, and capitalization increased, 1905, to £225,000, shares £1 par. Debentures, £25,000, at 6%. Company holds a considerable share interest in the North Cerro Muriano Copper Mines, Ltd.

Lands, 314 hectares, in the districts of Córdoba and Obejo, held under perpetual lease from the State, also various leasehold tracts. Property shows sundry old mines, which were worked during the era of Roman domination, to a depth of at least 400′, notwithstanding their wetness. Property shows 6 large and several small fissure veins in micaceous schists, diorite and quartzite, carrying chalcopyrite and iron pyrites, with a gangue of calcite, quartz, clay and country rock. Veins have widths of 1′ to 40′, with following proven lengths: Calavera, 1,635′; Excelsior, 635′; Lorenzo, 4,575′; Isabel, 5,550′; Cerro Muriano, 8,500′. Some ore taken from old Roman workings has assayed 28 to 34% copper.

Main shafts are the Santa Victoria, bottomed in the footwall at 726′, and the San Rafael, 917′ deep, and very wet, which intersected the vein at depth of 870′. The San Rafael shaft, 300 meters from the Santa Victoria, shows a vein of 5 to 13 meters width, with better portions worked out by the Romans, in the upper part of the mine. The San Rafael has a Hawthorne-Davey Cornish pump, with 54″ high-pressure cylinder having a 96″ stroke, and 94″ low-pressure cylinder with a 16′ stroke, calculated to operate to a depth of 1,580′. The San Guillermo shaft, 300 meters from the San Rafael, suspended sinking at 42′ depth.

Surface equipment includes 3 hoists and a 10-drill Walker air-compressor. Mine is served by the Ferrocaril Andaluces. This is one of the largest and most interesting of the old Hispano-Roman mines, and was famous, before the Christian era, for the high quality of copper and brass produced from its ores, but was entirely idle for nearly 2,000 years, until reopened by the present owners. The mine employs circa 150 men, and shows reserves of about 25,000 tons of 4% ore, blocked out. A small smelter is being built.

COMPAÑIA MINERA CERRO VERDE, S. A. **MEXICO.**

Is the Mexican incorporation of the San Xavier Copper Co.

CERULEAN COPPER MINING CO. **WYOMING.**

Office: Rawlins, Wyo. Mine office: Copperton, Carbon Co., Wyo. O. T. Gilbert, president and general manager; H. O. Granberg, vice-president; Ole Granberg, secretary; G. O. Gilbert, treasurer; preceding officers and Henry L. Larsen, directors. Organized July 21, 1906, under laws of Wyoming, with capitalization $1,000,000, shares $1 par; issued, $631,000. Lands 6 claims, area 120 acres, patents applied for, in the Battle Lake district, showing contact veins between limestone and quartz, opened by seven 10′ pits and shafts of 30′, 48′ and 65′. Idle.

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SUCESION CERVERÓ. **CHILE.**

Mine offices: Los Marquis, La Ligua, Aconcagua, Chile, and Ñipa, La Ligua, Aconcagua, Chile. Works office: Cabildo, La Ligua, Aconcagua, Chile. The Padres and Fraguas mines adjoin the Marquis mine of Otto Harnecker, and are similar in characteristics of ores. Greatest vertical depth is 130 meters, with extreme length of horizontal workings of about 200 meters. The Mina Maria, at Los Mercedes, 16 kilometers from Cabildo, has a vein in granite, ranging up to 15′ in width, with strike of 50° West, and dip of 68°, carrying auriferous and cupriferous pyrite, with quartz gangue, ore averaging about 4% copper and 40 grams gold per ton. The Mina Montoya, opened 1855, has a 900′ tunnel, opening a 15′ vein in porphyry, carrying argentiferous sulphides with calcite gangue. The Ñipa properties, 16 kilometers from Cabildo, includes the Castillo, Quisco and Cuevas mines, having an extreme depth of 350 meters, with extreme length of horizontal workings of 800 meters. The mines at Los Marquis produce 6% ore and the Ñipa mines make a small production of selected ore averaging 25% copper, after discarding large quantities of ore of about 4% tenor, suitable for concentration later. Average of all ores treated is about 5% copper.

The smelter, at Cabildo, the terminal of the Calera & La Ligua railway, does a general custom business, about one-third of the ore smelted being produced by the mines of the firm. The old smelter had a number of small reverberatories, which have been replaced by 42″ and 48″ circular water-jacket blast-furnaces, making ejes of about 45% copper tenor, 10% of which carries 250 grams of silver and 75 grams gold per metric ton. Fuel is mainly English and German coke, with some domestic coal and wood, 1 ton of imported coke being required for smelting 8 tons of ore, slags averaging 0.4% copper. Employs circa 100 miners and 50 smeltermen, latter at average wages of 1.4 pesos daily. Production, 1903, was 923,458 lbs. fine copper.

CHAFFEE GOLD & COPPER MINING CO. **COLORADO & WYOMING.**

Mine offices: Black Hawk, Gilpin Co., Colo., and Tie Siding, Albany Co., Wyo. S. N. Cravens, president; G. W. Doverspike, vice-president; H. R. McClellan, secretary and treasurer. Organized September, 1901, with capitalization $100,000, shares 10 cents par. Said to be out of debt, but without funds. Lands, 5 acres, known as the Telephone claim, 1¼ miles from Black Hawk, opened by a 100′ tunnel, said to show a 6′ vein, also 80 acres of copper lands, undeveloped, near Tie Siding.

CHAINMAN CONSOLIDATED COPPER CO. **NEVADA.**

Office: 25 Broad St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. J. Berry, president and treasurer; L. A. Burleigh, clerk; W. N. McGill, general manager; Geo. E. Gunn, consulting engineer. Organized 1907, under laws of Maine, with capitalization $5,000,000, taking over property of the Chainman Mining & Electric Co. Was promoted by W. B. Thompson. Lands, apparently 6 claims, area circa 120 acres, mainly patented. Mine was opened, 1869, for gold, but values turned into copper in lower workings. Old mine has a 300′ shaft, with about ½ mile of workings, showing perhaps 200,000 tons of auriferous iron ore carrying some silver. There is an immense surface showing of iron oxides, carrying $1.50 to $10 gold per ton, which should be underlaid by large bodies of copper ore. Iron ore will be valuable for fluxing, especially as it contains fair average gold values. It is planned to abandon the old Chainman shaft, and 2 new shafts, the Chamberlain, 200′, and the Aultman, have been sunk. Has a 200-ton mill, with cyanide plant, but production of gold has been hampered by increasing copper values. Is a property of much promise.

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CHAINMAN MINING & ELECTRIC CO. **NEVADA.**

Dead. Succeeded, circa 1906, by Chainman Consolidated Copper Co. Formerly at Ely, White Pine Co., Nev.

COMPAÑIA BENEFICIADORA DE MINERALES DE CHALCHIHUITES, S. A. **MEXICO.**

Is the Mexican incorporation of the National Smelting Co. Theo. Montgomery, president; Adolfo Trauwitz, secretary; Paul W. Meyer, treasurer. Capitalization, 250,000 pesos, shares 50 pesos par.

CHALCHIHUITES MINES CO. **MEXICO.**

Office: 288 Garside St., Newark, N. J. Mine office: Chalchihuites, Zacatecas, Mex. Edw. H. Jones, president; C. C. Hamer, secretary; B. W. Farris, general manager. Lands, 192 hectares, including the San Nicholás mine, carrying ores of gold, silver, copper and lead. Is opened by shaft and equipped with steam power.

CHALLENGE MINE. **MICHIGAN.**

Owned by St. Mary's Mineral Land Co.

CHAMBERS MINE. **MONTANA.**

Owned by Washoe Copper Co.

CHAMPION COPPER CO. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Mill office: Redridge, Houghton Co., Mich. Wm. A. Paine, president; Chas. J. Paine, Jr., vice-president; preceding officers, Geo. P. Gardner, Chas. H. Paine, Nathaniel H. Stone, Hon. Richard Olney and Saml. L. Smith, directors; Frederic L. Stanwood, secretary and treasurer; F. W. Denton, general manager; John Jolly, underground superintendent; F. G. Coggin, mill superintendent; R. H. Leach, assistant mill superintendent; H. F. Mercer, chief engineer; M. J. Harrington, chief clerk; Richard Trevarrow, mining captain; W. E. Campbell, master mechanic; Mark Cunningham, superintendent motive power.

Organized December, 1899, under laws of Michigan, with capitalization $2,500,000, shares $10 par. Owns $44,000 stock of the Michigan Smelting Co. Entire stock issue is owned, in equal parts, by Copper Range Consolidated Co. and St. Mary's Mineral Land Co. Dividends have been as follows: $300,000 in 1903; $200,000 in 1904; $1,000,000 in 1905; $1,200,000 in 1906; $1,000,000 in 1907. Two dividends, of $1 each, were declared Apr. 24, 1908. Net earnings 1905, were $976,770.87 and 1907 were $909,883.88, in addition to expenditure of $446,373.81 for construction. Company ended 1907 with a surplus of $504,345.11.

Lands, 1,240 acres, being the south half of Section 30; west half and north half of northeast quarter and southwest quarter of northeast quarter of Section 31, Town 54 North, Range 34 West; southeast quarter of Section 25 and east half of Section 36, Town 54 North, Range 35 West, practically all on the mineral belt. Neighbors of the Champion are the Copper Range and Trimountain on the north, lands of St. Mary's company and Hussey, Howe & Co. on the east; Hussey-Howe lands and the Globe tract on the south, and Copper Range lands on the west. The tract gives a distance of 9,047′ on the strike of the lode, and at the present angle of dip, the deepest shaft could go down 18,950′, before reaching the company's boundary line on the west.

Development was begun in 1899, under direction of Dr. L. L. Hubbard, and 3 parallel amygdaloids were uncovered by trenching, one of which, the Baltic bed, showed phenomenal copper values. The two amygdaloids paralleling the Baltic lode show copper in sufficient quantities to render their future exploration advisable. A fourth amygdaloid, about 15′ wide, discovered 1901, east of the Baltic lode, carries heavy copper to a promising extent, and there also is a

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fissure vein of arsenical ore, apparently algodonite, near C shaft. The width of this vein at surface is slight, and mineral contents variable, but on the second level the fissure is 2′ wide and well mineralized.

The dip of the Baltic bed at the Champion is circa 70°, with about the same strike as at the Trimountain, rather than the exaggerated easterly trend noted at the Baltic mine. The bed runs 13′ to 45′ and averages 24′ width, carrying more epidote than at the Trimountain and Baltic. The surface of the tract is very hilly, but the overburden is less than is found either to the northward or southward. The stretches of lean ground in the mine are few, and the lode carries heavy copper in profusion, mostly in barrel size, but running up to masses of 10 tons in weight.

The Champion mine is developed by 4 shafts, numbered from north to south, with room for 3 additional shafts.

A shaft is merely a site, there being no development.

B shaft, the northernmost, is 1,835′ south of the Trimountain boundary, with collar 635′ above mean water datum of Lake Superior, and, Jan. 1, 1908, was 1,300′ deep.

C shaft, 1,050′ south of B, is 1,616′ above the lake and Jan. 1, 1908, was 1,300′ deep.

D shaft, 1,300′ south of C, is 631′ above the lake, and Jan. 1, 1908, was 1,400′ deep.

E shaft, 1,300′ south of B and 3,900′ north of the Globe boundary, was 1,475′ deep on Jan. 1, 1908. The third level of E shaft had been driven 3,000′ to the southward to the Globe mine, September, 1908.

F shaft, started 1,300′ south of B, was abandoned on account of treacherous overburden, but the Baltic bed was located, 1907, by diamond drill, at a new site, circa 1,800′ south of E, and 2,100′ north of the Globe boundary.

G shaft is merely a site for a shaft, near the Globe mine, on which no work has been done.

All of the shafts are connected on numerous levels, and the mine has about 11 miles of lateral workings. The Baltic lode shows so little poor ground in the Champion that it is probable that eventually nearly every level will be opened from end to end of the mine, giving the longest average drifts of any Lake Superior property. The only really poor ground in the mine was shown in E shaft, between the 3d and 4th levels, below which the mineralization is regular and satisfactory. The mine shows some stopes of phenomenal width and richness. Dry-walling is used extensively, greatly reducing the cost of timbering.

The shafts are practically duplicates in all essential particulars, having 40x50′ shaft-rockhouses, with 90-ton ore-bins, enlarged, 1908, by the Wisconsin Bridge & Iron Co. Equipment at each rockhouse includes a steam-hammer for heavy copper, and one 12x15″ rock crusher, taking everything hoisted from the mine, direct from chutes. Initial equipment at the 4 shafts included second-motion Nordberg hoists, good for about 1,500′ depth each, but all shafts have been equipped with new hoists, which are duplicates, these being first-motion Nordbergs with 24x60″ duplex cylinders and double conical drums of 14′ diameter, with capacity for two 3,000′ cables each, hoisting 6-ton skips. The engine-houses are of redstone, or mine rock with redstone trimmings, the boiler-houses adjoining having Bradley and Burt boilers, with coal trestles connecting. Water for boilers is furnished from a 12,000,000-gallon dam, 30′ from hardpan foundation to crest, with a cement core 5′ wide at the bottom and 2′ at the top, reinforced by rock.

Very extensive use is made of electric power on surface, and there are some underground electric pumps. The electric plant at F shaft has a 250-kw.

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General Electric generator, direct-connected to an Allis-Chalmers cross-compound vertical engine.

The main compressor building, at F shaft, of steel, has a 100-drill Nordberg quadruple expansion two-stage air-compressor, with capacity to compress 9,120 cubic feet of free air per minute to a pressure of 70 lbs. per inch. The compressor operates at a steam pressure of 280 lbs. and has a regenerative feed-water system. Power is furnished by three 250-h. p. Geary water-tube boilers. At B shaft is a 40-drill Ingersoll-Sergeant cross-compound two-stage air-compressor, with vertical receiver intercooler. The electric plant, with a 100-kw. generator, is in the main compressor building.

Buildings at the mine include a 60x145' machine-shop, of sandstone, with slate roof, having a traveling crane and trolley rail for the entire length, with a 30-h. p. electric motor. Adjoining the machine-shop is a 50x128' smithy, of redstone, having a trolley rail, for handling forgings, running the entire length of the shop. The machine-shop and smithy have railroad tracks, connecting with the Copper Range railroad. The 32x60' carpenter-shop is of wood, with iron siding and roof.

Miscellaneous structures include a good office building, 2 changing houses, warehouses, stables, 3 large boarding-houses and about 250 substantial dwellings, located in the attractive townsite of Painesdale, which, in addition to the company's buildings, has a fine schoolhouse, hotels and various business houses; also the Sarah Sargeant Paine memorial library, a handsome redstone structure, costing $30,000, erected by Wm. A. Paine as a memorial to his mother, which is much appreciated by the employes.

The water system, serving the mine and town jointly, has a 1,000,000-gallon electric pump, at Lake Perreault, 4½ miles distant, distributing water to the mains from a 200,000-gallon steel stand-pipe, on high ground, near the mine.

The company has an automatic telephone system, with about 40 instruments, connecting the principal buildings and a number of pump stations underground.

The stampmill, at Freda, on Lake Superior, 2 miles west of Redridge, is 215x354', of steel and concrete, built by the Wisconsin Bridge & Iron Co. The mill originally had 4 Nordberg stamps, each with a 15' concrete foundation, and an addition, built 1905, was used first for new crushing machinery, but 2 heads were added, 1908, in place of an experimental graded crushing plant using gyratory crushers instead of stamps, operated 2 years, which system was described in Vol. VII. The 4 heads in the original mill were cross-compounded June, 1903, but were changed back to simple heads in 1906. Theoretically the cross-compounding was an advantage, but practically the experiment was unsuccessful. If all four heads could be operated simultaneously and regularly, cross-compounding would effect a considerable saving in fuel cost, but in ordinary mill practice it is found preferable to have each stamping unit independent.

The wash for the heads has Hodge graduated adjustable-speed jigs, with plungers working simultaneously or alternately, in pairs, Woodbury jigs and Deister concentrating tables. Raggings are reground by Allis-Chalmers crushing rolls, having one roll in a fixed bearing and the other in a spring bearing. The preliminary discharge from the stamp-heads is treated on very large jigs, having 30x48" sieves, of punched steel, with ⅛" openings, installed in connection with the head. Experiments with settling tanks having proven successful, an extensive series of settlers has been installed, each head having 6 tanks, each 40' long, 9' deep and of "V" shape, 12' wide at the top and 6" wide at the bottom, slimes being drawn from spigots at the bottom to the concentrators. The flow of the water through the settling tanks does not

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exceed 6′ per minute. Tailings losses were about 0.28% copper, but the new settlers are expected to bring the losses down to 0.24%, or even less.

The mill is heated by hot water from a Green fuel economizer, piped at 300° to 350° F. to a steel-clad chamber, whence heated air is drawn into ducts by a Sturtevant blower, and distributed through the mills, water being pumped back to the economizers and thence fed to the boilers.

The steel boiler-house has four 200-h. p. Stirling boilers, 5 Dutch Oven Scotch marine boilers, and 2 Hawley down-draft furnaces. Automatic stokers were tried, but discarded. Coal is brought to the boilers by tram, and reduced to uniform size by a grinder, before feeding to the grates, and ashes are washed into the lake through a launder, by jets of water. Exhaust steam passes through dry condensers, thence to a hot-well, from which water is fed to the boilers. Power for the mill is supplied by a 500-h. p. Nordberg cross-compound engine, having 14″ and 32″ cylinders, with 30″ stroke, a 180-h. p. engine formerly used for the 4-head mill being held in reserve.

The 40x60′ steel pumphouse, with truss roof and traveling crane, has a 20,000,000-gallon Nordberg triple-expansion pump. Water for the mill and boilers comes from the lake through a 1,020′ tunnel, the shore end having a well with bottom 8′ lower than the lake level, this being the longest tunnel ever driven under Lake Superior. The intake crib has an area of 45 square feet, and, with a second crib, the tunnel could furnish water for 8 to 10 stamps. Water cost is less than 1½ cents per ton of rock stamped. Screens have been installed in the tunnel, obviating the trouble formerly caused by sand and wood pulp in the water.

The mill plant includes a machine-shop, carpenter-shop, smithy, warehouse, office, laboratory and about 20 dwellings. There is a water system, with mains and hydrants and a fire pump, and the works have a private telephone system.

The mine is working about 80 power drills, and about 1,200 men are employed at the mine and mill.

Production of fine copper has been as follows: 10,564,147 lbs. in 1903; 12,212,954 lbs. in 1904; 15,707,426 lbs. in 1905; 16,954,986 lbs. in 1906; 16,489,436 lbs. in 1907. Mineral returns are 30 to 33 lbs. per ton, assaying about 73% fine copper, equivalent to circa 23 lbs. fine copper per ton. Rock stamped, 1907, was 708,685 tons, and yield of refined copper was 23.25 lbs. per ton, or 1.16%, placing the Champion second only to the Wolverine among the amygdaloid mines of Lake Superior in richness of its rock. Cost per ton of rock treated, including taxes, was $1.78, and cost of finished copper, delivered, including taxes, was 9.05 cents per pound. The Champion is one of the largest and richest of Lake Superior mines, and has been admirably managed from the beginning. The mine has by no means reached its ultimate limit of output, and is capable, with the present mining and milling equipment, of producing nearly or quite 25,000,000 lbs. fine copper yearly.

CHAMPION COPPER MINING CO. IDAHO.

Mine office: Wallace, Idaho. Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Adam O'Donnell, president and manager. Lands, just east of the Park mine, on the southern slope of Stevens Peak, 4 miles south of Mullan, have 2 crosscut tunnels, longest 600′. Property is said to show a mineralized zone of 75′ to 100′ width, with a vein ranging up to 25′, carrying chalcopyrite and occasional bornite, assaying up to 30% copper, with an average of about 5%, with quartz and calcite gangue. Idle and apparently moribund.

CHAMPION GOLD & COPPER MINING CO.

Office: California Blk., Tacoma, Wash. Location of lands, if any, unknown. Apparently moribund.

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CHAMPION GROUP MINING CO. **CALIFORNIA.**

Mine office: Yreka, Siskiyou Co., Cal. Property is the Herzog ranch, just outside the city limits, held under bond and lease, from September, 1907, which is being explored for copper.

CHAMPION MINING CO. **IDAHO.**

Office: care of Edward R. Hall, president, Marquette Bldg., Chicago, Ills. C. T. Mixer, vice-president and manager; R. T. Badger, secretary and treasurer. Organized 1905, with capitalization $100,000, shares 10 cents par, to develop claims in the Alder Creek district of Custer county, Idaho. Presumably idle.

CHAMPLAIN MINING CO. **IDAHO.**

Dead. Formerly at Doniphan, Blaine Co., Idaho.

CHAMPION MINING & MILLING CO.

Dead. Was organized under laws of Colorado, with capitalization $2,000,000, shares $1 par. In advertisements claimed to have 19 claims, but failed to give location of property or names of officers, and the promise of dividends for January, 1906, was prima facie evidence of rottenness. Was promoted from 608 Heist Bldg., Kansas City, Mo., and advertising seemed suspiciously like that formerly done by Theo. Stegner, a crooked mining promoter and jail-bird who formerly infested Kansas City.

SOCIÉTÉ DES MINES ET USINES DE CUIVRE DE CHAÑARAL. **CHILE.**

Office: 26 Rue de Chateaudun, Paris, France. Mine office: Las Animas, Chañaral, Atacama, Chile. Eugene Renevey, chairman; preceding officer, E. Bethmont, M. Gergen, A. Gutais, J. Dellater and G. Renevey, directors. Organized July 17, 1906, under laws of France, with capitalization 6,000,000 francs, shares 500 francs par.

Property, bought November, 1906, of Besa y Ca., includes the Manto Verde group, Fronton, Descubridora and Andacollo mines.

The Manto Verde mine, at Los Pozos, 25 kilometers from Las Animas, has shafts of 80 to 120 meters depth, and has been worked horizontally for a length of approximately 300 meters. The mine has 2 parallel ore bodies in porphyry and syenite, with strike of nearly north and south, and dip of 53°, with an oxidized zone of 10 to 20 meters depth, succeeded by sulphide ores, in decomposed porphyry, with quartzose gangue, of 8 to 16 meters width, carrying 7 to 8% copper, the production of the mine averaging better than 7% in tenor. Ores are somewhat refractory, but the property is one of much merit.

The Mina Fronton, at Las Animas, is 550 meters deep, showing 2 parallel veins, in syenite, separated by 8 meters of porphyritic rock, quartz gangue and much limestone. Ore is pyritic, averaging 7 to 8% copper. In 1903, under former ownership, the Fronton and adjoining properties employed 120 men, producing circa 6,000 metric tons of 8% ore.

The Descubridora mine, which is the deepest in the department of Chañaral, is an old property, abandoned at depth of 650 meters.

There is a small concentrator, with steam power, at the Fronton mine.

Works include 2 smelters, at Chañaral, known as the old and new, the old smelter, of small capacity, having 2 old 50-ton water-jacket blast furnaces, in poor condition, and 6 reverberatory furnaces, each 18′ in length, with a trapiche. In 1903 the old smelter treated 6,021 metric tons of ore averaging 8.53% copper, producing ejes of 50.76% average copper tenor.

The new smelter has 4 reverberatory furnaces and a 100-ton water-jacket blast-furnace, with hot blast, 2 Connersville blowers, three 52-h. p. engines and an electric light plant. Slags from new smelter average 0.65% copper. The new smelter requires remodeling, which doubtless will be done by the present owners. Fuel is Australian coal, costing 21 pesos per ton. Water is scarce and must be reused. Railroads run into the new smelter over a wooden trestle. A comparison of reverberatories and blast-furnaces for 1903 showed 12,041 tons

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of ore smelted in reverberatories at an average cost of 14.21 pesos per metric ton, and 16,165 tons or ore smelted in blast-furnaces, at an average cost of 10.01 pesos per metric ton. Ore averages 5.5% copper, but losses in smelting, through fumes, dust and slag, aggregate 1.2% copper, giving a net extraction of only 4.43% copper by the old works.

Production, 1903, under former management, was 644,573 lbs. fine copper, but for first fourteen months, under present management, November, 1906 to December, 1907, inclusive, was circa 1,300 metric tons fine copper, and for first half 1908, company produced 102 to 120 metric tons fine copper monthly. Property is considered valuable and management good.

MINA LA CHAPARRITA. **SPAIN.**

Owned by Sociedad Nuestra Señora de la Salud.

CHARLEMONT COPPER CO. **MASSACHUSETTS.**

Dead. Formerly at Charlemont, Franklin Co., Mass.

CHARSLEY'S NATIVE STAR MINE. **AUSTRALIA.**

Office: Herberton, Queensland, Australia. Mine office: Orient Camp, Queensland, Australia. E. C. Wright, secretary; T. Bermingham, mine manager. Employed 13 men, on development work, in 1907.

CHARTER OAK COPPER MINES, LTD. **BRITISH COLUMBIA.**

Office: 16 Victoria St., London, S. W., Eng. Sir H. Seton-Karr, chairman; T. Toten Willcox, secretary. Organized June 22, 1898, under laws of Great Britain, with capitalization £40,000, shares £1 par; issued, £28,957. Lands are 2 claims in British Columbia, and company sold 89 acres, in Carbon county, Wyoming, 1908, to Copper Bar Mining Co. Idle for many years.

CHASE CREEK COPPER CO. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Clarence K. McCornick, president; H. G. Smith, treasurer; S. S. Campbell, manager; I. N. Stevens, superintendent. Capitalization $5,000,000. Lands, 52 claims, area 1,040 acres, circa 8 miles west of Clifton, having a 1,750′ tunnel, 6x8′, on lands adjoining the Longfellow mine, cutting the Longfellow ore body, of concentrating grade, at a distance of 493′, having a back of about 900′, showing low grade sulphide copper ore. Tunnel practically reaches the Coronado railroad, permitting advantageous shipments. Property considered promising.

CHATHAM COPPER CO. **NEW MEXICO.**

Dead. Formerly at Silver City, Grant Co., N. M. Described Vol. VI.

CHATTERTON MINING CO. **COLORADO & WYOMING.**

Office 1101 Fisher Bldg., Chicago, Ills. Mine office: Pearl, Larimer Co., Colo. Was controlled, through stock ownership, by the National Mining & Milling Co., which moved from same office and left no forwarding address. Lands, 7 claims, area 125 acres, known as the Kurtz-Chatterton mine, in the Upper Platte district, opened by shafts of 30′, 35′ and 38′, and a 1,750′ cross-cut tunnel, said to show 7 veins of low grade sulphide ore traversing granite. Widest vein, 7′, is said to have given average assay of about 5% copper, with a trace of gold, ore being well adapted to concentration. Has a 5-stamp mill and a 50-ton concentrator. Idle for several years. Is not regarded favorably.

CHATTERTON MINING CO. **MEXICO.**

Mine office: Tapalpa, Sayula, Jalisco, Mex. Samuel C. Brown, general manager. Mine, known as the San Antonio and extensions, said to have been bought for $100,000, carries auriferous copper ore with values mainly in gold, and has been a small producer in the past. Has a 10-stamp mill and concentrator.

CHAUTAUQUA MINING CO. **CALIFORNIA.**

Dead. Formerly at Manvel, San Bernardino Co., Cal.

CHELAN CONSOLIDATED COPPER CO. **WASHINGTON.**

Office: 180 Broadway, N. Y. Mine office: Chelan, Chelan Co., Wash. Prof.

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Thos. B. Stillman, vice-president; Thos. J. Higgins, secretary and treasurer; preceding officers, M. L. Blackburn and H. L. Fox, directors; M. J. Corcoran, assistant secretary and treasurer. Organized under laws of Washington, with capitalization $12,000,000, shares $12 par.

Lands, 125 claims, area circa 2,500 acres, including 58 claims taken over from the North Star Mining Co., on Red Mountain, and 14 claims, area 280 acres, at Index, Snohomish Co., Wash. Property was advertised by company as 101 producing mines, which was untrue, and must have been known to be untrue when the statement was made. Nearest railroad point is Leavenworth, 48 miles southeast of Red Mountain, with a fair wagon road connecting.

The Index property, lying between the Ethel and Bunker Hill-Sullivan mines, has a 6′ vein, opened by tunnels of 600′ and 700′, with about 2,000′ of workings, showing bornite and chalcopyrite, claimed to carry average values of 10% copper, which is an overestimate, with small silver and lead values.

Company advertised, 1906, that there was no question that it would soon be producing and shipping no less than 1,000 tons of ore daily, and would pay 60 to 80% dividends annually, which statements must have been prompted by ignorance, or intent to deceive. Officers are said to be men of good standing, and the property is considered of some promise, but the company is regarded with suspicion, because of the ample evidence that some of its officers were utterly untruthful in the promotion.

CHELAN COPPER CO. **WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. Said to own the Texas Jack copper claims, in Upper Horseshoe basin, Washington. Vein is claimed to be 30′ between walls, in places, with a paystreak of about 20″, carrying copper and silver values. Idle and apparently moribund.

CHELAN TRANSPORTATION & SMELTING CO. **WASHINGTON.**

Dead. Formerly at Chelan, Chelan Co., Wash. Described Vol. VI.

CHEMAINUS COPPER MINES, LTD. **BRITISH COLUMBIA.**

Offices: 8 Broad Street Ave., London, E. C., Eng., and Vancouver, B. C. Mine office: Ladysmith, Vancouver Island, B. C. Samuel Erb, president; Chas. Erb, manager; preceding officers, C. J. Chapman, Robt. Larchin and Foster Collins, directors; A. Hebden, London secretary; Robt. McCracken, Vancouver secretary; Henry Cecil, superintendent. Organized under laws of Great Britain, with capitalization £200,000, shares £1 par. Lands, 241 acres, 2 miles from Esquimault & Nanaimo railway, known as the Victoria group, in the Bright district, well timbered and having a 200′ waterfall available for delevopment of power. Mine, opened by tunnel, has about 3,000′ of workings, and has been tested by shallow pits and trenches, showing 3 fissure veins carrying 2 to 5% copper, with a narrow paystreak of chalcocite and bornite ranging up to 35% in copper tenor, high grade ores being both auriferous and argentiferous.

CHEMUNG COPPER CO. **NEW MEXICO.**

Office: Wolvin Bldg., Duluth, Minn Mine office: Tyrone, Grant Co.; N. M. I. L. Merrill, managing director; preceding officer, John C. Oliver, Capt. Jas. Hoatson, T. J. Crump, C. D. Frazer, Chester A. Congdon and Geo. E. Tener, directors. Organized May, 1907, under laws of Minnesota, with capitalization $3,000,000, shares $10 par, as successor of Tyrone Development Co.. Levied a $1 assessment Sept. 1, 1908.

Lands, 3 groups, near the Burro Mountain, circa 12 miles southwest of Silver City, including the Burro Chief group, area 237 acres, with a millsite in Boston Gulch, near the mine; the Mutual group, 16 claims, area 247 acres, and the Huston group, 24 claims, area 469 acres, giving total holdings of 55 claims, area 953 acres. Mine is opened by 6 shafts, all in ore, 3 being upwards of 300′ deep each, No. 2 being 500′ in depth, mine having circa 3 miles of workings, developing approximately 1,000,000 tons of ore, of 2.5 to 3% average

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copper tenor, with a small amount of high grade ore of 6 to 20% copper tenor.

Equipment includes a powerful pump, boilers, engines and air-compressors, and a 1,000-ton concentrator is planned, with the expectation of putting about 7 tons into one. Company employs circa 100 men, and management is excellent. Property is of much promise, and apparently should make a big low grade mine.

CHENIUS FALLS COPPER MINING CO. **WASHINGTON.**

Mine office: Fairfax, Pierce Co., Wash. Organized July, 1902, with capitalization $1,000,000. Lands, 2 claims, on the Chenius river, circa 7 miles from Fairfax. Idle for some years.

CHEROKEE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

CHERRY CREEK MINES CO. **ARIZONA.**

Mine office: Cherry, Yavapai Co., Ariz. H. A. Ingalls, superintendent. Main shaft, 115′, shows a vein with a 3′ paystreak giving assays of about 12.5% copper, 4 oz. silver and $9.60 gold per ton.

CHESTATEE MINE. **GEORGIA.**

Mine office: Villa Rica, Carroll Co., Ga. Property, 6 miles from Villa Rica, has a bedded vein of cupriferous pyrite of 22′ to 30′ width, with paystreaks on either wall, outcrops being traceable circa 2,000′. Ore is said to average 3%, but probably averages about 1.5% in copper tenor only. Idle some years.

CHESTERFIELD COPPER CO. **ARIZONA.**

Office: 1001 Chestnut St., Philadelphia, Pa. Mine office: Tucson, Pima Co., Arizona. C. W. Savery, president; W. C. Lloyd, secretary and treasurer; Col. Thos. Hughes, vice-president and general manager; Thos. Hughes, Jr., superintendent; preceding officers and I. W. Thompson, directors. Organized April, 1907, under laws of Arizona, with capitalization $3,500,000, shares $1 par.

Lands, 22 claims, area 440 acres, including the Tiger and Crown King groups, in the Pima district, 25 miles from the Twin Buttes railroad. Property has an 18″ vein of massive argentiferous galena, with a 2-compartment 80′ shaft and 10 pits showing copper sulphides.

CHETICAMP COPPER CO., LTD. **NOVA SCOTIA.**

Office: 37 Sackville St., Halifax, N. S. Mine office: Cheticamp, Inverness Co., N. S. Edward Staris, president; John W. Regan, secretary and treasurer; Milton V. Grandin, superintendent; W. H. Strachan, auditor. Organized May, 1904, under laws of Nova Scotia, with capitalization $3,000,000, shares $1 par, as a merger of the Eastern National Copper Co., Ltd. and three other corporations.

Lands, 950 acres, also a 200-acre mill and smelter site, 1,000 acres timber land, and 200 acres water frontage, with a government license for exploring and locating mines on 50 square miles. Lands are freehold and paid for.

Property shows a mineralized zone, in micaceous schist, of circa 350′ width, traceable 1½ miles, carrying 4 ore bodies, of which 3 are developed by a 200′ shaft and by tunnels of 25′, 35′, and 115′, claimed by company to show 250,000 tons of exclusively sulphide ore, averaging 2.5 to 3.5% copper, 18% lead, 30 oz. silver and $2 to $30 gold per ton. Nearest railroad is 38 miles, but mine is 5 to 6 miles only from tidewater. Property considered promising, though estimates of tonnage and values are excessive.

CHETKO COPPER CO. **OREGON.**

Office: Ashland, Ore. Mine office: Kerby, Josephine Co., Ore. C. W. Evans, president and general manager; C. C. Hicks, vice-president and superintendent; A. E. Shepard, secretary and treasurer; J. M. Keith, mine superintendent. Organized, Aug. 10, 1905, under laws of Arizona, with capitalization $1,000,000, shares, $1 par; issued, $730,516.

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Lands, 36 claims, area 720 acres, fairly timbered, and 2 water rights, all in Curry county, Oregon. Property shows 8 ore bodies, with 2 under development, one reported by company as of 240′ average width, traceable 1¼ miles, carrying native copper in schist, also covellite, bornite and chalcopyrite, reported by company as of 9% average copper tenor, with $4.75 gold per ton. Development is by shafts of 45′, 34′ and 80′, and by 6 tunnels, of 30′ to 230′ length, with 969′ of workings, estimated by company to show 600,000 tons of ore, with 115,000 tons blocked out for stoping, which figures seem high. Employs 6 to 20 men. Company plans continuous development by tunnel, installing an air-compressor and building a 22-mile electric line from the mines to Chetko Harbor, on the Pacific, which seems the only available outlet, as the lands are about 70 miles from Grants Pass, the nearest railroad point.

CHEWELAH COPPER CO. **WASHINGTON.**

Office: Colville, Wash. Mine office: Chewelah, Stevens Co., Wash. F. A. Savage, president; F. H. McDermott, vice-president; L. E. Jesseph, secretary; B. F. Hammond, treasurer; Benj. Bramley, manager. Organized 1907, under laws of Washington, with capitalization $1,000,000, shares $1 par.

CHEWELAH COPPER KING MINING CO. **WASHINGTON.**

Office: 115 Wall St., Spokane, Wash. Mine office: Chewelah, Stevens Co., Wash. J. Grier Long, president; H. H. Hebart, vice-president; S. P. Domer, secretary and treasurer; preceding officers, J. W. McCabe and Walter G. Merryweather, directors; John M. Long, general manager; Geo. H. Miller, mine superintendent. Organized 1893, under laws of Washington, with capitalization $100,000, shares 10 cents par; issued, $797,000. Bonds, $30,000 authorized, at $8%; issued, $5,390.

Lands, 5 claims, area 100 acres, also an 8-acre millsite and 82 acres miscellaneous lands, showing 3 ore bodies, 2 of which have been developed by a 1,400′ main tunnel with circa 2,000′ of workings, showing a 30′ to 40′ vein carrying auriferous and argentiferous copper sulphides, of about 2.5 to 3% copper tenor and 6 to 12 oz. silver per ton, with small gold values. Transported ore, when working, to Chewelah, 4 miles, by 140-h. p. traction engine, hauling 5 to 10-ton loads, but plans a railroad spur and tram-line. Production, 1907, reported by company as 5,000 tons of ore, which probably carried about 250,000 lbs. fine copper. Suspended operations November, 1907, on account of financial depression. Some of claims are said to have been jumped, 1907. Management stands well and property is considered promising, but company lacks cash.

CHEWELAH COPPER MINING & SMELTING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. W. H. Browlow, president and general manager. Lands, 7 claims, 2 fractional, known as the Alberta group, opened by 60′ and 100′ incline shafts, in sulphide ore averaging circa 2.5% copper, 2 oz. silver and $5 gold per ton. Mine is wet. Has a 250-h. p. boiler and an air-compressor. Plans sinking shafts to 500′ depth.

CHIAPAS MINING CO., LTD. **MEXICO.**

Dead. Voluntarily liquidated, August, 1904. Formerly at Salto de Agua, Chiapas, Mex. Described Vol. V.

CHIAPAS ZONE EXPLORATION CO., LTD. **MEXICO.**

Dead. Formerly at Pichucalco, Chiapas, Mex.

CHICAGO-ALGOMA NICKEL CO. **ONTARIO.**

Dead. Formerly at Sudbury, Algoma, Ont.

CHICAGO-ALTA MINE. **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Was developing by tunnel, early 1908.

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CHICAGO-BRITISH COLUMBIA MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Greenwood, Boundary district, B. C. Described Vol. VI.

CHICAGO COPPER CO. **COLORADO.**

Mine office: Salida, Chaffee Co., Colo. Chas. Peck, manager, at last accounts. Lands, 7 claims, showing ore said to give good assays. Idle.

CHICAGO COPPER MINING CO. **NEW MEXICO.**

Mine office: Estey, Socorro Co., N. M. E. G. Rafferty, president, treasurer and general manager. Ira Chase, vice-president; T. C. Fenton, secretary. Organized Jan. 31, 1906, under laws of New Mexico, with capitalization $1,000,000, shares $100 par. Lands, 22 unpatented claims, in the Oscuro Mountains, 18 miles from nearest railroad, and sundry real estate in the town of Oscuro. Former owners shipped several carloads of ore said to have returned $270 per ton.

CHICAGO COPPER REFINING CO. **ILLINOIS.**

Office: 310-138 Jackson Blvd., Chicago, Ills. Works office: Blue Island, Cook Co., Ills. W. G. Coolidge, president; F. A. Simmons, secretary; C. R. Foster, superintendent; Winthrop Coolidge, metallurgical superintendent. Property is a refinery, with small smelter of 40 tons daily capacity, treating miscellaneous pig copper and by-products, making a specialty of copper mattes containing platinum, palladium and other rare metals. Has an electrolytic refinery with 100 tanks and two 60-kw. generators. Employs circa 100 men.

CHICAGO DIXIE MINING CO. **NEVADA.**

Office: 81 Clark St., Chicago, Ills. Mine office: Letter returned unclaimed from former mine office, Fallon, Churchill Co., Nev. Frank E. Wire, president; H. R. Adams, first vice-president; H. L. Knott, second vice-president; Chas. Kreiss, secretary; Geo. V. Clementi, treasurer; R. W. Packard, superintendent. Organized Aug. 5, 1907, under laws of Nevada, with capitalization $2,000,000, shares $1 par. Was promoted by the Chicago Promotion & Brokerage Co. Lands, 440 acres, in the Silver Mountains, about 60 miles from Fallon, having a 50′ shaft and short tunnel, showing ore assaying up to 3.83% copper, with fair gold and silver values. Idle.

CHICAGO & KOOTENAY MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Nelson, Kootenay district, B. C.

CHICAGO-LA SAL GOLD & COPPER CO. **UTAH.**

Dead. Formerly at La Sal, Grand Co., Utah.

CHICAGO-LA TOUCHE MINING & POWER CO. **ALASKA.**

Office: 1 Board of Trade, Chicago, Ills. Mine office: Latouche, Latouche Island, Alaska. Robert Prindle, president; Walter Hitch, vice-president and treasurer; Wm. E. O'Neil, secretary. Organized April, 1907, under laws of Maine, with capitalization $1,500,000. Property is 520 acres, carrying good water-rights, held under option, developed by about 900′ of tunnels. Employs about 20 men. Management considered good.

CHICAGO-MEXICAN CONSOLIDATED MINING CO. **MEXICO.**

Dead. Formerly at Cusihuiriáchic, Iturbide, Chihuahua, Mex.

CHICAGO & MILWAUKEE COPPER MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho

CHICAGO MINING & MILLING CO. **UTAH.**

Office: care of Fred T. McGurrin, secretary, Salt Lake City, Utah. Thos. Keeley, president. Organized 1904, with capitalization $150,000, shares $1 par. Lands include the Wild Bill group, in Beaver county, Utah. Idle.

CHICAGO NICKEL CO. **ONTARIO.**

Mine office: Worthington, Algoma, Ont. Lands are sundry prospects in Drury township, showing nickel-copper ores. Idle and apparently moribund.

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CHICAGO & PATAGONIA COPPER & GOLD MINING CO. **ARIZONA.**

Office: 97 Clark St., Chicago, Ills. Mine office: Nogales, Santa Cruz Co., Ariz. J. T. Brickwood, general manager. Organized January, 1904, with capitalization $250,000. Lands, known as the Old Soldier group, on the western slope of the Patagonia Mountains, east of the Santa Cruz river, have several shafts, deepest circa 225′, with about 1,000′ of workings.

CHICAGO-UTAH COPPER MINING CO. **UTAH.**

Mine office: Morgan, Morgan Co., Utah. Lands, 7 miles southeast of Morgan, in the northern Wasatch Mountains, slightly developed, are said to show, at depth of about 100′, ore assaying 20% copper and 20 oz. silver per ton.

CHICAGO-VENTURE MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Robt. H. Young, president and general manager; S. A. McCoy, secretary and treasurer. Organized 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, patented, area 100 acres, showing 2 fissure veins in limestone, near a grano-diorite contact, of which one, averaging 15′ width, is developed by shafts of 60′ and 200′, and tunnels of 50′ and 60′. Idle since circa 1904, and apparently moribund.

CHICKAGAMOO MINING CO. **QUEBEC.**

Mine office: Roberval, Chicoutimi Co., Que. Peter McKenzie, general manager. Lands, apparently undeveloped, are in the Lake St. John region, about 165 miles north of Roberval, the nearest railroad point. Presumably idle.

CHICKAMUN COPPER-GOLD MINING CO. **WASHINGTON.**

Dead. Was merged in New Century Exploration & Investment Co. Formerly at Darrington, Snohomish Co., Wash.

CHIHUAHUA COPPER CO. **MEXICO.**

Office: 267 Central St., Lowell, Mass. Mine office: Moctezuma, Bravos, Chihuahua, Mex. C. M. Dickey, president; Joseph Jackson, vice-president; Clarence W. Hoyt, secretary and treasurer; Morris B. Parker, superintendent. Organized Nov. 9, 1905, under laws of Maine, with capitalization $600,000, shares $1 par. Annual meeting, second Tuesday in November.

Lands, 100 hectares, in the Sierra Mojena, 20 miles west of Moctezuma, showing numerous contact veins between limestone and porphyry, of which 4, undergoing development, range 2′ to 40′ in width, giving average assays of 8% copper, 3 oz. silver and $1 gold per ton, from cuprite, malachite, chalcopyrite and occasional chrysocolla. Has several shallow shafts, deepest 75′, and 9 short tunnels, longest 120′, with 650′ of workings, estimated to show 2,500 tons of ore. Has a 25-h. p. hoist, good for 500′, small Gardner air-compressor, and necessary mine building. Property was a small producer in the past, but was tied up by litigation for some time, before secured by present owners. Company shipped sufficient ore, in the first quarter of 1906, to pay for the small machinery plant on hand, and all development work. Management and property are regarded favorably.

CHIHUAHUA COPPER MINING CO. **MEXICO.**

Office: Bearinger Bldg., Saginaw, Mich. Operating office: Apartado 299, Chihuahua, Mex. Mine office: Santa Barbara, Hidalgo, Chihuahua, Mex. B. W. McCausland, president; Ross D. McCausland, vice-president and general manager; Norman Rupp, secretary; E. G. Rust, treasurer; preceding officers, F. G. Palmerton, Geo. W. McCausland and F. R. Messinger, directors; Roy T. Chapman, superintendent; E. N. Funston, mill superintendent; Sidney S. Lang, engineer. Organized 1907, under laws of Arizona, with capitalization $1,500,000, shares $10 par; issued, $96,900. Cash on hand, Aug. 15, 1906, was circa $50,000, with liabilities of circa $10,000. Annual meeting, third Tuesday in February.

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Lands, 104 hectares, in the Chorreros, Santa Barbara and Carizalillo districts of Chihuahua. Property was said to include the Justicia y Anexas, in the Chorreros Mountains, bought of Madero Hermanos for 40,000 pesos, but it was reported, April, 1908, that bond on the Justicia y Anexas had been forfeited, after 2 payments. Properties show 8 ore bodies, of which 3, under development, are reported as 3′ to 8′ wide and traceable circa 4 miles, carrying chalcopyrite, bornite and nickeliferous pyrrhotite, averaging 5% copper, 5 oz. silver and 0.6% nickel. The Justicia mine has a 200′ shaft, other shafts being the Sidney, 100′; Bronces, 400′, and the Carizalillo shafts of 75′ and 100′, mine having circa 3,500′ of workings, estimated to show 100,000 tons of ore, with 75,000 tons blocked out.

The Hathaway mine, 18 miles south of Santo Domingo and 12 miles south of Falomir station, on the Kansas City, Mexico & Orient Ry., has 2 small but persistent veins, carrying rich copper sulphides.

Los Bronces mine, at Santa Barbara, in the Chorreros Mountains, has no equipment.

Equipment includes a 25-h. p. steam plant, a 120-h. p. Otto suction gas producer, and two 60-h. p. Otto gas engines, having a fuel consumption of less than one pound per brake h. p.-hour. Equipment includes 25-h. p. and 35-h. p. hoists and an 8-drill air-compressor.

Buildings include a stone carpenter shop, stone smithy, power plant, store, stable, warehouse, office and 40 dwellings.

The concentrator, of about 30 tons daily capacity, built of stone and timber, has a No. 4 Blake crusher and 2 jigs, producing concentrates of about 20% copper tenor. It is planned to double the capacity.

The Hathaway mine has old smelter, of antiquated design and equipment, of no value for modern uses.

Company plans sinking 3 new shafts, deepening present shafts, driving a tunnel, building a power plant and building a new concentrator and possibly a small smelter. In August, 1908, was producing circa 16 tons daily of concentrates of 25% copper tenor, and expected to reach a daily output of about 40 tons daily by 1909. Property is considered good and management seems efficient.

CHILCAT GOLD & COPPER CO. **ALASKA.**

Mine office: Haines, Alaska. Lands, 168 claims, on the Big Salmon river. Presumably idle.

J. K. CHILD & CO., LTD. **BOLIVIA.**

Office: 33 Drury Bldg., Liverpool, Eng. Mine office: Coro Coro, La Paz, Bolivia. J. L. Barber, chairman; R. D. Barber, mine manager; Thos. S. Hancock, secretary. Organized Nov. 3, 1905, under laws of Great Britain, with capitalization £70,000, shares £1 par, fully issued, succeeding Juan K. Child y Compañía. Also is organized under laws of Bolivia, with capitalization 150,000 bolivars. Mine, known as the Vizcachani, is 270 meters deep, carrying native copper in conglomerate strata. Has a steam plant and modern machinery. The mineral carrying native copper is dressed to barilla de cobre of about 80% average copper tenor, production of barilla being 25 to 30 quintals daily, produced at an average cost of 12.43 bolivars per quintal. Production, 1907, was circa 700,000 lbs. fine copper. Employs 250 men.

SOCIEDAD UNIÓN MINERA CHILENA. **CHILE.**

Mine office: Cobija, Tocopilla, Antofagasta, Chile. Lands, 5 hectares, including the Condesa and Unión mines. Presumably idle.

SOCIEDAD CHILENA DE FUNDICIONES. **CHILE.**

Mine office: Tamaya, Ovalle, Coquimbo, Chile. Works offices: Guayacán, Coquimbo, Chile, and Tongoy, Ovalle, Coquimbo, Chile. The Tamaya mines,

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opened circa 1860, are the principal cré producers. Company also has mines at Punitaqui and La Laja, in the province of Coquimbo. Has 2 smelters, the Fundicion Guayacan, which is one of the oldest copper reduction plants in Chile, having 20 very small calcining furnaces and 14 very small reverberatory furnaces, 4 of latter being used for casting ejes, 8 for bars and 2 for ingots, ejes averaging 50%, bars 97% and ingots 99.5% copper tenor, which may be considered excellent practice for so antiquated a plant, especially as slags average only 0.4% copper. Fuel, 1903, was 25,000 metric tons of Chilean coal, from Lebu, and 5,000 tons of Australian coke. Employs 350 men, at average wages of 1.2 pesos daily. Smelter production, 1903, was ejes carrying 9,695,090 kilograms fine copper.

The Fundicion Tongoy has 2 reverberatory smelting furnaces and 5 calcining furnaces, producing ejes averaging 57% and Chile bars averaging 97% copper, slags running about 0.5%, fuel being local coal and imported coke, ores treated averaging 15.4% copper tenor, with slag losses of 0.5%. Employs circa 50 men, at average wages of 1.2 pesos daily. In 1903 produced 1,177,000 kilograms fine copper, at estimated smelter cost of 16.3 pesos per metric ton.

Production, 1903, secured mainly from custom ores, was 23,968,609 lbs. fine copper.

CHILI COPPER CO., LTD. **CHILE.**

Registered in Guernsey, March 4, 1905, with capitalization £400,000, shares £1 par. Office and location unknown. Regarded with suspicion.

CHILI COPPER SULPHATE SYNDICATE, LTD. **CHILE.**

Office: 101 Leadenhall St., London, E. C., Eng. J. E. G. Hadath, secretary. Copper lands in Chile were sold to Copaquire Copper Sulphate Co., Ltd.

SOCIÉTÉ CHILIENNE. **BOLIVIA.**

Mine office: Coro Coro, La Paz, Bolivia. Operates mines of native copper opened in conglomerate strata.

CHILLAGOE BLOCKS, N. L. **AUSTRALIA.**

Dead. Formerly at Herberton, Cardwell Co., Queensland, Australia.

CHILLAGOE COMPANY, LTD. **AUSTRALIA.**

Office: 39 Queen St., Melbourne, Australia. British office: Palmerston House, London, E. C., Eng. Mine and works office: Chillagoe, Lynd Co., Queensland, Australia. J. S. Reid, chairman; Harvey Patterson, vice-chairman; C. L. Hewitt, secretary; Edwin Habben, London secretary; E. A. Whitbery, consulting engineer; Peter Branden, mine manager; J. Horsburgh, smelter superintendent; Fred Back, railway superintendent; W. A. F. Davies and E. J. J. Rodda, mine superintendents.

Organized June 16, 1898, under laws of Victoria, as Chillagoe Proprietary, Ltd.; reorganized as Chillagoe Railway & Mines, Ltd.; reconstructed, 1902, as New Chillagoe Railway & Mines, Ltd., and reconstructed for third time, June 5, 1905, under laws of Queensland, under present title, with capitalization £350,000, shares 10s. par; 9s. paid in. Debentures, £500,000, at 5%, issued by New Chillagoe Railway & Mines, Ltd., registered February, 1902. Debentures were issued at 6%, but holders agreed to permanently reduce interest rate to 5%, except in years when shareholders have been paid dividends to exceed 1s. per share. Owns 75,000 shares, of 5s. par, in the Mungana (Chillagoe) Mining Co., Ltd., which was organized by the predecessor of the Chillagoe Co., Ltd., March, 1901. For fiscal year ending June 30, 1908, receipts were £270,276, with expenditures of £212,375. Quick assets were £240,275, and liabilities were £225,394.

Lands, 1,863 acres, mainly held under special act of the Queensland Parliament, also an 80-acre smelter site and miscellaneous lands giving total holdings of 2,935 acres, in the Walsh & Tinaroo district. Mineral concessions include 9

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groups, with 70 leases, expiring Jan. 1, 1948, held at annual rental of £1 per acre, with exemption from labor conditions, also 6 ordinary leases.

Principal mines are the Ruddygore, Zillmanton, Penzance and Queenslander or Morrison. The district shows Silurian limestone, sandstone and conglomerates, with various fissure veins and contact deposits, carrying auriferous copper ores giving average returns of 3.5% copper and 2 oz. silver per ton, with traces of gold, and lead ores ranging in tenor about 20% lead, 8% zinc and 2 oz. silver per long ton.

The Ruddygore, which is the principal mine, shows a large ore body, opened by shaft, but worked mainly open-cast. Production, 1907, was 4,139 long tons of ore, yielding 337,276 lbs. fine copper and 10,411 oz. silver, an average return of 3.63% copper and 2.5 oz. silver per ton. A new shaft is planned. Equipment includes a 6-drill air-compressor and an 8x12" hoist.

The Zillmanton mine has shafts of 360' and 250', shaving a 17' to 20' vein, and, in 1907, produced 1,855 tons of ore, averaging 4.75% copper and 1.6 oz. silver per long ton, with reserves of 18,000 tons. Mine was flooded, early 1908, but has been reopened.

The Penzance, or Red Cap, mine, has a 200' shaft, but is worked mainly open-cast, in 1908 producing 853 tons of ore, ranging 2 to 6% in copper tenor and circa 2.5 oz. silver per ton.

The Queenslander or Morrison mine has a 255' main shaft, with Cornish pump, carrying mainly low grade sulphide fluxing ore, and, in 1907, produced 2,232 long tons of ore, yielding 142,260 lbs fine copper. Reserves are estimated at 18,500 long tons, averaging circa 3% copper and 3 oz. silver per ton. Owing to disappointing development, work was suspended on bottom levels March 15, 1908.

Miscellaneous mines include the Hensey, having a 200' shaft, which, in 1907, produced 76 tons of ore; the Dargalong mine, which shows auriferous copper and lead sulphides; the Otho, which has proven disappointing in development; the McIllwraith, having a 250' shaft, which is idle; the Victoria, having a 600' shaft, which is idle; the Harper, which has a 368' shaft and is idle; also the Hobson and Ti Tree mines, both idle. Fluxing properties include the Boomerang and Mount Lucy iron mines, and a limestone quarry at Mount Lucy.

Equipment includes steam power at the principal mines, with 6 hoists good for 500' each, and several air-compressors. Buildings include a 50x70' wood and iron machine-shop, and a 50x70' carpenter-shop and smithy, with 5 other mine structures, and 11 dwellings.

The smelter, at an average distance of 4 miles from the different mines, receiving ore by railroad, is of 700 tons rated daily capacity, treating also custom ores from the Mungana and other mines. The smelter has five 140-ton copper furnaces, and two 140-ton lead furnaces, the lead smelter using the Huntington-Heberlein process of reduction, with 8 kettles. Smelter includes a converter with 4 shells, taking 35% matte from the blast-furnaces, and turning out pimple metal averaging 79% copper and 100 oz. silver per ton. Fuel is wood, coal and coke, and water is taken from a 1,500-gallon dam across Chillagoe Creek, which has a minimum flow of 4,000 gallons hourly. The smelter has electric power.

The Mareeba to Chillagoe railway, owned by the company, has 102 miles of main line, and, July, 1908, had 84 miles of steel laid on the Etheridge extension, and planned reaching Einasleigh, 106 miles distant, in 6 weeks, and the terminus, 140 miles from Chillagoe, early 1909. The railway is proving profitable.

Company employs about 600 men. Production, for fiscal year ending June 30, 1908, was 53,112 long tons of ore, yielding 3,391,360 lbs. fine copper, 4,399 long tons lead, and 478,478 oz. silver, these figures including metals made from

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custom ores of the Mungana. Production, 1907, from company's own ores, was circa 1,500,000 lbs. fine copper.

CHILLAGOE COPPER PROPRIETARY, LTD. **AUSTRALIA.**

Dead. Dissolved Dec. 26, 1902. Formerly at Chillagoe, Lynd Co., Queensland, Australia.

CHILLAGOE RAILWAY & MINES, LTD. **AUSTRALIA.**

Dead. Reconstructed June 5, 1905, as Chillagoe Company, Ltd. Very fully described Vol. VI.

CHINIPAS COPPER CO. **MEXICO.**

Office: 1531 Railway Exchange, Chicago, Ills. H. M. McIntosh, manager; Fred W. Dow, superintendent. Organized Oct. 8, 1906, under laws of Maine. Lands, in the northwestern corner of the state of Chihuahua, Mexico, include El Vencidor mine, having a ledge or dyke of circa 300' width, with an ore chute traceable about one-third mile, showing considerable native copper, ore, after eliminating the native metal, giving average assays of about 7% copper.

CHIPPEWA COPPER MINING CO. **WISCONSIN.**

Dead. Lands sold, October, 1902, for debt. Succeeded by Corona Copper Mining Co. Formerly at West Superior, Douglas Co., Wis. Described Vol. II.

CHIRICAHUA DEVELOPMENT CO. **ARIZONA.**

Dead. Succeeded Jan. 9, 1907, by San Simon Copper Co. Formerly at Paradise, Cochise Co., Ariz. Very fully described Vol. VI.

MINAS LA CHIRIPA y ANEXAS. **MEXICO.**

Mine office: Zimapán, Hidalgo, Mex. León Lamaire y Ca., owners. Properties are La Chiripa, La Pretoria and El Moro mines, carrying argentiferous lead and copper ores. Employed circa 50 men at last accounts.

CHISNA CONSOLIDATED MINES CO. **ALASKA.**

Office: 263 La Salle St., Chicago, Ills. Mine office: Landlock, Prince William Sound, Alaska. Geo. L. McKay, president; Ira A. Town, vice-president; Chas. Kreis, secretary and treasurer; Jos. Kreis, general manager; Dr. Edward T. Griffith, superintendent. Organized April, 1906, under laws of Washington, with capitalization $5,000,000, shares $1 par, as successor of Central Alaska Gold & Copper Co.

Lands are 28 placer claims, on the Chisna river, in interior Alaska, claimed to return $1.75 per cubic yard gold, which is more than doubtful, and company is also said to have quartz claims on the Chistochina river, circa 220 miles north of Valdez.

Coast lands are 37 claims on Landlock Bay, near Valdez, including the Oxide, Peacock, Steinmetz and Kreis groups, latter east of the Reynolds-Alaska. The Steinmetz group, near Valdez, has a shaft only 70' from the bay, in a fissure vein claimed to be 150' wide and to carry an average of 7% copper, which is a palpable exaggeration, though assays up to 23% copper, with gold and silver values, have been secured. It is planned to drive a tunnel on the Kreis group, to cut 7 veins outcropping at surface. Ore is loaded into vessels by gravity.

The predecessor of the Chisna Consolidated was guilty of advertising that was very flamboyant and remarkably uninstructive. The Steinmetz apparently is a property of some promise, but the present company advertised its stock as an investment in proven properties, which is not true, and is not regarded favorably. Production, 1907, was circa 300 tons of ore, of about 12% average copper tenor.

CHITTNA EXPLORATION CO. **ALASKA.**

Dead. Formerly at McCarthy's Creek, Copper River district, Alaska. Described Vol. V.

CHLORIDE GOLD MINING CO. **ARIZONA & CALIFORNIA.**

Office: 10 Board of Trade, Pueblo, Colo. Mine office: Chloride, Mohave

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Co., Ariz. L. Hoffman, president and manager; Dr. A. B. Seelye, vice-president; J. H. Hoffman, secretary; C. Hoffman, treasurer; preceding officers and J. R. Adams, directors. Capitalization $1,000,000, shares $1 par. Lands, 130 acres, known as the Samoa group, 4 miles east of Chloride, having auriferous silver-lead ores, said to carry average values of about $40 per ton, opened by a 300′ shaft. Lands include the Iron Gossan group, 11 claims, in the northeastern corner of San Bernardino county, California, near the Nevada line, showing a 20′ to 150′ iron gossan, traceable about 1 mile, of iron ore carrying copper carbonates of about 1.6% average tenor.

COMPAÑIA MINERA y BENEFICIADORA DE METALES DE CHOIX, S. A. MEXICO.

Is the Mexican incorporation of the Choix Consolidated Mining Co.

CHOIX CONSOLIDATED MINING CO. MEXICO.

Office: 43 Wall St., New York, N. Y. Operating office: 516-355 South Broadway, Los Angeles, Cal. Mine office: Choix, Fuerte, Sinaloa, Mex. R. A. Thomas, president; Thos. E. Metcalfe and W. W. Thomas, vice-presidents; J. R. Thomas, secretary; J. E. MacKechnie, general manager. Organized May, 1902, under laws of Arizona, with capitalization $5,000,000, shares $1 par, and protocolized under laws of Mexico.

Lands, 471 hectares, also several mill and smelter sites, on both sides of the Fuerte river, in the Choix district of Sinaloa and the Urique district of Chihuahua. Apparently part of lands were sold, 1907, to Los Platanos Development Co. The property originally included the Creston-Verde group, area 103 hectares, and the Colon-Espinocena group of 115 hectares. Ore bodies are claimed to measure 50′ to 300′ in width, occurring as contact deposits between porphyry, diorite and limestone, with gold ores in fissure veins in granite and quartzite. Property includes several antiguas.

Shipments, 1900-1902, of 1,062 tons of ore to the Aguascalientes smelter, gave returns of 19.5 to 28% copper, with gross values of $127,915.44 and net values of $47,940.61. Property considered promising. Apparently idle for several years.

CHOTA NAGPUR MINES. INDIA.

Mine office: Chota Nagpur, Bengal, India. Were worked in very ancient days. Ore occurs as chalcopyrite, disseminated in schistose rocks. A local company did a little development work, 1903; since idle.

CHTASTIE MINE. BULGARIA.

Sold, June 24, 1907, to Widin Copper Syndicate, Ltd.

SOCIEDAD BENEFICIADORA DE CHUQUICAMATA. CHILE.

Office: Santiago de Chile. Mine office: Tarapacá, Tarapacá, Chile. Organized Apr. 30, 1902, under laws of Chile, with capitalization 225,000 pesos, shares 1,500 pesos par.

SOCIEDAD ESPLOTADORA DE CHUQUICAMATA. CHILE.

Office: Valparaiso, Chile. Mine office: Calama, Antofagasta, Chile. Organized Aug. 7, 1900, under laws of Chile, with capitalization £40,000, and reorganized, Jan. 18, 1904, with capitalization £100,000, shares £2 par.

SOCIEDAD MINERA CHURRUCA. PERÚ.

Mine office: Morococha, Junín, Perú. Organized 1904. Lands, in the San Francisco and Santa Cruz Mountains, near Morococha, are being developed by a tunnel known as the Roland East, with a force of 50 men. Production, 1903, was 228,683 lbs. fine copper.

COMPAÑIA MINERA DE LA CIENEGUITA, S. A. MEXICO.

Is the Mexican incorporation of the Cieneguita Copper Co.

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CIENEGUITA COPPER CO. **MEXICO.**

Office: 1303-25 Broad St., New York, N. Y. Mine office: Minas de Cieneguita, Sahuaripa, Sonora, Mex. Geo. Beebe, president; J. H. Wilhelm, vice-president; C. W. Wilhelm, secretary and treasurer; Chas. W. Howbert, general manager; Frank Fitz, superintendent; preceding officers, August Gauch, Hon. C. Campbell and Dr. Eugene Boyce, directors; R. F. Tipton, mine superintendent; W. F. Oden, smelter superintendent.

Organized May 18, 1901, under laws of Arizona, with capitalization $10,000,000, shares $10 par, and reorganized, 1905, under laws of Nevada, with same capitalization, reconstruction being effected to eliminate a certain stock interest, known as the Christy, which stock in the old company was rendered worthless by the reorganization. Suits in the courts resulted in upholding the company. Holds property through the Compañía Minera de la Cieneguita, S. A., which has direct title to lands.

Lands, 937 hectares, circa 40 miles southeast of Sahuaripa, also about 30,000 acres of grazing lands, fairly watered and timbered. Property is in 4 groups. The Chipiona group carries about 1,800′ of the strike of a vein system; the Cargona group is near the Chipiona; the Ostimuri group, circa 2 miles southeast of the Chipiona, was worked extensively in early days, and the Tayapa group, lying west of the Osimuri, has several antiguas, carrying silver-lead and copper ores. Country rocks are recent acid eruptives, of rhyolitic nature, rhyolite tuffs and rhyolite breccias, with diabase dykes, probably diorite. Development includes shafts of 125′ and 136′, but is mainly by 18 tunnels, of 35′ to 1,200′ length, with circa 3 miles of workings. In 1907 new openings of 3,919′ were made. Veins are of practically vertical dip, and 13 ore bodies have been located, with 5 under development, these being reported as 3′ to 50′ in width, and one, traceable 3 miles, opened to extreme depth of 800′ by tunnel. Ores are sulphides, first claimed to carry average values of 5% copper, 70 oz. silver and $8 gold per ton, which figures were grossly exaggerated, and stated later to run 4% copper and 61 oz. silver, but average assays December, 1907, gave 2.5% copper and 45 oz. silver. Company, in 1906, claimed 2,000,000 tons of ore in sight, with 300,000 tons blocked out for stoping, which was absolutely untrue, as the company yet lacks any considerable amount of ore blocked out for stoping.

Equipment at the mine includes a 100-h. p. steam plant, with 6-drill air-compressor, 30x60′ stone machine-shop, assay office, store, miscellaneous mine buildings and 120 dwellings for employes.

The smelter, at Chipiona, 1,500′ from the portal of the main tunnel, and receiving ore therefrom by tram-line, has Blake crushers and rolls, a 75-ton calcining furnace and 2 small wood-burning reverberatory furnaces, of about 50 tons daily capacity each. Fuel is inferior wood, costing $3 per cord. Smelter was blown in Sept. 24, 1906, but apparently has proven a misfit, and Mr. Howbert recommends the installation of a 150-ton pyritic smelter, and company is said to plan a mill also.

Transportation is by a 65-h. p. 2-motor freight automobile.

At the annual meeting, Feb. 3, 1908, the financial statement showed $748,000 had been advanced to the Mexican operating company, for development and equipment. Despite much talk regarding the richness of these mines, the large production imminent, and the tremendous profits to be earned, the actual output for 1907 was only 42 tons of 40 to 50% copper matte, of which 12 tons were shipped. The property, while not devoid of promise, is poorly located as to transportation facilities, and the company's estimates of ore reserves, production and profits are utterly unwarranted. Company is not regarded favorably.

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MINA CIGARRERO. **MEXICO.**

Office and mine: Baca, Jiménez, Chihuahua, Mex. I. Rodriguez, general manager. Ores are mainly high-grade silver-lead carbonates, averaging circa 26 grams gold per ton, with gold values increasing and silver values decreasing at depth.

CIMA COPPER CO. **CALIFORNIA.**

Office: Searchlight, Nev. Mine office: Cima, San Bernardino Co., Cal. Was exploring for copper, 1907, with a diamond drill.

CIMARRON MOUNTAIN MINING CO. **NEW MEXICO.**

Office: 13 Dodge Blk., Lansing, Mich. Mine office: Cimarron, Colfax Co., N. M. Hon. Justus S. Stearns, president; C. C. Hopkins, vice-president; F. S. Porter, secretary and treasurer. Organized Oct. 24, 1904, under laws of New Mexico, as successor of Consolidated Verde Mining & Milling Co., with capitalization $2,000,000, shares $1 par; issued, $1,800,000.

Lands, 65 acres, patented, in the Cimarron district of the Maxwell land grant, 35 miles from Springer, the nearest railroad station, with good wagon road connecting. Property shows gossans of decomposed limonite and honeycomb quartz carrying gold values and copper stains. Has circa 1,500′ of workings, mainly tunnels. Practically no work has been done by present company.

CINCINNATI CONSOLIDATED MINING CO. **UTAH.**

Office: care of A. Hanauer, Jr., Salt Lake City, Utah. Lands are in Beaver county, Utah. Refuses a statement; idle some years and apparently moribund.

CINCO DE MAYO MINING & SMELTING CO. **MEXICO.**

Office: San Antonio, Tex. Letter returned unclaimed from former mine office, Descubridora, Mapimí, Durango, Mex. Alfred Van der Stucken, president; E. Harms, vice-president and general manager; G. C. Carothers, secretary; Douglas Muir, general manager. Lands include the Mimbe and Parandara mines, both copper properties, latter showing a 4′ vein of 8% ore, developed by shafts, No. 1 being 75 meters and No. 3 being 30 meters in depth. Was shipping ore to Torreón smelter, until 1907 copper slump, employing circa 50 men.

CIRCUMSTANCE GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Huron, Yavapai Co., Ariz. Idle and apparently moribund.

CITY ROCKS MINING CO. **UTAH.**

Office: Shelden Bldg., Houghton, Mich. Mine office: Alta, Salt Lake Co., Utah. Wm. S. Cleaves, president; John Edwards, vice-president; Jas. P. Edwards, secretary and treasurer; W. S. Zehring, assistant secretary; Robt. L. Edwards, general manager. Organized 1906, under laws of Utah, with capitalization $1,000,000, shares $1 par. Has an issue of convertible bonds. Lands, paid for 1907, area circa 250 acres, are about one-half mile from the Columbus Consolidated and near the Continental-Alta, showing a main fissure of about 12′ average width, with 2 other promising ore bodies undeveloped. Mine is opened by 2 tunnels, the Topeka, or upper tunnel, being circa 1,800′ and the lower or City Rocks tunnel, circa 2,700′, all but first 300′ of latter being on the vein, face of tunnel having a back of 900′ showing a 20′ vein. Also has a 1,500′ tunnel, and plans a fourth tunnel, to be started 700′ vertically below No. 3, and to run 6,000′. Ores are argentiferous lead and copper sulphides, and highly argentiferous lead carbonates. Shipped ore, 1907, running 12.5% copper, 16 oz. silver and $1 gold per ton, also carbonate ores averaging 30% lead and 10 oz. silver per ton. Has gasoline power and a short aerial tram, connecting with the 5-mile aerial tram of the Continental-Alta. Extensive ore dumps, remaining from old workings, were leased, 1907, to John C. Stillwell, for culling. Property considered promising.

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CLAIRE COPPER CO. IDAHO.

Mine office: Montpelier, Bear Lake Co., Idaho. G. C. Gray, president and treasurer; A. D. Young, secretary. Organized Sept. 16, 1902, under laws of Idaho, with capitalization $200,000, shares 50c. par. Lands, 3 claims, area 60 acres, with fissures in sandstone, and contact deposits between limestone and porphyry, giving ores assaying 4.6% copper, 10 oz. silver and about $1 gold, from a 12" vein carrying cuprite, melaconite, dioptase and chrysocolla, opened by tunnels of 100' and 200'. Idle.

CLARA CONSOLIDATED GOLD & COPPER MINING CO. ARIZONA.

Office: 536 Byrne Bldg., Los Angeles, Cal. Mine office: Planet, Yuma Co., Ariz. Geo. Mitchell, president; T. J. Carrigan, vice-president and general manager. Organized circa August, 1908, with capitalization $3,000,000, as a merger of the Clara Gold & Copper Mining Co., Signal Copper Co., Crown Princess Mining Co., Crown Queen Mining Co. and Morrow Copper Co.

Lands, 132 claims, having about 6,000' of workings. The Clara mine, circa 10 miles from Planet, has a vein of 30' to 100' width, opened by shaft and tunnel, with circa 2,000' of workings, showing malachite and chrysocolla, with copper sulphides at depth, all carrying fair silver values and exceptional gold values.

The Signal group includes the Copper Prince mine, which has a 150' shaft showing a large ore body.

CLARA COPPER CO. UTAH.

Dead. Formerly at Thompsons, Grand Co., Utah.

CLARA GOLD & COPPER MINING CO. ARIZONA.

Dead. Merged, circa August, 1908, in Clara Consolidated Gold & Copper Mining Co. Formerly at Planet, Yuma Co., Ariz. Described Vol. VI.

CLARA MINING & SMELTING CO. MONTANA.

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. VI.

CLARA ST. DORA COPPER MINING CO. AUSTRALIA.

Dead. Succeeded, 1897, by New Clara St. Dora Copper Mining Co., N. L. Formerly at Hergott Springs, South Australia. Described Vol. IV.

CLARK CONSOLIDATED MINING CO. ARIZONA.

Dead. Formerly at Douglas, Cochise Co., Ariz. Described Vol. VI.

CLARK COPPER CO. CALIFORNIA.

Office: Los Angeles, Cal. Mine office: Greenwater, Inyo Co., Cal. F. M. Lyon, vice-president; H. L. Percy, secretary and treasurer; Jas. P. Harvey, superintendent; preceding officers and Patrick Clark, directors; J. Ross Clark, general manager. Organized 1906. Lands, 6 claims, near the Furnace Creek Copper Co., showing carbonate ores assaying 8 to 18% copper. Idle.

CLARK DEVELOPMENT CO. ARIZONA.

Office: care of H. S. Clark, secretary and manager, Los Angeles, Cal. Mine office: Chloride, Mohave Co., Ariz. Capitalization $2,000,000. Lands include the Chester mine, sometimes known as the Distaff, having 2 shafts, deepest circa 200', with about 1,000' of workings.

CLARK MINE. MICHIGAN.

Office: care of Dr. Léon Estivant, owner, 47 Ave. de l'Alma, Paris, France. Mine office: Copper Falls, Keweenaw Co., Mich. R. R. Godell, agent. Lands, 2,433 acres, including mines formerly known as the Clark, Bell and Montreal, lying south of Copper Harbor, between Lake Fannie Hooe on the north and Breakfast Lake on the south, including Lake Manganese. Mine, opened 1858, for copper, had a 16-stamp gravity mill, built 1874, run by water power from Lake Manganese, mill now being dismantled. Property also carries a promising 2' vein of pyrolusite, average of assays, 1900, by Duparc, of Geneva, giving 55.73% manganese and 1.36% copper. Has shipped circa 1,200 tons of high

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grade manganese ore. Was tested, 1905, by diamond drills. Idle. Fully described Vol. II.

CLARK-MUNGER CO. **ARIZONA.**

Office and mine. Phoenix, Maricopa Co., Ariz. Mine, in the Mazatzal district, circa 55 miles from Phoenix, has a 60′ shaft and 20-ton smelter. A small shipment, 1909, to El Paso smelter, returned 22% copper, 6 oz. silver and $2.80 gold per ton.

KÖNIGLICHE HÜTTENAMT CLAUSTHAL. **GERMANY.**

Works office: Clausthal, Hanover, Germany. Herr Bergrat Boltze, manager. Property is a silver-copper smelter, operated under state auspices.

CLAYTON MINING & SMELTING CO. **IDAHO.**

Mine office: Clayton, Custer Co., Idaho. Lands, 18 claims, showing argentiferous copper and lead ores. Has water power and a smelter rated at 50 tons. Idle.

CLEAR CREEK MINING & REDUCTION CO. **COLORADO.**

Dead. Formerly at Russell Gulch. Clear Creek Co., Colo. Described Vol. VI.

CLEAR GRIT MINE. **MONTANA.**

Owned by Washoe Copper Co.

CLEARWATER GOLD & COPPER MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Clearwater, Idaho Co., Idaho. Organized 1907, under laws of Idaho, with capitalization $2,500,000, shares $5 par. Lands, 5 lode claims, 1 fractional, and 3 placer claims, on the north fork of the Clearwater river, circa 20 miles south of Wallace. Has 2 tunnels, longest circa 100′, showing ore assaying 15 to 23% copper and 3 to 20 oz. silver per ton.

CLEOPATRA COPPER CO. **ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Hon. Geo. W. Hull, president, treasurer and general manager; H. E. Wilcox, secretary. Organized 1902, under laws of Arizona, with capitalization $4,000,000, shares $1 par, and planned, September, 1907, increasing capitalization to $10,000,000.

Lands, 13 claims, 11 patented, area circa 200 acres, showing fissure and gash veins carrying ores assaying 1 to 65% copper and 1 to 500 oz. silver per ton, with fair gold values. Has 6 shafts, of 25′ to 150′ depth, and 9 tunnels, the Dillon tunnel, of circa 3,200′ length, planned to connect with the 1888 shaft, showing a 3′ vein of argentiferous and auriferous copper sulphide, of good average tenor. The Dillon tunnel passes through the Cleopatra into lands of the Hull Copper Co., and latter has permission to use the tunnel through the Cleopatra tract. Company estimates 2,000,000 tons of ore in sight, which is a preposterous figure. Some good ore has been taken from cross-cuts driven from the Dillon tunnel, but apparently no commercial ore bodies have been developed thereby.

Equipment includes a steam plant, hoists, air-compressor and necessary mine buildings. A 100-ton smelter, built 1906, was not blown in, simply from lack of ore, notwithstanding the immense tonnage claimed in sight. Company is developing with a small force, and plans blowing in the smelter, eventually.

CLEOPATRA GROUP. **CALIFORNIA & OREGON.**

Office: care of F. H. Osgood, Seattle, Wash. Mine office: Galice, Josephine Co., Ore. F. H. Osgood and Col. J. S. Crawford, owners. Lands, 45 claims and a 40-acre millsite, in Del Norte county, California, and Josephine county, Oregon. Slight development shows auriferous and argentiferous copper ore, and native copper in masses up to several hundredweights. District is isolated and difficult of access. Idle for several years.

CLEVELAND-ARIZONA MINING CO. **ARIZONA.**

Dead. Lands sold, 1907, to El Tiro Copper Co. Formerly at Red Rock, Pinal Co., Ariz. Described Vol. VI.

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CLEVELAND-MONTANA MINING & DEVELOPMENT CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. D. A. McKenzie, general manager; preceding officer, Frank S. Mitchell, Frank Hartzell, D. D. Bogart and D. Dorais, directors. Organized Feb. 15, 1905, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, in Leslie Gulch, southeast of Butte, have a tunnel, said to be 1,000′ long. Is not regarded favorably. Presumably idle.

CLEVELAND-NEVADA MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Black Horse, White Pine Co., Nev. Organized 1907, with capitalization $5,000,000. Is said to be an auxiliary of the Amalgamated Nevada Mines & Power Co.

CLIFF MINE. **MICHIGAN.**

Owned by Tamarack Mining Co.

CLIFTON-ARIZONA COPPER CO., LTD. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Organized 1907, under laws of Arizona, with capitalization $750,000.

CLIFTON-ARIZONA COPPER CO., LTD. **ARIZONA.**

Dead. Succeeded, June 6, 1901, by Clifton Consolidated Copper Mines of Arizona, Ltd., also dead. Formerly at Clifton, Graham Co., Ariz.

CLIFTON CONSOLIDATED COPPER MINES OF ARIZONA, LTD. **ARIZONA.**

Dead. Absorbed, 1903, by New England & Clifton Copper Mines of Arizona. Formerly at Clifton, Graham Co., Ariz.

CLIFTON COPPER CO. **NEW MEXICO.**

Office: Deming, N. M. Mine office: Santa Rita, Grant Co., N. M. J. L. Burnside, president; F. F. Rogers, secretary; M. M. Z. Elliott, superintendent. Organized 1900, with capitalization $500,000, shares $5 par. Lands, in the Central district of Grant county, were in litigation until 1906. Mine has 5 shafts, deepest 235′, showing a vein of 40′ to 50′ claimed length and one-half mile length, carrying oxide, carbonate and sulphide ores, with occasional native copper, ore being of concentrating grade, with occasional high-grade paystreaks. Mine shows considerable ore ready for stoping. Has steam hoists and a 65-ton concentrator with 2 Huntington mills, 2 Wilfley tables and 2 Standard concentrators. Idle several years.

CLIFTON COPPER BELT MINING CO. **UTAH.**

Office: 24-65 West Second South St., Salt Lake City, Utah. Mine office: Callao, Juab Co., Utah. Clyde H. Wilson, president; Frank L. Wilson, secretary, treasurer and general manager. Capitalization $25,000; shares 5c par. Lands, in the Deep Creek district, show ores assaying up to 35.5% copper, 9 oz. silver and $1.20 gold per ton. Also has ores carrying lead, nickel, tin and bismuth, values apparently being mainly in auriferous bismuth.

CLIFTON COPPER MINES, LTD. **ARIZONA.**

Office: 52 Wall St., New York, N. Y. Mine office: Clifton, Graham Co., Ariz. Organized July 29, 1903, with capitalization $1,000,000, shares $5 par, as a reconstruction of the Arizona Copper Syndicate, which forfeited its West Virginia charter, 1902, on account of unpaid corporation tax. Is controlled, through ownership of 70% of stock, by Standard Consolidated Copper Co. Lands, 8 claims, area 160 acres, lying east of the Standard mines. Production, 1905, was 37,517 lbs. fine copper.

CLIFTON COPPER MINING CO. **ARIZONA.**

Dead. A stock-jobbing scheme, promoted 1898, by Julius Leszynsky. Formerly at Clifton, Graham Co., Ariz.

CLIFTON GOLD & COPPER CO. **ARIZONA.**

Office and mine: Clifton, Graham Co., Ariz. A. S. Rosecrans, manager; LaMar Cobb, consulting engineer. Organized circa August, 1907. Lands

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include the Oregon group, having a shaft showing ore of 5 to 8% copper tenor.

CLIMAX GROUP MINING CO. **WASHINGTON.**

Office: 1203 Maxwell Ave., Spokane, Wash. Mine office: Baring, King Co., Wash. J. J. Browne, president; J. W. Douglas, vice-president; Frank P. Smith, general manager. Organized under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, 9 claims, area 180 acres, also a 20-acre millsite, in the Index district. Country rocks are granite and diorite, showing several contact veins, of which two are developed by a 37' shaft, two short tunnels and a 345' tunnel not yet in ore. Ores are bornite and chalcopyrite, giving assays of 3 to 34% copper, 20 to 70 oz. silver, and from a trace to $6 gold per ton. Property idle for some years, except for assessment work.

CLIMAX MINING CO. **COLORADO.**

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, president. Property is the Sponduliix mine, opened by a shaft showing auriferous and argentiferous copper ore. Presumably idle.

CLIMAX MINING CO. **COLORADO.**

Dead. Formerly at Ouray, Ouray Co., Colo.

CLIPPER MINING CO. **WASHINGTON.**

Dead. Formerly at North Bend, King Co., Wash. Very fully described Vol. VII.

CLONCURRY CELESTIAL COPPER & OPTIONS CO. **AUSTRALIA.**

Office and mine: Cloncurry, Queensland, Australia. Organized circa January, 1908, with capitalization £5,000, shares £10 par.

CLONCURRY COPPER & GOLD EXPLORATION CO, LTD. **AUSTRALIA.**

Offices: 39 Lombard St., London, E. C., Eng., and Brisbane, Queensland, Australia. Mine office: Cloncurry, Queensland, Australia. F. H. Hopkins, mine manager; Alex Doig, London secretary. Organized Jan. 22, 1906, under laws of Queensland, with capitalization £5,000, shares £5 par. Lands, 560 acres, near the Corella river.

CLONCURRY COPPER & SMELTING CO., LTD. **AUSTRALIA.**

Dead. Succeeded Oct. 29, 1895, by New Cloncurry Copper & Smelting Co., Ltd. Formerly at Cloncurry, Beaconsfield Co., Queensland, Australia.

CLONCURRY EXPLORATION SYNDICATE, LTD. **AUSTRALIA.**

Office: 31 Lombard St., London, E. C., Eng. Mine office: Cloncurry, Queensland, Australia. Organized Jan. 22, 1907, under laws of Great Britain, with capitalization £7,000, shares £1 par.

CLONCURRY RAILWAY & DEVELOPMENT SYNDICATE. **AUSTRALIA.**

Office: 541 Salisbury House, London, E. C., Eng. Mine office: Cloncurry, Queensland, Australia. Lord Ernest W. Hamilton, chairman; F. A. Labouchere, secretary. Organized June 14, 1906, under laws of Great Britain, with capitalization £50,000, shares £1 par, fully issued.

COMPAÑIA COBRURADORA DE COBRE. **CHILE.**

Mine office: Melhagua, Santiago, Chile. Property shows large ore bodies of low grade, mainly blanket veins carrying 4 to 6% copper. Works, at Noviciado, include a plant for leaching, but apparently the company has not made a success of its venture.

CLUIN COPPER DEVELOPMENT SYNDICATE, LTD. **IRELAND.**

Office: 356 Winchester House, London, E. C., Eng. Mine office: Allihies, County Cork, Ireland. R. J. Norton Dawson, chairman; A. E. Middleton, secretary. Organized Aug. 26, 1904, under laws of Great Britain, with capitalization £10,000, shares £1 par; issued, £7,892. Property is an option to lease, at £20 yearly, plus 5% royalty, a tract of about 900 acres, lying southwest of lands of the Berehaven Copper Mines, Ltd. Idle.

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CLUSTER MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands, lying between the Bingham Consolidated and United States mines, were planned to be developed by a 1,000′ tunnel. Is in litigation with Ernest Bamberger over title to apex of vein. Has produced circa 1,000 tons of medium grade ore. Idle.

COAHUILA MINING & SMELTING CO., LTD. **MEXICO.**

Office: Apartado 72, Monterey, N. L., Mex. Mine office: Jimulco, Viesca, Coahuila, Mex. G. F. Meehan, president; Frank J. Llewellyn, vice-president; H. B. Bennett, secretary; Walter E. Parker, general manager; F. B. Draper, superintendent. Company is operated as a close corporation, but apparently has paid dividends. There is complaint from minority shareholders that they cannot obtain information.

Property includes the Santa Maria, Sultana and other mines, carrying auriferous and argentiferous copper and lead ores, opened by a 700′ main shaft and a 1,000′ main tunnel, equipped with steam and electric power. Company was said, August, 1907, to have bonded the Filipinas copper group, area 25 hectares, adjoining Las Vigas Mining Co. at San Sóstenes, Coyame, Iturbide, Chihuahua, Mex.

A 250-ton smelter, with steam and electric equipment, blown in early 1903, is connected with the mines by rail, but the smelter has not been operated regularly. At last accounts the company was manufacturing guayule rubber, and apparently had turned its old smelter into a rubber factory. Latest reported production, 1903, was 178,865 lbs. fine copper.

COAST LINE COPPER CO. **MEXICO.**

Office: Caborca, Altar, Sonora, Mex. John T. Cave, president; Judson A. Elliott, secretary; John Henderson, consulting engineer; John Cave, general manager. Organized, 1902, as successor of the Porvenir de Sonora company. Lands include a gold property at El Oro, 14 miles from Pozo, in the Ures district, and an idle copper property, formerly a profitable silver producer, in the Altar district. Gold mine has a 100-ton mill and cyanide plant. Employed circa 25 men at last accounts.

COAST RANGE COPPER CO. **OREGON.**

Office and mine: care of T. R. Sheridan, Roseburg, Douglass Co., Ore. Organized Jan. 16, 1903, under laws of Oregon, with capitalization $25,000, shares $50 par. Presumably idle.

COBAR CHESNEY COPPER & GOLD MINING CO. **AUSTRALIA.**

Dead. Lands sold to Great Cobar, Ltd. Formerly at Cobar, Robinson Co., N. S. W., Australia. Fully described Vol. VI.

COBAR COPPER CO., LTD. **AUSTRALIA.**

Office: 308 Winchester House, Old Broad St., London, E. C., Eng. Mine office: Cobar, Robinson Co., N. S. W., Australia. A. E. Barton, chairman; A. E. McMahon, secretary. Organized Feb. 9, 1907, under laws of Great Britain, with capitalization £70,000, shares £1 par.

COBAR CORPORATION, LTD. **AUSTRALIA.**

Dead. In 1907 experimented with an electrical ore finder, this work resulting in liquidation. Formerly at Cobar, Robinson Co., N. S. W., Australia.

COBAR FREEHOLD COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized 1907, under laws of New South Wales, with capitalization £15,500, shares 10s. par. Lands, sundry claims about one-half mile from the Great Cobar, slightly developed by a shallow shaft showing malachite and azurite.

COBAR GOLD MINES, LTD. **AUSTRALIA.**

Office: 10 Austin Friars, London, E. C., Eng. Mine office: Cobar, Robinson Co., N. S. W., Australia. A. R. Stephenson, chairman; Thos. Buckland,

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managing director; J. Bondeson, mine manager; Wm. Bailey, secretary. Organized May 3, 1898, under laws of Great Britain, as a reconstruction of company by same name that was formed March 17, 1896, with capitalization £200,000, shares £1 par; issued, £176,407. Property is leases of 123 acres of gold mining lands, 50 acres of water rights and a 50-acre millsite. Mine shows a large body of low grade auriferous copper ore. Equipment includes a 100-stamp mill, cyanide plant and slimes plant, and it is planned to erect a new plant for the treatment of sulphide ores. Accounts for 2 years, to September 30, 1906, showed receipts, from production, of £57,630, with £7,547 net profits, with £45,775 carried forward to credit of profit and loss.

COBAR JEWEROO MINING CO., N. L. **AUSTRALIA.**

Office: Wrightsville, N. S. W., Australia. Mine office: Canbelego, Canbelego Co., N. S. W., Australia. Organized early in 1907, under laws of New South Wales, with capitalization £3,000, shares £10 par. Is a prospect only.

COBAR LUCKNOW COPPER MINING CO., N. L. **AUSTRALIA.**

Office and mine: Cobar, Robinson Co., N. S. W., Australia. Organized early 1907, under laws of New South Wales, with capitalization £3,000, shares £10 par. Is a prospect only.

COBRE DE GRANDE MINING CO. **MEXICO.**

Dead. Formerly at Sahuaripa, Sonora, Mex. Described Vol. VI.

COBRE GRANDE COPPER CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Was organized to develop the Cobre Grande mine, under a bond given by Col. Wm. C. Greene, which provided for quarterly payments of $37,500, with the proviso that failure of payments should forfeit claims. No payments were made under this agreement, and property, reverting to Col. Greene, later became part of Cananea Consolidated Copper Co., S. A. A controlling interest in the Cobre Grande company was bought, for a nominal sum, by Col. Greene, and placed in the treasury of either the Cananea Consolidated or Greene Consolidated. Sundry shareholders of the Cobre Grande have brought suit against the Greene Consolidated Copper Co. and Cananea Consolidated Copper Co., S. A., but apparently the litigation is directed at Col. Greene personally, through these corporations. Lands once held by the Cobre Grande were forfeited to the Mexican government, and afterwards denounced by the Cananea Consolidated, which took direct title from the government. It is obvious that the Cobre Grande Copper Co. has no recourse against either the Cananea Consolidated, Greene Consolidated or Greene-Cananea, the only chance of recovery being a verdict for damages against Col. Greene personally, and on the evidence such a verdict would appear impossible.

COBRELOMA CONSOLIDATED COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office, 212 Henne Bldg., Los Angeles, Cal. Mine office: Middlemarch, Cochise Co., Ariz. Richard Gird, president; M. M. O'Gorman, vice-president; Wm. J. Gird, secretary and treasurer; preceding officers, Robert C. Davis and Edw. C. Kelley, directors. Organized under laws of California, with capitalization $1,000,000, shares $50 par. Lands, 43 claims, in 9 groups, which have had more or less desultory development in the past, 9 miles west of Pearce. Surface indications are promising, but development, to a limited depth, has shown no large ore bodies. Property is opened by the 165' Ella shaft, showing 4% ore; the 105' Emma shaft and the 120' Emma tunnel, the 344' Iron Age tunnel, crosscutting a 12' vein, and the 386' Carpena tunnel, planned to cut rich ore outcropping on the surface of Richmond Hill, and a 90' tunnel on the Cobreloma claim, planned to penetrate Copper Glance Hill, which shows sulphide ore in a 70' shaft. There also are several other shallow shafts. Ore occurs in a mineral zone carrying 6 veins, substantially parallel, limestone and porphyry being the country rocks,

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with a garnet capping that is 200' wide in places. Property has steam power and a telephone system. In 1906 company planned a consolidation with the Middlemarch Copper Co.

COBRE MINING CO. **ARIZONA.**

Mine office: Silver Bell, Pima Co., Ariz. Lands, 15 claims, known as the Copper Prince group, circa one mile south of the Copper Giant, slightly developed by a two-compartment shaft. Presumably idle.

MINAS DE COBRES DE CARRIZALILLO. **CHILE.**

Mine office: Chañaral, Atacama, Chile. Property includes several old and deep mines, with one shaft 2,122' deep, but idle, because of heavy inflow of water, mine lacking adequate pumping equipment.

COMPAÑIA MINERA LA COBRIZA. **MEXICO.**

Office: Monterey, N. L., Mex. Mine office: Santa Barbara, Hidalgo, Chihuahua, Mex. Donald R. Morgan, president and general manager; W. B. Van Voorhees, secretary; Edw. J. Coshan, superintendent. Capitalization, 500,000 pesos. Lands in the Chorreros Mountains, include the Brooks group, having 2 shafts. A concentrator is planned. Company also owns the Minillas mines, which have produced some auriferous silver-lead ore.

COMPAÑIA MINERA LA COBRIZA. **MEXICO.**

Mine office: San Dimas, Durango, Mex. Idle and apparently moribund.

COMPAÑIA MINERA LA COBRIZA y ANEXAS. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Manuel Salazar y Perron, manager. Has argentiferous and auriferous copper ores, developed by shafts and tunnels.

MINA COBRIZAS. **BOLIVIA.**

Office and mine: Lipez, Potosí, Bolivia. Is a considerable producer of native copper, making more or less silver as a by-product, both metals being found native, and in association. Is the largest Bolivian producer of native copper outside of the Coro Coro district.

SOCIEDAD MINERA COCHAY-COCHA. **PERÚ.**

Mine office: Morococha, Junín, Perú. Organized 1894, under laws of Perú. Is controlled, through ownership of practically entire stock issue, by Cerro de Pasco Mining Co. Lands, 4 pertenencias, including the San Miguel, Victoria and several smaller mines. Main ore body is a fissure vein in diorite with northeast and southwest strike, traceable 1 mile, property also having other ore bodies of less importance, some of which are workable. The San Miguel mine has a 550-meter tunnel, giving a back of about 90 meters, with portal 2' above the level of Lake Morococha. Principal ores are enargite, tetrahedrite and chalcopyrite, with about 20,000 metric tons of high grade ore, averaging circa 17% copper and 7 oz. silver per ton, in sight. Has a pumping station, about 200 meters from mouth of tunnel. The San Miguel mine, opened 1894, produced to end of 1907, circa 40,000 metric tons of ore of 15% average copper tenor. Production, 1904, was 4,416 metric tons of ore yielding 1,947,102 lbs. fine copper, and, 1905, was 5,497 tons of ore averaging 11% copper and 2,188 grams silver per metric ton, secured at a cost of $10.50 per ton, yielding 1,450,554 lbs. fine copper. Employs circa 300 men.

COCHISE CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 1404 Arrott Bldg., Pittsburg, Pa. Mine office: Paradise, Cochise Co., Ariz. Henry F. Alexander, president and general manager; W. C. Hagan, vice-president. Capitalization $1,500,000, shares $1 par.

Lands, 17 claims, circa 6 miles northeast of Paradise, including an unpopulated townsite called Pittsburg. Mine has the 150' Ainsworth shaft, sunk at 60°, and the Treasure shaft showing a 4' vein of medium grade chalcopyrite, claimed to give average assay values of circa $75 per ton in copper, silver and gold, which is a serious overestimate. The 2-compartment 180'

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Duplex shaft shows mixed sulphides carrying good values in copper, silver and gold, with heavy percentages of zinc. There also is a short tunnel.

Equipment includes a 150-h. p. Webber gasoline engine and a small electric light plant. The 50-ton mill is 62x100′, having a crusher, 3 sets of rolls, 3 elevators, 2 jigs and 2 settling tanks. Water is supplied from 2 wells, and pumped into five 6,000-gallon tanks.

The company was in financial difficulties for some years, which culminated, 1907, in sale of property, by sheriff, for $23,350, to Madison F. Larkin, et al., of Scranton, Pa., shareholders having 6 months in which to redeem the property. Apparently this sale was set aside by Judge Doane Oct. 31, 1907, and property was resold, by sheriff, June 27, 1908, to Gibson Abstract Co., as trustee, on 4 judgments, leaving Larkin the principal creditor. Company apparently is hopelessly involved, with remote prospects of saving its property.

COCHISE COPPER CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. K. L. Hart, manager; Geo. M. Brown, superintendent. Lands carry the extension of the vein of the Peabody mine lying to the eastward. Has a shallow 2-compartment shaft, with circa 500′ of workings.

COCHISE COPPER MINING CO. **ARIZONA.**

Dead. Reorganized, August, 1905, as Cochise Development Co., Formerly at Bisbee, Cochise Co., Ariz.

COCHISE DEVELOPMENT CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Lemuel C. Shattuck, president; C. L. Jones, vice-president and general manager; Harry Dusy, secretary; Joseph M. Muheim, treasurer; R. J. Ledwich, mine superintendent. Organized Aug. 1, 1905, under laws of Arizona, with capitalization $1,000,000, shares $10 par, succeeding the Cochise Copper Mining Co. Annual meeting, second Tuesday in January. Lands, 16 claims, area 176 acres, abutting on the Holbrook mine of the Copper Queen Consolidated, lying north of the Dividend fault and Dubacher gulch. Has a 600′ 3-compartment shaft, with a drift on the 300′ level showing small bunches of sulphide ore. Machinery includes a 10x30″ first-motion double-drum hoist, good for 1,200′, a 6-drill Sullivan straight-line air-compressor and a 100-h. p. Atlas boiler. Has an engine-house, boiler-house, 20x40′ carpenter shop, 20x30′ smithy and a coal trestle. Property considered promising. Idle.

COCHISE EXPLORATION & DEVELOPMENT CO. **MEXICO.**

Office: Bisbee, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mexico. Lands, at the southern end of the Ajo Mountains, about 25 miles west of Fronteras, show ores assaying well in copper, lead, silver and gold. Presumably idle.

COCHISE MINING & MILLING CO. **ARIZONA.**

Dead. Formerly had copper claims in Cochise and Pinal counties, Arizona.

COCHISE PROSPECTING, MINING & DEVELOPMENT CO. **MEXICO.**

Dead. Succeeded, Jan. 25, 1906, by Brooks Consolidated Copper Co. Formerly at Fronteras, Arizpe, Sonora, Mex.

COCONINO COPPER CO. **ARIZONA.**

Dead. Formerly at Ryan, Coconino Co., Ariz. Property sold to Buckskin Mountain Copper Co. Very fully described Vol. III.

COCOPAH COPPER CO. **CALIFORNIA.**

Office: 1014 Central Bldg., Los Angeles, Cal. Mine office: Needles, San Bernardino Co., Cal. Dr. S. D. Godshall, vice-president and manager; Dan Murphy, president; G. Holterhoff, Jr., secretary and treasurer. Lands are the Copper World group, formerly operated by the Ivanpah Consolidated Smelting Co., said to have produced circa $500,000 worth of ore under former ownership.

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COEUR D'ALENE EAGLE MINING CO. **IDAHO.**

Office: care of C. E. Mitchell, secretary, Spokane, Wash. Mine office: Lane, Kootenai Co., Idaho. B. N. Danskin, president; R. H. Dunn, vice-president. Organized circa 1906, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, 4 claims, area 80 acres, on Eagle Hill, 2 miles from Lane, having a 60′ shaft and 115′ tunnel showing auriferous and argentiferous lead and copper ores. Has a 5-drill air-compressor and 4 buildings. Resumed work January, 1908, after 4 months idleness.

COEUR D'ALENE PACIFIC MINES. **IDAHO.**

Office: care of Dr. Jas. Sutherland, Spokane, Wash. Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. J. A. Reinhart, vice-president; M. N. Stratton, secretary and treasurer; preceding officers, E. A. Patrick and E. Jessup, directors. Lands, 2 claims, near the Silver Cable mine, circa 9 miles east of Mullan, showing fair surface indications of lead and copper ore, with a short tunnel.

ELBERT G. COFFMAN. **MEXICO.**

Mine office: Teocaltiche, Jalisco, Mex. Property is the San Felipe mine, carrying auriferus and argentiferous copper ores.

COLDWATER COPPER MINING CO. **COLORADO.**

Office: 232 West Cedar St., Kalamazoo, Mich. Mine office: Encampment, Carbon Co., Wyo. Z. L. Baldwin, president; E. S. Drury, vice-president; Edwin Gillis, secretary and treasurer; Burt Lobdell, general manager. Organized May 18, 1900, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, area circa 50 acres, also 20 acres miscellaneous lands, in the Pearl district of Larimer county, Colorado. Property, known as the Wolverine mine, has 3 fissure veins in granite and diorite, of which 1, of 20′ estimated width, shows oxidized ores and native copper, with sulphides at a little depth, estimated to carry an average of 10% copper and 3 oz. silver per ton, opened by shafts of 80′ and 170′, bottom of principal shaft showing massive chalcocite and a little disseminated chalcopyrite, of high average grade. Has steam power. Property is leased, for a 3 to 5 year term, to the Wolverine Leasing & Mining Co., composed of Coldwater shareholders. Idle.

COLEBROOK PROSPECTING ASSOCIATION. **TASMANIA.**

Mine and works office: Rosebery, Montagu Co., Tasmania. Senator Clemons, chairman; Cecil Rae, smelter superintendent. Lands circa one mile from Rosebery, show chalcopyrite in a schistose gangue, said to be self-fluxing and adapted to cheap smelting. Mine is worked opencast, with 3 opencuts, and has a 1,000′ gravity tram.

Smelter building is 50x60′, with a 200-ton blast-furnace, which was in blast only 120 hours, after an expenditure of £7,000. Ore was estimated, by alleged careful sampling, to carry 3% copper, but smelting returns were under 1% copper. Smelted 800 long tons of ore to obtain 6¾ tons of copper. Mr. Rae says the mine is worthless, and is accused, by directors, of making misleading reports. Idle since May, 1908. Company in debt, and bankruptcy apparently inevitable.

COMPAÑIA MINERA DE COLLAHUASI. **CHILE.**

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Bartolomé Novoa, general manager. Lands, 28 claims, area 140 hectares, lying near the peak of the Cerro de Collahuasi, at an elevation of 4,480 meters above sea-level. Lands include various mines, deepest workings being 426′, carrying fissure veins in porphyry having an oxidized zone of about 100 meters depth, which shows argentiferous copper ore averaging nearly 20% in tenor, succeeded by chalcopyrite. At beginning of 1907 ore in sight was 85,791 short tons, estimated to average 27.2% copper; on the floors and dumps were 25,866

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tons, estimated to average 13.6% copper, a total of 111,657 short tons, with a general average tenor of 24% copper.

Principal property is the Pergolesi mine, having 8 levels opened on the Pergolesi and Delirio veins, showing ore of high average tenor.

The Don Eduardo mine has a 36′ ore body, claimed to average 30% copper on the third level, which seems almost impossible, but the statement is fully vouched for by authorities of excellent standing. On the second level north the Don Eduardo has various veins of 3′ to 4′ thickness, giving average assays of 66% copper, presumably from massive chalcocite.

The San Nicolás mine has 2 levels opened, showing ores averaging 20% copper, with rich bunches up to 50% in tenor, in a vein of 16″ to 8′ width.

The Anita mine shows ore up to 50% copper tenor in rich chutes, with long stretches of barren ground intervening.

The Tiuque mine shows various small stringers of ore and has a vertical shaft which will cut the Tiuque vein at a depth of circa 45 meters.

The Esperanza mine has the Empalme shaft of 3x5 meters section, and plans sinking a new shaft 250 meters to the south.

The Sud-America mine has a 42′ main shaft, showing a little ore.

Transportation formerly was by llamas to Carcote, nearest railroad station on the Ferrocaril Onera i Antofagasta, but the Ollagüe i Collahuasi railway was nearing completion at last accounts.

To end of 1903 the property produced circa 5,000 tons of ore averaging 32% copper, 600 grams silver and 2.3 grams gold per metric ton. Production, last half of 1906, was 4,218 short tons of ore, ranging 20 to 30% in copper tenor, of which 1,637 short tons were shipped, balance being held at mine. Production, 1907, estimated at 1,750,000 lbs. fine copper. Is a property of exceptional promise.

COLLAHUASI SYNDICATE, LTD. **CHILE.**

Dead. Was organized Feb. 23, 1904, and reorganized Apr. 4, 1905, as Compañía Minera Poderosa de Collahuasi. Formerly at Collahuasi, Tarapacá, Chile.

COLOMBIA GOLD & COPPER CO. **COLUMBIA.**

Office: 71 Broadway, New York, N. Y. Thos. E. Moffat, president. Capitalization $125,000, shares $10 par. Lands are sundry undeveloped government concessions in the Republic of Colombia. Apparently company never made any effort to develop ore, and is regarded as a mere bit of stock-jobbery.

COLONIAL COPPER CO. **NOVA SCOTIA & ONTARIO.**

Office: 716 Law Bldg., Baltimore, Md. Mine office: Cape D'Or, Cumberland Co., N. S. David H. Carroll, president; W. J. Sneeringer, vice-president; Frederick B. Beacham, secretary; Fletcher B. Speed, treasurer. Organized Jan. 19, 1899, under laws of West Virginia, with capitalization $5,000,000, shares $1 par; issued circa $3,700,000. Bonds, $300,000 authorized, at 6%; issued, $140,000. Annual meeting, first Tuesday after first Monday in February.

Lands, circa 2,000 acres, well timbered, and circa 500 acres miscellaneous lands, showing 6 ore bodies, reported as fissure veins in Triassic trap, and contacts between trap and conglomerate, with nearly vertical dip, 3 deposits being more or less developed, one, of 25′ reported average width, said to be traceable circa 6,500′, having a 500′ incline shaft and 2 vertical shafts, showing native copper, formerly reported as of 2.5% average tenor, but now reported by company as averaging 1% copper only.

There are 3 large and 6 small hoists, 3 small Rand air-compressors and about 20 small mine buildings. There is a 300 h. p. equipment at the mine, with 150 h. p. at the mill.

A 400-ton concentrator, circa 100x300′ in size, has Blake crushers, rolls and 15 jigs, and is connected with the mine, 1½ miles distant, by a 36″ narrow-

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gauge railway. Nearest railway is 30 miles, but property is located on the Bay of Fundy, with good shipping facilities by water.

Company also owns the New Annan mine, carrying sulphide ore in lenses, and the Chandos mine, in Peterboro county, Ontario, latter showing a 4' vein, said to assay 5% copper, both idle for some years.

Operations were suspended December, 1907, but company plans resumption. Production of mine has been about 40 tons fine copper, secured in the course of development.

COLONIAL COPPER CORPORATION, LTD. **AUSTRALIA.**

Office: 615 Salisbury House, London, E. C., Eng. Mine office: Lithgow, Robinson Co., N.S.W., Australia. Geo. Hardie, chairman; C. R. Oswald, secretary, J. Wills, mine manager. Organized March 29, 1899, under laws of Great Britain, with capitalization £125,000, shares £1 par; issued, £102,507. Lands, 243 acres, freehold, including the Cow Flat mine, 20 miles from Lithgow. Idle some years.

COLONIAL MINING CO. **ARIZONA.**

Mine office: Ehrenburg, Yuma Co., Ariz. Louis S. Judd, manager. Has argentiferous and cupriferous cinnabar, assaying up to 7% copper, 30% mercury and 150 oz. silver per ton. Has gasoline power and a 30-ton Scott furnace.

MINA COLORADO. **MEXICO.**

Office: care of Independence Grove, owner, Guadalajara, Mexico. Lands, 10 hectares, on the Rio Palmarejo, circa 12 miles west of Ameca, Jalisco, Mexico, showing a vein of about 6' width, carrying auriferous and argentiferous copper and iron sulphides, opened by a 700' tunnel. Idle.

MINA COLORADO. **MEXICO.**

Office and mine: care of Don Carlos Yanes, owner, San Javier, Alamos, Sonora, Mex. Idle.

COLORADO-BOHEMIA MINING & MILLING CO. **COLORADO & OREGON.**

Office: 15 William St., New York, N. Y. Albert Hawkins, president; S. B. Henzer, secretary and treasurer. Organized under laws of Colorado, with capitalization $1,250,000, shares $1 par. Property claimed is sundry gold and copper claims, located in various districts of Oregon and Colorado. No traces of lands, and no traces of operations.

COLORADO & CONNECTICUT GOLD MINING CO. **COLORADO.**

Office: 35 Wall St., New York. Wm. Garlick, president; Col. John A. Thompson, vice-president; A. S. Garlick, secretary. Organized 1902, under laws of South Dakota, with capitalization $40,000, shares $5 par, non-assessable. Lands, 3 claims, area 21 acres, known as the Dolly Varden mine, in the Galena district of Hinsdale county, Colorado, showing three 2' fissure veins, giving assays of 9 to 19% copper, with good silver values, from chalcopyrite, tetrahedrite and occasional argentite, opened by a 50' shaft and an 800' tunnel. Company's prospectus quotes Edwin J. Hulbert as predicting (in 1879) that this property will equal the Calumet & Hecla as a dividend-payer. The report by Mr. Hulbert is a most remarkable document, but not especially calculated to inspire confidence in the property by reason of the ridiculous comparisons made. Idle.

COLORADO CONSOLIDATED MINING CO. **COLORADO.**

Dead. Formerly at Cochetopa, Saguache Co., Colo. Described Vol. VI.

COLORADO COPPER CO. **COLORADO.**

Dead. Was a swindle, perpetrated by the notorious Wm. F. Wernse gang, of St. Louis.

COLORADO COPPER CO. **NEW MEXICO.**

Dead. Formerly at Clayton, Union Co., N. M. Described Vol VI.

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COLORADO COPPER MINING CO. COLORADO.

Office: Salida, Colo. Mine office: Copperfield, Frémont Co., Colo. Organized under laws of New Mexico, with capitalization $5,000,000. Was promoted by W. C. Calhoun, of Denver, one of the most notorious mining swindlers now out of jail. Apparently is a mere bit of stock-jobbery.

COLORADO COPPER SYNDICATE, LTD. COLORADO.

Dead. Voluntarily wound up, April, 1901.

COLORADO-ELY COPPER CO. NEVADA.

Mine office: Ely, White Pine Co., Nev. Capitalization $1,000,000, shares $5 par.

COLORADO GOLD-COPPER MINING & TUNNEL CO. COLORADO.

Dead. Organized 1901, and was succeeded by Ouray Consolidated Mining Co. Formerly at Ouray, Ouray Co., Colo.

COLORADO MINE. MONTANA.

Owned by Trenton Mining & Development Co.

COLORADO MINING & DEVELOPMENT CO. MONTANA.

Dead. Title changed, 1904, to Wickes-Corbin Copper Mining Co. Formerly at Corbin, Jefferson Co., Mont.

COLORADO MINING & SMELTING CO. COLORADO.

Letter returned unclaimed from former office and mine, Cañon City, Frémont Co., Colo. H. C. Tabor, general manager. Lands were in the western part of Frémont county, Colorado.

COLORADO MINING & SMELTING CO. MONTANA.

Dead. Succeeded, 1905, by Trenton Mining & Development Co. Formerly at Butte, Silver Bow Co., Mont.

COLORADO RIVER & ELY COPPER CO. CALIFORNIA.

Mine office: Klinefelder, San Bernardino Co., Cal. Organized 1906, under laws of Arizona, with capitalization $1,000,000. Lands are the Desert Light and Big Foot groups, 4 miles from Klinefelder.

COLORADO RIVER GOLD & COPPER CO. CALIFORNIA.

Office: 511 Bradbury Bldg., Los Angeles, Cal. Mine office: Parker, Yuma Co., Ariz. Geo. E. Bouton, president; J. L. Curtis, vice-president; E. S. Gannon, secretary and treasurer; T. M. Brennan, general manager; preceding officers, C. F. Gray, J. P. Elms and E. W. Peck, directors. Organized July 1, 1901, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, $1,230,000. Annual meeting, first Monday in January.

Lands, 10 claims, area 200 acres, and a 5-acre smelter site, in the Monumental district, 10 miles from the Arizona & California Railway, showing 12 ore bodies, occurring as fissures in altered granite, quartz-porphyry and limestone, one vein of 12″ to 30′ width, traceable circa 6,000′, being opened by 7 pits, shafts of 120′ and 140′, and 4 tunnels, of 15′ to 310′ length, with 1,400′ of workings, estimated to show 20,000 tons of ore, with 12,000 tons blocked out for stoping. Ore is oxidized for shallow depth, succeeded by chalcopyrite said to give average assays of 8% copper, 1 oz. silver and $15 gold per ton. Has river transportation to the camp. Company plans deepening shaft to the sulphide ore zone.

COLUMBIA RIVER MINING & DEVELOPMENT CO. CALIFORNIA.

Letter returned unclaimed from former mine office, Needles, San Bernardino Co., Cal. Lands are 4 miles from Mount Whipple, near Echo Bend, at the junction of the Bill Williams Fork river with the Colorado river, showing a promising outcrop giving fair assays in gold and silver.

COLORADO & SONORA MINING CO. MEXICO.

Mine office: La Cananea, Arizpe, Sonora, Mex. Benj. M. McCloskey, superintendent. Presumably idle.

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COLORADO SPRINGS COPPER MINING & TUNNEL CO. **COLORADO.**

Dead. Lands sold, January, 1906, to Michigan-Colorado Mining & Milling Co. Formerly at Florissant, El Paso Co., Colo.

COLOSSAL GOLD & COPPER CO. **UTAH.**

Letter returned unclaimed from former office, care of Wallace W. Wait, Salt Lake City, Utah. Organized August, 1902, under laws of Utah, with capitalization $600,000. Lands included the C. M. C. group, in Beaver county, Utah. Idle and apparently moribund.

COLUMBIA BUTTE MINING & MILLING CO. **MONTANA.**

Office: Butte, Silver Bow Co., Mont. Mine office: Whitehall, Jefferson Co., Mont. J. L. Howard, general manager. Organized 1908, under laws of Montana, with capitalization $100,000, shares 50 cents par. Lands, 8 claims, freehold, circa 6 miles northeast of Whitehall, having a crosscut tunnel and a 140′ shaft showing a little gold ore.

COLUMBIA COPPER CO. **ARIZONA.**

Dead. Lands sold, under judgment for $4,000. Formerly at Globe, Gila Co., Ariz.

COLUMBIA COPPER CO. **MEXICO.**

Dead. Property was sold, 1906, to Greene Gold-Silver Co. Formerly in state of Chihuahua, Mexico.

COLUMBIA COPPER CO. **NEW MEXICO.**

Office: Guaranty Trust Bldg., El Paso, Tex. Mine office: Santa Rita, Grant Co., N. M. Colonel Lewis, president and general manager; Martin Fishback, vice-president; Samuel W. Biggs, secretary and assistant manager; Eugene R. Neff, treasurer; preceding officers, Jas. A. Carroll, Winchester Cooley and Geo. J. Wolfinger, directors; F. O. Wills, mine superintendent. Organized 1906, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Annual meeting, second Monday in July. Rio Grande Bank & Trust Co., El Paso, registrar.

Lands, 35 claims, area 700 acres, in 4 groups. The Gallinas group, 10 claims, 5 patented, 7 miles from Gallinas, in the Gallinas Mountains, has a 200′ shaft, with 700′ of workings, showing argentiferous copper and lead ores.

The Clearwater group, 4 claims, 2 patented, near Santa Rita, held under a two-year bond and lease, includes the Clearwater mine, having a new 2-compartment shaft, with hoist good for 1,000′, with circa 1,000′ of workings, showing considerable ore of 4 to 6% copper tenor.

The Columbia group, 9 claims, in Good Fortune Cañon, San Andres Mountains, circa 10 miles north of Three Rivers, has a 300′ tunnel and a 52′ shaft, showing oxidized ores giving average assays of 6.45% copper and 1 oz. silver per ton, and several carloads of ore have been shipped.

The Iron Mask group, 10 claims, in the White Mountains, near the Mescalero Indian reservation, shows a limonite gossan, apparently of commercial grade for iron ore, carrying traces of copper and silver.

Company employs 15 men, in development work, and shipped, 1907, a little ore from the Santa Rita properties. Officers are men of good standing.

COLUMBIA COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

COLUMBIA COPPER MINING CO. **ARIZONA.**

Dead. Merged circa 1903, in Consolidated King Development & Columbia Copper Mining Co. Formerly at Jerome, Yavapai Co., Ariz.

COLUMBIA COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Princeton, Boundary district, B. C. Described Vol. VI.

COLUMBIA COPPER MINING CO. **UTAH.**

Dead. Lands sold, 1903, to Ohio Copper Co. Formerly at Bingham Canyon, Salt Lake Co., Utah. Fully described Vol. III.

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COLUMBIA COPPER MINING CO. **WASHINGTON.**

Office: 1014 Spafford Ave., Spokane, Wash. Mine office: Conconully, Okanogan Co., Wash. E. P. Wheeler, president; W. D. Scott, vice-president; preceding officers, R. L. Campbell and G. W. Dickinson, directors. Organized March, 1904, under laws of Washington, with capitalization $1,000,000, shares $1 par; issued, $615,000. Lands, 100 acres, well timbered, showing 2 ore bodies, largest of 9′ estimated average width, also a low grade dyke of about 300′ width, former giving ores, mainly bornite, assaying 5 to 6% copper, with traces of silver and $3 to $18 gold per ton. Has shafts of 30′ and 40′ and tunnels of 110′ and 200′. About $15,000 has been expended on the property.

COLUMBIA COPPER MINING CO. **WYOMING.**

Mine office: Holmes, Albany Co., Wyo. At last accounts was in litigation with the Duchess Mining, Milling & Smelting Co.

COLUMBIA GOLD & COPPER CO.

Office: 27 Central St., Boston, Mass. Location of lands, if any, unknown.

COLUMBIA GOLD & COPPER MINING & SMELTING CO.

Mine office: Rosalia, Whitman Co., Wash. Idle and apparently moribund.

COLUMBIA MINE. **NEVADA.**

Mine office: Goodsprings, Lincoln Co., Nev Lands, 6 claims, formerly owned by Columbia Mining Co., said to show a 30′ vein averaging 15% copper, which is an overestimate all around, the carbonate and oxide ores carrying about 10% copper and up to $10 gold per ton. The Extension vein, 3′ wide, is opened to a depth of 230′. Mine has about 1,800′ of workings. Property is considered promising.

COLUMBIA MINING CO. **CALIFORNIA.**

Dead. Formerly at Needles, San Bernardino Co., Cal. Described Vol. VI.

COLUMBIA MINING CO. **NEVADA.**

Dead. Formerly at Goodsprings, Lincoln Co., Nev.

COLUMBIAN COPPER CO. **ONTARIO.**

Office: care of Hunt & Sutherland, Chamber of Commerce Bldg, Detroit, Mich. Property supposedly is in the Georgian Bay district of Algoma, Ontario.

COLUMBIA RIVER GOLD MINING CO. **WASHINGTON.**

Mine office: Kettle Falls, Stevens Co., Wash. Col. J. M. Fish, president and general manager. Lands, 9 claims, on Gold Hill, opened by a tunnel and a 350′ shaft, with about 2,000′ of workings. Shaft shows a vein 5′ wide at surface, 12′ wide at 200′ depth and 48′ wide on the 350′ level, at latter depth carrying a paystreak of 3′ width. Company is said to have expended about $65,000 on the mine. Has a 50-h. p. gasoline engine and a 3-drill air-compressor. Small sample shipments, 1905, gave returns of 22% copper, 3 oz. silver and $4.60 gold per ton.

COLUMBUS-BUTTE MINING CO. **MONTANA.**

Dead. Lost option, 1906, on Jennie Dell mine and adjoining claims. Formerly at Butte, Silver Bow Co., Mont. Fully described Vol. VI.

COLUMBUS CONSOLIDATED MINING CO. **UTAH.**

Office: 37 Commercial Blk., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Anthony O. Jacobson, president; Dr. W. R. Harlow, vice-president; S. A. Whitney, secretary and treasurer; preceding officers, Lewis A. Jeffs and Chas. A. Walker, directors. Organized 1902, under laws of Utah, and capitalization increased, 1904, to $1,500,000, shares $5 par. Began quarterly dividends January, 1907, with a 15 cent disbursement, followed by 20 cent dividends in April and July, 1907, after which dividends were passed, total dividend disbursements, 1907, being $212,625.50. Company ended 1907 with a debit balance of $9,841, having been caught badly by the 1907 slump in the metal market.

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Lands, 17 claims, area 275 acres, on both sides of Little Cottonwood Cañon, mainly on Old Flagstaff Hill, showing 9 fissure veins and contact deposits, 6 said to average 12′ width. Principal ore body, known as the Braine fissure, of circa 12′ average width, has been reached by 2 tunnels, 1,250′ apart, practically on the same level, mine being opened by 4 shallow shafts and 4 tunnels, latest, a drainage tunnel, started 1907, circa 4,000′ down the cañon, being planned to unwater the Columbus Consolidated and adjoining properties. Mine has about 3 miles of workings, new openings, 1907, being 3,427′. No. 5 shaft, in 1907, showed, on the 110′ level, a large body of sulphide ore ranging 5 to 15% in copper tenor. Principal ore bodies are fissures and contacts in limestone and quartzite, with highly mineralized sections of 30′ to 100′ width and several hundred feet length, carrying concentrating and smelting ores, latter ranging up to 8% copper, 18% lead, 15% zinc, 60 oz. silver and $4.50 gold per ton. Ores are carbonates at and near surface, succeeded by sulphides. Some trouble was had, 1908, with water from underground vugs. It is planned deepening the main shaft to 1,500′. The Holland and Columbus tunnels are connected on the Braine fissure, and the Holland tunnel has electric traction. Production is divided into 3 classes, first being copper ore, second silver-lead ores and third concentrates.

A Pelton water-wheel works under a head of 494′, taking water through a 20″ and 22″ steel pipeline, of 4,500′ length, developing 660-h. p., which is transformed into electricity by two 300-kw. dynamos, and carried to the mine by a 4½-mile transmission line. Foundations are in for a second wheel of the same size. At the mine there are four 25-h. p. hoists, good for 600′ each, 10-drill Nordberg and 5-drill Ingersoll-Sergeant air-compressors, machine-shop and a sawmill.

The concentrator, of 150 tons daily capacity, was built from material secured out of two old 100-ton mills. Equipment includes a Gates gyratory crusher, 2 sets of Rogers rolls, six 3-compartment jigs and 7 Wilfley tables. Mill puts about 4 or 5 tons into 1, and concentrates are shipped, 16 miles, to Murray, for smelting.

The mine being located in a very rugged district, transportation facilities are poor, but have been much improved by a new wagon-road leading from the loading station to the railroad.

Production, 1907, was 6,865 wet tons, or 6,689 dry tons, of first-class ore, yielding $259,359, or $38.77 per ton, in addition to 10,569 dry tons of milling ore that gave average returns of $11.38 per ton. Production was suspended, late 1907, and resumed circa April, 1908. The Columbus Consolidated is a valuable property, though dividend disbursements were too free, and the company was caught badly by the 1907 slump in the metal market.

COLUMBUS EXTENSION MINING CO. **UTAH.**

Office: care of Anthony O. Jacobson, president and general manager, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Lands, circa 300 acres, near the Columbus Consolidated, having an old 140′ tunnel. Is developing by a new tunnel, begun May 20, 1906, planned to be driven 6,500′ jointly by Columbus Consolidated and Columbus Extension.

COLUMBUS-WEDGE MINING CO. **UTAH.**

Dead. Was succeeded, circa 1908, by Superior & Montana Mining Co. Formerly at Alta, Salt Lake Co., Utah.

COLUSA-LEONARD EXTENSION COPPER CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Dr. O. E. Whitford, president; Meyer Gensberger, vice-president; J. A. Talbot, treasurer; Arthur Smith, secretary. Organized Oct. 1, 1906, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Trust Company of America, New York, registrar and transfer agent. Lands, 5 fractional patented claims, area 47 acres, form-

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ing practically a parallelogram, some distance east of the Colusa and Leonard mines of the Boston & Montana and about 2,000′ east of the Minnie Healy mine of the Butte Coalition, being near the Pittsburg & Montana. Has an 800′ 3-compartment shaft, planned to be sunk to 1,500′, on the Little MacQueen claim, lying about the center of the group. Shaft has cut several small stringers of ore assaying up to 9% copper, but none of commercial size, and has a 7′ vein of 2% ore carrying a 14″ paystreak said to range 8 to 10% in copper tenor, with small gold and silver values and some lead and zinc. Judging from neighboring properties on the east, ore will be found at considerable depth, if at all. Shaft was sunk on record time. Equipment includes a good air-compressor and temporary hoist, and the company was said to have ordered a 5-ton Nordberg first motion hoist, good for 2,000′. Mine is said to have a 400-gallon electric pump. Was promoted by same people who put out the Emma Mining & Development Co., which was a failure; the Reins Copper Co., which is in doubt, and the Butte & London Mining & Development Co., which also is in doubt. An attempt to place shares in London was not successful. Idle at last accounts.

COLUSA-PARROT MINING & SMELTING CO. **MONTANA.**

Office and works: Butte, Silver Bow Co., Mont. Hon. Wm. A. Clark, president; Arthur H. Wethey, vice-president and general manager; W. M. Bickford, secretary; Fred Pratt, mill superintendent; David Mathews, smelter superintendent. Organized Nov. 26, 1897, under laws of Washington, with capitalization $500,000, shares $50 par. Has paid dividends, to the end of 1906, of $2,080,000, and surplus, Jan. 1, 1907, was $1,391,656.

Property is a concentrating and smelting plant, known as the Butte Reduction Works, on the flat south of Butte, overhauled and largely rebuilt, 1905-1906, at a cost of circa $300,000, and partially destroyed by fire February, 1906, after which again thoroughly rebuilt.

The 1,000-ton concentrator puts 4 tons into one. Equipment includes a 15x24″ Blake crusher, five 9x15″ crushers, ten 6′ Chilean mills, nine 16x30″ Cornish rolls, 62 two-compartment and 3-compartment Hartz jigs and 76 Wilfley tables. Concentrates carry 15 to 20% silica.

The smelter has 5 Wethey and 2 McDougall calciners. Crude ore fines are mixed with concentrates, and the roasted product carries 5 to 7% sulphur only. High-grade ore requiring no concentration is desulphurized by kiln-roasting, going thence to the blast-furnaces. There are two 150-ton blast-furnaces and three 80-ton 20x60′ reverberatory furnaces. Waste gases from the reverberatories are utilized for power purposes. The main dust-chamber, 60′ to 80′ wide, 30′ high and 360′ long, has brick walls and sheet steel roof. The smelter has the largest concrete stack ever built, this being 352′ 7″ high, with a uniform diameter of 18′ from top to bottom. Material required for this stack included 60 tons of steel, 1,500 barrels of Portland cement and 1,400 tons of sand. The foundation, 100′ square and 3′ deep, weighing 12,800 tons, is made of molten slag, in solid blocks, interlaced with 70 tons of scrap iron and steel, leading from the base into the bottom of the stack. Above the foundation of slag is a solid block of concrete, 42′ 6″ square, 5′ high at the sides and 8′ 6″ high in the center, with four layers of 1¼x1¼″ "T" iron, also 500 bars of the same size "T" steel, radiating in a circle from the chimney opening. The stack was built at the rate of about 30′ per week.

The converter building, 100x225′, of steel, has 2 stands, with room for a third, and six 84x126″ shells, electrically rotated. These works treat the ores of the Original Consolidated Mining Co., and are modern and efficient, with a capable management.

COMANCHE CONSOLIDATED COPPER CO. **NEW MEXICO.**

Office: 1201 Alaska Bldg., Seattle, Wash. Mine office: Fairview, Sierra Co.,

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N. M. J. J. Haggerty, president; P. D. Johnson, vice-president; Marcus Murray, treasurer; Maurice D. Leehey, secretary; preceding officers, J. B. Taylor, Mangus McIntosh and J. C. Arkard, directors; Harry B. Johnson, general manager. Organized 1906. Lands, 14 claims, 10 miles from Fairview. Presumably idle.

COMANCHE MINE. **MONTANA.**

Owned by Boston & Montana Consolidated Copper & Silver Mining Co.

COMANCHE MINING & SMELTING CO. **NEW MEXICO.**

Office: 46 Loan & Trust Bldg., Milwaukee, Wis. Mine and works office: Silver City, Grant Co., N. M. S. S. Curry, president; Geo. J. Lonstorf, vice-president; Hugh F. Ellard, secretary; Carl Landsee, treasurer; Hon. E. A. Wayne, trustee. Organized 1902, under laws of Arizona, with capitalization $5,000,000, shares $1 par.

Lands, 38 claims, area 760 acres, with sundry ranch and orchard lands, including the Burro Mountain and Pinos Altos groups, in the Burro Mountains, circa 13 miles from Silver City. Mines are the Hearst, Pacific, Kept Woman, Gillette and Oquawka, also the Iron Mountain mine of hematite, used for fluxing ore.

The Burro Mountain group shows 3 lenses, carrying oxide, carbonate and silicate ores, said to give average assays of 5 to 8% copper, with only nominal gold and silver values, with indications of sulphides at a little greater depth.

The Pinos Altos mines were considerable producers for some years, under the ownership and management of the late Senator Hearst. The group shows 4 fissure veins, opened by 4 shafts of 400′ to 700′ depth. The Gillette is the main working shaft. Ores are cuprite, malachite, azurite and chysocolla in the upper workings, with sulphide ores below that give returns up to 3% copper, 15 oz. silver and $7 gold per ton, with occasional zinc up to 20% in tenor. The Pinos Altos group has large bodies of low-grade ore developed.

The mines and works are connected by a 13-mile narrow-gauge railway, from Pinos Altos to Silver City, built 1905-1906.

The reduction plant, replacing the old works, burned 1903, includes a concentrator 1,500′ west of the smelter, having magnetic separators for the extraction of zinc.

The smelter has 250-ton and 300-ton blast-furnaces, with converter turning out blister copper of 98% tenor, including 150 oz. silver and 10 oz. gold per ton, silver and gold being secured mainly from custom ores. Slag losses were 0.39% copper. The reduction works includes a briquetting plant, machine-shop, iron foundry, smithy, electric light plant, office building and a number of dwellings for employes.

The company came to grief, late 1907, when an attempt was made to levy a 10-cent voluntary assessment, which was not paid—such assessments never are. A receiver was appointed, December, 1908, the company's debts amounting to $402,096. Property has been idle since late in 1907, but, in October, 1908, plans were under way for a merger of the Comanche with the Copper Gulf Mining Co., under title of Savanna Copper Co.

COMPAÑIA MINERA DE COMBARBALÁ. **CHILE.**

Office: Valparaiso, Chile. Mine offices: Combarbalá, Coquimbo, Chile, and Illapel, Coquimbo, Chile. Organized Oct. 31, 1906, under laws of Chile, with capitalization 400,000 pesos, shares 25 pesos par.

COMET GOLD & COPPER MINING CO., LTD. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Archibald McClellan, president; J. L. Whalen, secretary. Lands, 4 claims, adjoining the Springfield, on the western slope of Stevens Peak, opened by tunnel, with about 1,000′ of workings.

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COMMERCE GOLD & SILVER MINING CO. **ARIZONA.**

Dead. Formerly at Duncan, Graham Co., Ariz.

COMMERCIAL CORPORATION, LTD. **SPAIN.**

Office: 4 Union Court, London, E. C., Eng. Spanish general office: Pelayo 2, Barcelona, Spain. Mine office: Huercal-Overa, Almería, Spain. Jas. Taylor, chairman; Henry R. Gardiner, secretary. Organized May 10, 1897, under laws of Great Britain, with capitalization £500,000, in £494,000 ordinary and £6,000 deferred shares of £1 par; issued, £302,000 ordinary and £4,100 deferred. Property is sundry lands carrying copper, nickel and cobalt ores, in process of development at last accounts.

COMMERCIAL MINING CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Maxton, Yavapai Co., Ariz. Lands, in the Copper Basin, are extensively developed, and considerable production was secured by leasers, 1907, output being 694,126 lbs. fine copper.

COMMODORE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

COMMODORE MINES, LTD. **BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Vancouver, B. C. Mine office: Van Anda, Texada Island, B. C. Bruce Kirk, chairman; H. W. Pegram, secretary; W. Thos. Newman, manager. Organized June 20, 1902, under laws of British Columbia, with capitalization $750,000, shares $10 par.

Lands, near the Marble Bay mine, show 3 veins that can be worked from the same set of openings, there being a 2-compartment 200′ main shaft, with about 2,000′ of workings. Development is on the main or contact vein, between limestone and eruptive rocks, showing argentiferous and auriferous chalcopyrite, associated with sphalerite and galena, of good average tenor. Equipment includes a 16-h. p. Jenckes hoist, Cameron sinking pump, duplex Morris station pump and several mine buildings. Employed 12 men, latter half of 1907. Property considered promising.

COMMONAGE COPPER SYNDICATE, LTD. **TRANSVAAL.**

Office: 8 Bain's Bldgs., Johannesburg, Transvaal. Mine office: Upington, Transvaal. H. Southcott, secretary; Chas. O. Bain, David Poole, E. Parsley, E. J. Pullinger and W. J. Holmes, directors. Organized July, 1908, under laws of Transvaal, with capitalization £3,000, shares £1 par. Lands, circa 2,000 acres, in 2 equal tracts, with privilege of 99-year lease on the basis of 1% of gross value of output, also 2 options of 7,750 morgen each on the Bethesda group, having 7 miles of frontage on the Orange river, showing a vein of 12" to 24" width, traceable circa 1,000′, giving samples of ore assaying 15% copper and 14 dwts. silver per long ton.

COMMONWEALTH MINES CO. **UTAH.**

Office: care of Newton A. Dunyon, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Wm. M. Bradley, vice-president; W. T. Aiken, secretary and treasurer; preceding officers, C. H. Strevell and Jas. H. Paterson, directors. Organized November, 1906, under laws of Wyoming, with capitalization $600,000, shares $1 par. Lands, 7 claims, in the Star district, adjoining the Hub property on the east, and near the Burning Moscow mine, supposed to carry the extension of ore bodies of the Cactus mine. Considerable lead ore was produced from surface workings, in the past, and the Nellie claim shows copper sulphides at bottom of workings. Property shows a broad contact zone between granite and porphyry, intersected by 6 cross-fissures showing ores assaying well in copper, lead and silver. The Beaver claim shows ores giving average assays of 13.2% copper and 17.2 oz. silver per ton, with more or less lead. Property considered promising.

COMMONWEALTH MINING CO. **MEXICO.**

Office: Boston, Mass. Mine office: Ocotlán, Ocotlán, Jalisco, Mex. Lands,

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23 acres, known as the Humboldt mine, having a 42' crosscut shaft on a 12' vein giving assays up to 6% copper, 62% lead, 500 grams silver and 6 grams gold per metric ton.

COMPTON COPPER CO. **ARIZONA.**

Dead. Property was the House mine, circa 30 miles south of Casa Grande, having a 65' shaft, with gasoline power. Formerly at Casa Grande, Pinal Co., Ariz.

COMORA MINING CO. **IDAHO.**

Mine office: Kelton, Box Elder Co., Utah. E. Rammelmeyer, superintendent. Lands, in Cassia county, Idaho, show argentiferous and auriferous lead and copper sulphides, mainly former, galena assaying up to 79% lead, 119 oz. silver and $1.20 gold per ton. Has a 250' shaft with about 600' of drifts, on a 6' vein carrying a 12" paystreak of massive galena. Wagon freight to Kelton is $7 per ton.

COMSTOCK COPPER MINING CO. **IDAHO.**

Office: care of John H. Nordquist, Wallace, Idaho. Mine office: Burke, Shoshone Co., Idaho. Organized under laws of Idaho, with capitalization $1,500,000, shares $1 par. Lands are on Baldy Mountain, east of Burke.

COMSTOCK COPPER MINING SYNDICATE. **AUSTRALIA.**

Mine office: Gloucester, N. S. W., Australia. W. J. Gillam, secretary. Capitalization £30,000. Has received a government grant in aid of prospecting. Lands, circa 30 miles from Gloucester, show a 6' vein, opened by a 55' shaft and a 100' tunnel, exposing high grade carbonates, with sulphide ore at shallow depths, giving assays up to 23.61% copper, 21 oz. silver and 3.7 dwts. gold per long ton. Is supposed to be building a small smelter.

COMSTOCK MINE. **WYOMING.**

Office and mine: Hecla, Laramie Co., Wyo. Martha Ferguson, owner. A. H. Lindsey & Co., lessees, at last accounts. Has a 150' shaft and a 300' tunnel, showing small bunches of chalcocite.

COMSTOCK MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Fully described Vol. VI.

COMPAÑIA MINERA CONCEPCIÓN DEL ORO. **MEXICO.**

Mine office: Concepción del Oro, Mazapil, Zacatecas, Mexico. Santiago Chamberlain, president; J. L. Kowalski, secretary and general manager; Santiago Chamberlain, Jr., superintendent; Juan Sanchez, mining captain. Organized 1902, with capitalization $30,000, shares $30 par. Lands, 32 pertenencias, area circa 80 acres, in the Mazapil district. A 4' vein carries oxide ores assaying 30% copper, with gold and silver values. Shaft, 33 metres. Ore is shipped 336 miles to smelters at San Luis Potosí. Has gasoline power.

GEWERKSCHAFT CONCORDIA. **GERMANY.**

Mine office: Herdorf, Rheinprovinz, Germany. Was a very small producer of copper ore at last accounts.

COMPAÑIA MINERA CONCORDIA DE COLLAHUASI. **CHILE.**

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized March 17, 1906, under laws of Chile, with capitalization 120,000 pesos, shares 100 pesos par. Property is the Concordia mine, undergoing development.

CONCRETE GOLD MINING CO. **COLORADO.**

Office: 324 Cooper Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Saml. V. Newell, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has steam power. Presumably idle.

COMPAÑIA MINERA CÓNDOR DE COLLAHUASI. **CHILE.**

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized July 4, 1906, under laws of Chile, with capitalization £50,000, shares £5 par.

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COMPAÑIA MINERA DE CONDORIACO. CHILE.

Mine office: La Serena, Coquimbo, Chile. Has steam power and employed about 75 men at last accounts. Presumably idle.

CONFEDERATE MINING CO. ARIZONA.

Office: care of Col. Lee Crandall, president, Washington, D. C. Maj. D. W. Crabb, secretary and treasurer; Carl Crandall, manager. Organized Sept. 6, 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Property is the Candelaria group, on Reno Mountain, Maricopa county, Arizona, opened by shafts of 30', 60' and 64', said to show a 12' vein of sulphide ore, carrying a 4' paystreak, giving assays of 20% copper. Idle for several years.

CONGLOMERATE MINING CO. UTAH.

Office: care of G. Lavagnino, Denver, Colo. Mine office: Bingham Canyon, Salt Lake Co., Utah. A. P. Hanson, consulting engineer. Idle.

CONGO MINE. WYOMING.

Mine office: Dillon, Carbon Co., Wyo. C. L. Flahane, manager. Lands, north of Dillon, opened mainly by tunnel to depth of 250', show a ledge up to 40' in width, carrying a paystreak of about 4' of concentrating ore. Is said also to have struck a 25' body of copper ore of good grade. Is said to contemplate building a small concentrator or matting furnace.

CONGOR GOLD & COPPER MINING CO. UTAH.

Office: 506 Auerbach Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Glen R. Bothwell, president and general manager; R. C. McConaughy, vice-president; Frank E. Loose, secretary; preceding officers, E. F. Jenkins and C. G. Hall, directors. Capitalization increased, 1907, from $200,000 to $1,000,000, shares $1 par. Lands, 10 claims, area circa 150 acres, adjoining the Dalton & Lark mine, with about 400' of workings, showing copper sulphides.

CONGRESO COPPER (MEXICO), LTD. MEXICO.

Office: 134 Salisbury House, London Wall, London, E. C., Eng. G. H. Phillips, chairman; Dr. T. R. Marshall, resident managing director; G. H. Bullock, secretary; Fredk. Swinney, superintendent. Organized June 23, 1906, under laws of Great Britain, with capitalization, £20,500, in 20,000 ordinary shares, £1 par, and 10,000 deferred shares of 1s. par. Lands, circa 150 acres, adjoining the Congreso mine. Employed 40 men at last accounts.

CONGRESS GOLD & COPPER CO. COLORADO.

Office and mine: Silverton, San Juan Co., Colo. J. B. Ross, president and general manager; Jacob Ross, vice-president; Frank L. Ross, secretary and treasurer; preceding officers and Isaac D. Smead, directors; M. E. Rumery, mine superintendent. Organized Apr. 16, 1908, under laws of Colorado, with capitalization $500,000, shares $10 par. Bonds, $100,000 authorized, at 6%; none issued. Lands, 3 claims, area 30 acres, in the Red Mountain district, carrying 5 ore bodies, opened by a 350' shaft, with 1,500' of workings, showing ore reported to assay 15 to 20% copper, 5% lead, 5.1% zinc, 8 to 20 oz. silver, and 0.5 to 1.5 oz. gold per ton. Property was worked 1883-1892, and is said to have produced circa $400,000 in ore. Has a 50-h. p. steam plant. Company plans deepening main shaft 100' and opening the 5 ore bodies on one level.

CONGRESS GOLD & COPPER MINING CO. WASHINGTON.

Letter returned unclaimed from former office, Spokane, Wash. Mine office: Keller, Ferry Co., Wash. Joseph Roslow, president; J. Goodrich, secretary. Lands, circa, 80 acres, opened by shafts and tunnels, on 2 veins giving good assay values in gold, silver and copper, with a little nickel. Idle and apparently moribund.

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CONQUEST CONSOLIDATED MINING CO. **WASHINGTON.**

Office: 253 Broadway, New York, N. Y. Mine office: Newport, Stevens Co., Wash. Wm. Coverley, president; Robt. Caddock, vice-president; W. C. Ingalls, secretary; A. W. Lindsay, treasurer. Organized under laws of Washington, with capitalization $5,000,000, shares $1 par, as a merger of Conquest Copper & Gold Mining Co. and American Eagle Gold Mining Co. Annual meeting, second Tuesday in November.

Lands, 15 claims, area 300 acres, in the Newport district of Washington and Idaho, showing 7 ore bodies, of which one, under development, 1′ to 6′ wide and traceable circa 2,000′, is opened by a 186′ shaft and by tunnels of 200′, 700′ and 500′, with circa 3,000′ of workings, showing slightly auriferous and argentiferous copper sulphides of concentrating grade, with considerable ore blocked out and on the dump. Has steam power, with hoist good for 1,000′, and several mine buildings. Idle since April, 1907, from lack of cash. Property considered promising.

CONQUEST GOLD & COPPER MINING & MILLING CO. **WASHINGTON.**

Dead. Reorganized, circa 1902, as Conquest Consolidated Mining Co. Formerly at Newport, Stevens Co., Wash.

CONRAD CONSOLIDATED MINE. **AUSTRALIA.**

Dead. Succeeded, 1906, by Conrad Stannite Mines, Ltd. Formerly at Howell, Hardinge Co., N.S.W., Australia.

CONRAD STANNITE MINES, LTD. **AUSTRALIA.**

Office: 13 Austin Friars, London, E. C., Eng. Mine office: Howell, Hardinge Co., N.S.W., Australia. Sir W. L. Young, chairman; R. Randall Stevens, secretary. Organized Feb. 14, 1906, under laws of Great Britain, with capitalization £500,000, shares £1 par; issued £375,000. Lands, 10 leases, area 294 acres, including the Conrad and King Conrad mines, in the parish of Mayo. The geology is unusual, country rock being granite carrying a fissure vein at 20″ to 30″ width, without faults, so far as developed. Ore is an intimate mixture of copper, lead and tin sulphides, principal values being in tin. The ores include slightly argentiferous galena, chalcopyrite, stannite and pyrite, with small quantities of sphalerite, stannite being a rather rare member of the pyrite family, carrying circa 27.5% tin, 29.5%, copper, 13.1% iron and 29.9% sulphur. Mine, opened to depth of 400′, has estimated ore reserves of about 200,000 tons. Ore stands well, requiring little timbering.

Ore is hand-sorted at surface before sent to 2 mills using the Wetherill magnetic process. Two classes of concentrates are made, the first being silver-lead, which is easily separated by jigging, the second concentrate consisting of a mixture of copper and tin with a small amount of galena and zinc.

The smelter has a 30-ton water-jacket blast-furnace, 10-ton reverberatory furnace and 3-ton slag furnace for treatment of tin slags. In the blast-furnace the tin and copper separate, product being a white metal carrying mainly copper, with small percentages of tin and lead; bulk of the tin being thrown off in the slags, which are resmelted in the tin furnace. Employs circa 200 men.

COMPAÑIA MINERA LA CONSECUHNCIA DE SANTA ROSA. **CHILE.**

Office: Iquique, Chile. Mine office: Santa Rosa, Tarapacá, Chile. Organized Aug. 3, 1904, under laws of Chile, with capitalization, 64,000 pesos, shares 100 pesos par.

CONSERVATIVE MINING CO. **WASHINGTON.**

Office: Snohomish, Wash. Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Frank M. Evans, president; Hugh Kennedy, secretary and manager. Organized under laws of Washington, with capitalization $200,000, shares 20 cents par. Lands, 10 claims, known as the St. Louis group, 3 miles from Silverton, said by company to show a 15′ vein—

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which is called by others a vein of 18" to 36" width—carrying argentiferous and auriferous chalcopyrite, assaying up to 20% copper. Idle and apparently moribund.

CONSOLIDATED AFRICAN COPPER TRUST, LTD. **RHODESIA.**

Office: 8 Old Jewry, London, E. C., Eng. Mine office, Bulawayo, Rhodesia. Dr. Hans Sauer, chairman; preceding officer, J. H. Walker, H. D. Boyle, E. R. Tymms and J. Secar, directors; P. S. Inskipp, J. D. McDonald and Geo. Mitchell, local committee; Consolidated Gold Fields of South Africa, Ltd., consulting engineers and secretaries; Cyril E. Brackenbury, general manager.

Organized Feb. 17, 1902, under laws of Great Britain, with capitalization £600,000, shares £1 par, in £50,000 cumulative 7% preference shares and £550,000 ordinary shares; issued, £534,000. The preference shares carry the right, until August, 1910, to purchase one share of Edmundian Copper Mining Co., Ltd., at par. Preference shares are convertible, at option of holder, into ordinary shares at par. On August 7, 1907, company floated the Edmundian Copper Mining Co., Ltd., controlling the latter through ownership of £85,000 in stock, of the capitalization of £135,000, apparently holding all of the present issued stock of the Edmundian.

Lands are 1,587 claims, including 135 in the Lomagunda district, 900 in the Victoria district, 30 in the Kafue district, 20 in the Umtali district, 70 in the Tuli district of Mashonaland, 60 in Bechuanaland, including coal lands. The Mozambique claims, 202½ in number, in Portuguese East Africa, were sold to the Edmundian Copper Mining Co., Ltd.

The Alaska mine, 90 miles northwest of Salisbury, shows the second largest ancient workings in Rhodesia, having ore bodies estimated at 150' width and 1,700' length, which estimate seems high. Numerous drill-cores from depths of 200' to 800' show copper ore, and the company estimates that 150,000 tons of cupriferous schists, of 3% tenor, are exposed above the water-level. Company has expended £13,011 on the Alaska mine, which has been idle some years.

The Umkondo mine, in the Victoria district, 10 miles west of the Subeni river, and circa 115 miles east of Victoria, by wagon road, shows ancient workings inferior only to those of the Alaska, extending over 300' in width, and circa 1,500' in length, with some open pits of 60' depth, and small shafts with ore stoped out to the water-level. The Umkondo has been tested extensively by diamond drill, cores giving average assays of circa 9% copper. Several shafts have been sunk, showing 2 veins, with a shallow oxidized zone, company estimating reserves at 81,000 long tons of ore at 8.5% average copper tenor. To June 30, 1907, the company had expended £30,060 on development at the Umkondo.

The properties of this company are extensive, and both the Alaska and Umkondo mines are of promise, and management is considered good.

CONSOLIDATED ARIZONA GOLD & COPPER CO. **ARIZONA.**

Office: Phoenix, Ariz. Mine office: Troy, Pinal Co., Ariz. Property is the Lucky Boy mine, carrying gold and copper ores.

CONSOLIDATED ARIZONA SMELTING CO. **ARIZONA.**

Office: 1212-71 Broadway, New York, N. Y. John L. Elliott, president; L. Vogelstein, vice-president; Wm. Schall, Jr., treasurer; preceding officers, G. Haven, Jr., Chas. J. Peabody, Chas. D. Chapman and Henry A. James, directors; J. K. Rice, receiver. Organized 1906, under laws of New Jersey, with capitalization $17,500,000, shares $10 par; issued $16,000,000. Property is practically the entire stock issues of the Arizona Smelting Co. and the De Soto Mining Co., which are separately described, and it is said that practically the entire stock issue of the Consolidated Arizona Smelting Co. is controlled by the Consolidated Arizona Smelting & Securities Corporation.

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Upon Thos. W. Lawson becoming financially interested in this company, it promptly went bankrupt, in 1907. Assets are figured by court appraisers at $1,165,417. Efforts, for nearly a year, to reorganize, have been unsuccessful, and the company's prospects are not bright.

CONSOLIDATED BIG LEAD & CALUMET MINING CO. **ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Lands include the Calumet mine, said to have been bought for $40,000 cash, which shipped 147 carloads of ore up to August, 1907. Presumably idle.

CONSOLIDATED CENTRAL BUTTE COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Augustus T. Morgan, D. J. Charles, William V. Lalor, Robt. M. Cobban, Elmer D. Hershey, R. H. Wearing and R. R. Jones, directors. Organized Oct. 27, 1906, under laws of Montana, with capitalization $1,200,000, shares $1 par. Lands are sundry claims near the South Butte, also claims east and west of the Ophir mine of the Butte Central & Boston. Lands are said to show several veins of 1′ to 4′ width. Idle.

CONSOLIDATED COPPER CO. **BRITISH COLUMBIA.**

Dead. Formerly at Ainsworth, Kootenay district, B. C.

CONSOLIDATED COPPER CO. **NEVADA & UTAH.**

Dead. Was organized May, 1907, under laws of Delaware, with capitalisation $50,000,000, shares $5 par, and name changed, April, 1908, to Coppermines Co. Formerly at Ely, White Pine Co., Nev.

CONSOLIDATED COPPER CO. **OREGON.**

Office: Anderson, Ind. Mine office: Homestead, Baker Co., Ore. Organized Sept. 25, 1905, under laws of Oregon, with capitalization $2,500,000, shares $10 par, by Wm. Robertson, Wm. Garretson and A. E. Johnson, to develop copper claims on the Snake river, near Homestead. Idle.

CONSOLIDATED COPPER CO., LTD. **CORSICA & MEXICO.**

Letter returned unclaimed from former office, Dashwood House, London, E. C., Eng. Mine office: Charcas, Moctezuma, San Luis Potosí, Mex. F. Hawdon, chairman; S. J. Crouch, secretary; Thos. P. Rowe, manager. Organized June 10, 1899, under laws of Great Britain, as a reconstruction of the New Consolidated Mining Co., Ltd., with capitalization £100,000, shares 10s. par. Lands include La Bufa de Charcas and sundry adjoining claims, carrying copper, silver and lead ores, in Mexico, also the Lancone copper mine at Bastia, Corsica, which has been idle for some years.

CONSOLIDATED COPPER CO. OF LOWER CALIFORNIA. **MEXICO.**

Office: 301 Bradbury Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, San Quintin, Norte, Baja California, Mex. W. E. Simpson, president; Wm. C. Mullock, vice-president; E. T. Wright, secretary; J. M. Stead, treasurer; preceding officers, C. A. Ford, W. I. Hollingsworth, Geo. P. Brown, Walter H. Wren and I. L. Pike, directors. Organized 1905, with capitalization $1,000,000. Lands, 48 hectares, also a 50-acre millsite, lying 4 to 50 miles from tidewater, several miles inland from Punta Canoas, below San Quintin. Lands are said to show 18 veins, of 10′ to 50′ width, all carrying carbonate and oxide ores with quartz gangue averaging better than 6% copper, which is manifestly improbable. Mines were claimed by old owners to show upwards of 250,000 tons of ore averaging 10% copper, 18 oz. silver, and 15 to 16 oz. gold, which is a self-evident fabrication. Property includes the Julio Caesar and Santa Maria mines, latter said to have a 120′ vein opened by shaft, and has wagon roads from principal mines to San Quintin. Mill, rated at 100 tons capacity, has 5 Newnham crushers. Property also has a 160-ton leaching plant.

CONSOLIDATED COPPER CO. OF PARRY SOUND. **ONTARIO.**

Office: 705 Palladio Bldg., Duluth, Minn. Mine office: Parry Sound,

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Parry Sound district, Ont. Robt. Forbes, president; Robt. Millard, vice-president; J. G. Harris, secretary and treasurer; preceding officers, A. C. Le Richeux, Frank Cox, M. A. Ryan, Dr. J. D. Budd, F. L. Young and C. J. Jackes, directors; John Moffatt, general superintendent. Organized February, 1902, under laws of Ontario, with capitalization $5,000,000, shares $1 par; issued, circa $3,100,000. Has no bonds or liabilities.

Lands, circa 1,500 acres, practically all patented, carrying considerable standing timber, in Foley, McDougall, Haggerman and Conger townships. Property formerly was held by Hattie Belle Gold, Copper & Nickel Co., which claimed 4,000,000 tons of ore in sight, of $10 to $15 average value per ton, which was untrue. Ores occur as contact veins, between slate and quartzite, and as fahlbands, ore being mainly chalcopyrite, with occasional bornite and chalcocite, mainly low in grade but with occasional seams of high grade ore. There are 18 different ore bodies, shown by test-pits and stripping, of which 2 are somewhat developed. The fahlbands are said to show a width of more than 1,000', carrying 7 bands of fairly good ore, of 200' estimated aggregate width, between which is low grade ore, part of which may be amenable to concentration. Ores assay 1.5 to 12% copper, circa 3 oz. silver, and from a few cents up to $8 gold per ton. Property has a 180' vertical shaft, and about 25 pits of 10' to 30' depth.

The Spider Lake mine has a shafthouse, and steam hoist good for 500', with necessary mine buildings, and a considerable ore body has been exposed by trenching.

The Leflex mine has shafts of 90' and 40', showing nothing of particular promise. Surface on the Leflex shows an iron gossan, carrying up to 2% copper and $2 to $3 gold per ton. A 600-lb. test shipment, from the 65' level, returned circa 30% copper, and various samples have shown from 0.5% to 3% nickel, and from nothing to $20 gold per ton. Property considered promising.

CONSOLIDATED COPPER CO. OF VIRGINIA.

Office: 924-5 Beekman St., New York, N. Y. Franklin Bien, president; Edw. T. Coyne, vice-president; Jos. B. Bissell, treasurer; Nathan E. Clark, secretary. Organized October, 1902, under laws of South Dakota, with capitalization $100,000,000. Presumably an abortive attempt at some sort of a consolidation of existing companies.

CONSOLIDATED COPPER CREEK MINING CO. **ARIZONA.**

Office: 707 Shukert Bldg., Kansas City, Mo. Mine office: Mayer, Yavapai Co., Ariz. E. J. White, secretary, treasurer and manager; F. E. Dobbins and I. W. Dumm, fiscal agents; G. W. Lightburn, superintendent. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Controls the Consolidated Copper Co. of Colorado, which holds the Delmonico gold mine at Cripple Creek. Arizona lands, 15 claims, known as the Sunset group, adjoining the Rosalie Copper Co., carrying slightly argentiferous copper ores, with a 100' 2-compartment shaft. Equipment includes a 125-h. p. boiler, 8x10" hoist and 8-drill air-compressor. Advertising, largely in the cheap mail order monthlies, is of the brazenly fakish sort, calculated to catch the dollars of the ignorant. Advertised, 1907, that it was altogether likely to become as famous as Amalgamated, but this impression is not shared generally. Is regarded with suspicion.

CONSOLIDATED COPPER DEVELOPMENT CO. **NATAL.**

Office: Mutual Bldg., Harrison St., Johannesburg, Transvaal. Mine office: Vryheid, Transvaal. Works office: New Clare, Transvaal. Organized circa September, 1907, under laws of Transvaal, with capitalization £15,400. Lands, near the Umhlatusi river, in the Babanango division of the N'kandhla district of Zululand, Natal, near the Zululand-Transvaal border, show an extensive belt of schists, carrying disseminated copper ores below commercial grade, with

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commercial ores occurring in contact deposits between granite-porphyry and schist, ore being mainly bornite, with some chalcopyrite, with quartz gangue, the bornite carrying 3 to 27 dwts. gold per long ton.

CONSOLIDATED COPPER-GOLD MINES CO. **CALIFORNIA.**

Office: care of Arthur Philbrick, president, Reno, Nev. Mine office: Quincy, Plumas Co., Cal. John S. E. Houck, secretary and treasurer. Lands, 32 claims, in Genesee Valley and on Copper Hill, in the Ward Creek district, said to show 8 practically parallel veins of 1′ to 30′ width. Has a 30′ shaft, said to be bottomed in a 24″ paystreak of massive chalcocite, and is said to have other openings showing auriferous and argentiferous copper ore of about 10% average tenor. Planned driving a 2,300′ crosscut tunnel to cut veins at depth of 1,500′ and installing a 500-h. p. water plant. Idle and apparently moribund.

CONSOLIDATED COPPER MINING CO. **IDAHO.**

Dead. Succeeded, circa 1904, by Ladd Metals Co. Formerly at Mineral, Washington Co., Idaho.

CONSOLIDATED COPPER MINING & MILLING CO. **MONTANA.**

Office: care of F. D. Willard, secretary, Mullan, Idaho. Mine office: Saltese, Missoula Co., Mont. Company plans developing the Black Traveler vein by a 500′ tunnel.

CONSOLIDATED FLAGSTAFF MINES CO. **UTAH.**

Dead. Was succeeded, April, 1908, by Flagstaff Copper Mines Co. Formerly at Alta, Salt Lake Co., Utah.

CONSOLIDATED GOLD & COPPER CO. **ARIZONA.**

Dead. Was promoted by Douglas, Lacey & Co., notorious swindlers, of 66 Broadway, New York. For methods of these scoundrels see description of Amalgamated Gold & Copper Co. Formerly at Clifton, Graham Co., Ariz.

CONSOLIDATED GOLD & COPPER CO. **MEXICO.**

Dead. Formerly at La Cananea, Arizpe, Sonora, Mex. Described Vol. VI.

CONSOLIDATED GOLD, COPPER & COAL CO. **COLORADO & WYOMING.**

Office: Encampment, Wyo. Mine office: Pearl, Larimer Co., Colo. J. E. Hedding, president; J. W. Hedding, secretary. Lands include 2 copper claims, area 40 acres, near Pearl, Larimer Co., Colo.; 6 gold claims, known as El Rey gold mine, area 98 acres, and 3,595 acres of coal lands, circa 15 miles from Walden, Larimer Co., Colo. Latter tract is said to show a 65′ vein of coal, which could be developed by stripping. Coal lands are remote from transportation, but probably will be of value eventually. Idle for several years.

CONSOLIDATED GOLD & COPPER MINING CO. **UTAH.**

Office: 25 Broad St., New York. Letter returned unclaimed from former mine office, La Sal, Grand Co., Utah. A. Graham Donnelly, president; N. D. Biddison, secretary; Gid R. Propper, superintendent. Capitalization $20,000,000. Claims also to have lands in Utah, Montana, Colorado and Oregon, with a total of 56 claims. Is grossly overcapitalized, idle, and management, at last accounts, proposed reorganizing—presumably in order to sell more stock to people who like that sort of thing and are willing to pay real money for it.

CONSOLIDATED GOLD & COPPER MINING & MILLING CO. **WYOMING**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

CONSOLIDATED GOLD MINES CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Berlin, King Co., Wash. W. H. Sherrod, superintendent. Lands, 2 claims, known as the Una group, formerly the John Stevens mine, opened 1892, on Miller river, 5 miles from Berlin. Mine has about 1,800 tons of ore, blocked out for stoping, giving assays of 8% copper, 3 oz. silver and $4 gold ton.

CONSOLIDATED GREENE COPPER CO. **ARIZONA.**

Mine office: Kirtland, Yavapai Co., Ariz. Lands, near the Zonia Copper

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Mining Co., circa 9 miles southeast of Kirtland, show ores giving average assays of 6 to 10% copper and 2 to 6 oz. silver per ton.

CONSOLIDATED GREEN MOUNTAIN ST. LOUIS MINES, LTD. BRITISH COLUMBIA.

Office: care of Chas. D. Clark, treasurer, Peoria, Ills. Letter returned unclaimed from former mine office, Rossland, Trail district, B. C. W. L. Lowry, president. Capitalization $3,000,000, shares $1 par. Has a 400′ shaft. Idle for some years and apparently moribund.

CONSOLIDATED GREENWATER COPPER MINING CO. CALIFORNIA.

Office: 1306 Keystone Bank Bldg., Pittsburg, Pa. Mine office: Greenwater, Inyo Co., Cal. John A. Kirby, president; J. G. Butler, Jr., vice-president; Walter C. Lamb, secretary; Eugene Howell, treasurer; preceding officers, Hon. Francis Newlands, W. H. Blackburn and Arthur Kunze, directors. Organized 1906, under laws of South Dakota, with capitalization $1,500,000, shares $1 par. Lands, 23 claims, area circa 450 acres, in 3 groups, showing 4 practically parallel copper veins, widest 25′. Idle.

CONSOLIDATED JEFFERSON GOLD & COPPER MINING CO. UTAH.

Office: 221 Atlas Block, Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. A. W. Neiman, president; H. F. Wallstein, vice-president; Frank Rumel, secretary and treasurer; preceding officers, Julius Coop, C. I. Nicholson, Nicholas Schmittroth, A. Y. Reed and Jacob Coop, directors; F. W. Shule, superintendent. Organized June, 1902, under laws of Nevada, with capitalization $1,000,000, shares $1 par.

Lands, 49 claims, 7 fractional, and 40 acres placer grounds for a building site, in the Big Cottonwood district, having a 1,400′ tunnel, with about a quarter-mile of workings, showing sulphide ores, said to average circa 5% copper, with small silver values and high gold values. Equipment includes a good machinery plant and necessary mine buildings.

CONSOLIDATED KANSAS CITY SMELTING & REFINING CO. TEXAS.

Works, office: El Paso, El Paso Co., Tex. Is controlled, through stock ownership, by American Smelting & Refining Co., and is a branch of same.

CONSOLIDATED KING DEVELOPMENT & COLUMBIA COPPER MINING CO. ARIZONA.

Office and mine: Jerome, Yavapai Co., Ariz. Geo. W. Hull, president; H. E. Wilcox, secretary. Organized under laws of Arizona, with capitalization $6,000,000, shares $1 par. Lands, 34 claims, area 400 acres, in the Verde district, adjoining the United Verde on the south and east, showing several ore bodies carrying oxide, carbonate and sulphide ores, giving fair assay values in copper, gold and silver. Development is by a 400′ shaft and several tunnels, longest 1,750′. It is claimed that about $250,000 has been expended on the property. Idle for several years.

CONSOLIDATED LA SAL MINING & SMELTING CO. COLORADO.

Dead. Formerly at Cashin, Montrose Co., Colo. Fully described Vol. VI.

CONSOLIDATED MERCUR GOLD MINES CO. UTAH.

Office: P. O. Box C, Salt Lake City, Utah. Mine office: Mercur, Tooele Co., Utah. John Dern, president; Wm. M. Thompson, secretary; Geo. H. Dern, treasurer and general manager. Is a gold mine, but has tailings carrying thousands of tons of copper, which eventually may be recovered partially.

CONSOLIDATED MINES & DEVELOPMENT CO. ARIZONA.

Mine office: Globe, Gila Co., Ariz. Organized 1905, with capitalization $500,000, shares $1 par. Lands, 8 claims, at the head of Arkansas Gulch, 7 miles west of Globe, from which diamond drill cores have shown 6% ore, apparently from stringers in the ledge. A 45′ shaft is claimed to be bottomed in solid sulphide ore. Idle.

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CONSOLIDATED MINING & SMELTING CO. **NEW MEXICO.**

Mine office: Cerillos, Santa Fé Co., N. M. R. B. Thomas, manager; J. L. Wells, superintendent. Ores carry gold, silver, lead, zinc and copper, latter in small quantities, as a by-product. Property includes the Tom Paine, Albany and other mines, extensively developed and well equipped with gasoline and electric power. Has a 120-ton lead smelter.

CONSOLIDATED MINING & SMELTING CO. **UTAH.**

Dead. Formerly at Brigham, Box Elder Co., Utah.

CONSOLIDATED MINING & SMELTING CO. OF CANADA, LTD. **BRITISH COLUMBIA.**

Office: 49 Wellington St., Toronto, Ont. Mine office: Rossland, Trail district, B. C. Works office: Trail, Trail district, B. C. W. D. Matthews, president; Geo. Summer, vice-president; W. H. Aldridge, managing director; preceding officers, E. B. Osler, Chas. R. Hosmer, H. S. Osler, W. L. Matthews, J. C. Hodgson and F. P. Buck, directors; R. H. Stewart, mine manager; Jules Labarthe, smelter manager; John N. Turnbull, engineer.

Organized 1905, as Canadian Consolidated Mines, Ltd., and name changed, Jan. 1, 1906, to present title, with capitalization $5,500,000, shares $1 par; issued, $5,355,200. First quarterly dividend of 2.5% was paid April, 1906, and dividends, 1907, were $500,005. Annual meeting, fourth Tuesday in September.

Company is mainly a securities holding corporation, controlling, through stock ownership, the Centre Star Consolidated Mining Co., War Eagle Consolidated Mining & Development Co., Ltd., St. Eugene Consolidated Mining Co., Ltd., and the Rossland Power Co., companies in question being described separately under their respective titles. Also holds, under lease, the Snowshoe mine, at Phoenix, B. C., and owns the Richmond-Eureka mines at Sandon, B. C., Phoenix-Amalgamated, Crown Point and Iron Mask mines, at Rossland, and owns and operates the Canadian Smelting Works at Trail.

The reduction works include both copper and lead departments, and in addition to treating ores from the mines of the company, it does an extensive custom business, mainly on Rossland ores. In connection with the smelter, is an acid plant making sulphuric acid as a by-product.

The sampling plant, built 1906, includes a 100-ton Gates crusher, 3 Vezin automatic samplers and a Jones riffle sampler.

The copper smelter, of 1,650 tons daily capacity, has one 42x264" Bruckner furnace and five 42x240" Bruckner furnaces, taking a 32-oz. cold blast, with 24 Huntington-Heberlein pots. Ore and fluxes are handled in hopper-cars, drawn by three 10-h. p. electric locomotives. First fusion product is a matte of only 7 to 12% copper tenor, which is granulated and roasted in 2 O'Hara calciners, the 10 hand-roasters formerly used having been discarded. Calcined matte is briquetted, and resmelted to a matte of circa 50% average copper tenor. The roast department includes 6 Bruckner roasters. The second fusion matte is shipped to the Tacoma works, for conversion.

The lead smelter, of 350 tons daily capacity, has two 60x244" furnaces, and 6 Huntington-Heberlein calcining furnaces of 26' diameter. The lead plant includes an electrolytic lead refinery, handling silver-lead-zinc ores, which is the first ever built, and these works have turned out commercial lead assaying 99.997 fine, which means that 1 ton of lead carried only 1 oz. of impurities —a marvelously successful result. In connection with the lead refinery is an antimony plant, built 1907, which is designed to fill a promising field.

Power at the works is electric throughout, brought 30 miles, from Bonnington Falls, on the Kootenai river, a line current of 32,000 volts being stepped down to 550 volts at the smelter, where 1,000-h. p. is used by 16 motor units. Fuel at the smelter is coke.

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The company employs a total force of circa 1,400 men, at the various subsidiary mines and works, about 350 being at the smelter.

Operations, 1907, were hampered by two coal miners' strikes, severe weather and a serious fall in the market price of both copper and lead, notwithstanding which a very creditable record was made. For the fiscal year ending June 30, 1907, production was 3,433,310 lbs. copper, 20,380,083 lbs. lead, 1,100,271 oz. silver and 69,186 oz. gold. Receipts for fiscal year 1907, were $4,062,129 from smelter products, and $812,263 from ores sold. For fiscal year ending June 30, 1908, the works treated 305,956 tons of ore, producing 4,004,468 lbs. fine copper, 32,157,139 lbs. lead, 2,224,888 oz. silver and 121,380 oz. gold. The company controls valuable mines, and has a thoroughly modern and well equipped smelter that gives exceptionally successful results, with a strong and experienced management.

CONSOLIDATED MOUNT LYELL COPPER MINES, LTD. TASMANIA.

Dead. Formerly at Gormanston, Montagu Co., Tasmania.

CONSOLIDATED NICKEL, TIN & COPPER MINES, LTD. SPAIN.

Office: 6 Court Row, Guernsey, Eng. Ernest H. Williamson, chairman; J. Simon, secretary. Organized March 21, 1903, under laws of Guernsey, with capitalization £60,000; issued £53,480, partly full paid, partly part paid. Was organized to adopt an agreement with the Lerida Copper Mines, Ltd. Apparently moribund.

CONSOLIDATED STANLEY MINING & MILLING CO. COLORADO.

Dead. Succeeded by Stanley Mines Co. Formerly at Idaho Springs, Clear Creek Co., Colo.

CONSOLIDATED UNITED VERDE JUNIOR MINING CORPORATION. ARIZONA & COLORADO.

Office. Old Orchard, Me. Letter returned unclaimed from former mine office, Jerome, Yavapai Co., Ariz. Daniel L. Dean, president; F. A. Sidelinger, secretary and treasurer. Capitalization $2,000,000, shares $1 par. Lands are the Lucile group in the Wisconsin district of Gilpin Co., Colo. Arizona lands were lost. In debt and apparently moribund.

CONSOLIDATED VERDE MINING & MILLING CO. NEW MEXICO.

Dead. Organized Aug. 23, 1899, and reorganized Oct. 24, 1904, as Cimarron Mountain Mining Co. Formerly at Cimarron, Colfax Co., N. M.

CONSTANTINE COPPER MINING CO. WYOMING.

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VII.

CONSOLIDATED WHITE BEAR MINING CO., LTD. BRITISH COLUMBIA.

Mine office: Rossland, Trail district, B. C. J. J. Warren, superintendent. Ore is auriferous and argentiferous chalcopyrite, carrying values mainly in silver and gold, friable and sliming badly in concentration. Equipment includes a 150-h. p. Jenckes electric hoist and a 30-drill Rand compound air-compressor, driven by a 300-h. p. electric motor. Has a mill with 30 gravity stamps, having double-discharge mortars, 6 Wilfley tables and a 4-unit Elmore oil concentrator. Production, 1907, was 310 tons of concentrates and 2,641 tons of ore, carrying circa 100,000 lbs. fine copper. Formerly employed about 25 men. Closed down October, 1907.

CONSTELLATION CONSOLIDATED COPPER MINES. CALIFORNIA.

Mine office: Campo Seco, Calaveras Co., Cal. Idle.

CONSTELLATION GOLD MINES CO. OREGON.

Dead. Formerly at Sumpter, Baker Co., Ore.

CONSTITUTION CONSOLIDATED COPPER MINES. NEW MEXICO.

Office: care of Boody, McLellan & Co., 57 Broadway, New York, N. Y. Mine office: Lucero, Mora Co., N. M. Jas. R. Pitcher, president; R. Pitcher Woodward, vice-president and secretary; F. M. Andrus, treasurer; preceding officers, Hon. Frémont Cole and A. H. Hall, directors; S. W. Tyler, consulting

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engineer. Organized Apr. 24, 1906, under laws of Maine, with capitalization $3,000,000, shares $1 par. Lands, 400 acres, showing 3 parallel beds of slate or arenaceous shale, having an approximately north and south strike, with 3 minor ledges, main beds being 3′ to 8′ in thickness, carrying impregnations of malachite, chalcocite and bornite, occasionally weighing pounds, but occurring more commonly in masses of a few grains up to several ounces in weight. Veins extend nearly vertically, interbedded with limestone and arcose sandstone, the cupriferous shales containing both calcium carbonate and organic matter in appreciable quantities, probably accounting for precipitation of the copper ores. Apparently igneous rocks are lacking on the property, though these should exist if impregnations are to prove sufficiently rich to constitute ore of commercial grade. Ore is said to assay 3 to 20% copper, with net claimed average of at least 5% copper and $1 to $2 gold per ton, this estimate probably being too high. Development is by numerous pits and trenches, and by shafts of 230′ and 325′. Management is composed of men of excellent business and professional standing, but lacking mining experience. New Mexico has thousands of square miles of Permian red beds, carrying small percentages of copper, mainly of unworkable tenor. Future of the company is merely a question of the average copper contents of the shale beds, plus capital and management.

CONTACT COPPER CO. **MONTANA.**

Letter returned from former mine office, Helena, Lewis & Clark Co., Mont. N. H. Graeniling, superintendent. Organized 1906, with capitalization $40,000. Lands, in Colorado Gulch, circa 4 miles west of Helena, show a vein of 6′ to 8′ width, carrying slightly auriferous ore, giving average assays of 4 to 6% copper, from a 60′ shaft, showing ore from surface, which it is planned to sink to depth of 500′. Has gasoline power. Made, 1907, several small ore shipments.

CONTENTION MINING CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Ores carry gold, silver and copper values. Has steam and water power. Presumably idle

CONTINENTAL CONSOLIDATED MINING CO.

Office: care of Ben Blanchard, manager, Mayer, Ariz. Mine office: Salome, Yuma Co., Ariz.

CONTINENTAL COPPER CO. **SOUTH DAKOTA.**

Dead. Succeeded by Continental Copper Mining & Smelting Co. Formerly at Hill City, Pennington Co., S. D.

CONTINENTAL COPPER CO. **MEXICO.**

Dead. Reorganized, April, 1905, as Continental Mining Co. Formerly at Pánuco, Monclova, Coahuila, Mex. Fully described Vol. VI.

CONTINENTAL COPPER CO. **WYOMING.**

Dead. Formerly at Battle, Carbon Co., Wyo.

CONTINENTAL COPPER & GOLD MINING CO. **ARIZONA.**

Office: care of J. F. Halsted, secretary, County Recorder's office, Los Angeles, Cal. Mine office: Planet, Yuma Co., Ariz. Lands, 15 claims, on Bill Williams Fork river, in the northern part of Yuma county, on which a little development work has been done.

CONTINENTAL COPPER MINING CO. **WYOMING.**

Mine office: Battle, Carbon Co., Wyo. J. T. Brown, superintendent. Property, in the Cow Creek district, is said to show a large outcrop of quartz impregnated with copper sulphides. A crosscut tunnel, planned to cut the vein at depth, was started.

CONTINENTAL COPPER MINING & SMELTING CO. **SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Hill City, Pennington Co., S. D. A. C. Baxter, president and general manager; J. W. Horton, vice-president; W. J.

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Booth, secretary; H. M. Moore, treasurer; preceding officers, Thos. Sweeney, C. J. Buell, A. K. Gardner and C. H. Kinter, directors; A. C. Overpeck, superintendent. Organized March, 1907, under laws of South Dakota, with capitalization $3,000,000, shares $1 par, as successor of Continental Copper Co. Bonds, $600,000 authorized, at 5%; issued, circa $150,000, in denominations of $100, $200 and $500, "convertible into stock after company has been placed on a paying basis." Is a holding company, its only property consisting of two-thirds of the stock issue of the Dakota-Calumet Co., and property is described under title of latter.

CONTINENTAL COPPER SYNDICATE, LTD. **AUSTRIA.**

Dead. Liquidated Apr. 20, 1906. Floated the Mitterberg Copper Co., Ltd. Formerly at Innsbruck, Tyrol, Austria. Described Vol. VI.

CONTINENTAL GOLD MINING CO. **OREGON.**

Mine office: Nugget, Douglas Co., Ore. W. B. Stewart, president and general manager, at last accounts. Ore is an auriferous iron-copper sulphide, with values principally in gold. Was said, 1906, to be building a 50-ton concentrator.

CONTINENTAL MINES & SMELTING CORPORATION. **UTAH.**

Office: 505-52 Broadway, New York, N. Y. Operating office: 409 Dooly Bldg., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Wm. J. Robinson, president; Henry M. Crowther, vice-president and managing director; G. C. Van Alstyne, secretary and treasurer; Richard S. Smith, superintendent; Harry Lee, mine superintendent. Organized July, 1903, under laws of New York, with capitalization $1,500,000, shares $10 par. Is controlled, through stock ownership, by Unity Mines Co. Empire State Trust Co., New York, registrar.

Lands, 30 claims, partly patented, area 460 acres, and a 20-acre millsite. Property shows circa 20 contact deposits, between limestone and porphyry, of 1' to 40' width, giving assays of 2 to 35% copper, 10 to 48% lead, circa 7.5% zinc, 15 to 120 oz. silver and 60 cents to $5 gold per ton, from oxidized copper ores, galena and sphalerite. Lands formerly were held by the Lavinia, Grizzly Consolidated, Darlington and Regular mining companies, said to have produced upwards of $1,000,000 worth of ore. Mines were first opened circa 1864.

Mines have 5 shafts, deepest 200', and 9 tunnels, of 300' to 2,000' length, with total workings of circa 18,000', estimated by company to show 742,000 tons of ore, with 242,000 tons blocked out for stoping, which estimate is considered excessive.

Transportation is by a 5-mile Riblet aerial tram, greatly reducing the former freight cost of $1.75 per ton on outgoing ore, and $5 per ton on incoming fuel and supplies.

A 100-ton mill, built 1905, puts about 4 into 1, turning out concentrates said to carry circa 40% lead and 16 oz. silver per ton. Water from Little Cottonwood Creek actuates a direct-connected Pelton wheel.

Company paid, to end of 1905, eleven 2% dividends on issued treasury stock, amounting to $24,000, which apparently came from stock sales, and not from earnings, hence is regarded unfavorably.

CONTINENTAL MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Organized May, 1908, under laws of Idaho, with capitalization $1,250,000, shares $1 par, by John P. Gray, Jas. T. McCarthy, M. J. Flohr, A. H. Comer and Therres Towles. Lands are one claim.

CONTINENTAL MINING CO. **MEXICO.**

Office: care of City Brewery, San Antonio, Tex. Mine office: Mineral de Pánuco, Monclova, Coahuila, Mex. Otto Koehler, president; Otto Wahrmund,

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vice-president and general manager; Arthur L. Tuttle, general superintendent; A. H. Buck, mine superintendent; S. D. Bridge, auditor and sales agent. Organized April, 1905, as successor of Continental Copper Co. Ownership and management are practically the same as that of Jimulco Mining Co.

Property is extensive mines at Pánuco and Romero Rubio, including La Reforma group at latter point. Principal property is the Mina Pánuco, an antigua, opened circa A. D. 1700, and worked at intervals since. Mine, bought of the Pánuco Copper Co., Ltd., which was a badly mismanaged corporation, is circa 600′ deep, having a fissure vein in syenite, carrying mainly slightly argentiferous chalcopyrite, estimated by former owners as of 6% average copper tenor, but actually averaging about 4%.

Company owns a 71-kilometer railroad, from Monclova to Pánuco, with 3 locomotives, costing circa $300,000, and has invested about $1,000,000, all told. Largest production under former ownership, 1902, was 665 long tons fine copper. Production was begun circa July, 1907, by present owners, at rate of about 200 tons daily, shipped to Velardeña smelter, shipments being deflected, October, 1907, on closing down of Velardeña smelter, to the Aguascalientes smelter, when production was cut to about 3,000 tons monthly. Mine considered valuable and management good.

CONTINENTAL MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Fully described Vol. VII.

CONTINENTAL SMELTING & REFINING CO. **COLORADO.**

Dead. Became bankrupt June 5, 1907. Was successor of Saratoga Smelting & Refining Co. Formerly at Ironton, Ouray Co., Colo. Fully described Vol. VI.

COOKE & MONTANA MINING CO. **MONTANA.**

Office: Owsley Blk., Butte, Mont. Mine office: Cooke, Park Co., Mont. W. M. Kearns, president; Thos. Hicks, vice-president and manager; J. C. Fetig, secretary; Dr. Chas. M. Eddy, treasurer. Capitalization $250,000, shares $10 par. Lands, 4 claims, on Henderson Mountain, in the New World district, developed by a tunnel of circa 600′ length having a back of about 300′, showing ore assaying 13.6% copper, 34 oz. silver and $14 gold per ton. Has a power plant, smithy and cabins, and a second tunnel is planned. Property considered promising, though handicapped by lack of adequate transportation facilities.

COONEY HILL GOLD & COPPER MINING & MILLING CO. **WYOMING.**

Dead. Lands passed, 1907, to Emerald Mining Co. Formerly at Wheatland, Laramie Co., Wyo.

CO-OPERATIVE COPPER & GOLD MINING CO. **OREGON.**

Office: Rockford, Ills. Mine office: North Powder, Union Co., Ore. Mine, opened 1905, has a 180′ shaft, with indications of copper at bottom. Has gasoline power and electric light.

CO-OPERATIVE MINING CO. **WASHINGTON.**

Dead. Formerly at Berlin, King Co., Wash.

CO-OPERATIVE MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

COOSHEEN MINERALS, LTD. **IRELAND.**

Office: 5 Great Winchester St., London, E. C., Eng. Mine office: Schull, County Cork, Ireland. Sir Thos. Selby Tancred, Bart., chairman; Thos. Williams, Jr., secretary. Organized May 10, 1906, under laws of Great Britain, with capitalization £25,000, shares 5s. par; issued, £20,000, fully paid. Property is a 60-year lease, from March, 1906, at yearly rental of £30 and 30% royalty of net profits, of the Coosheen mine, area 329 acres. Property, formerly a copper producer, was reported upon favorably by J. Andrew Wauchope. Sir Thos. Selby Tancred, baronet, the chairman, is a guinea-pig, with a long

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record of connection with various stock companies that have proven the reverse of successful.

COPAQUIRE COPPER SULPHATE CO., LTD. CHILE.

Office: Bassishaw House, Basinghall St., London, E. C., Eng. Operating office: Casilla 266, Iquique, Chile. Mine office: Huatacondo, Copaquire, Tarapacá, Chile. H. P. Desham, chairman; H. Crewdson Howard, secretary; Richard Stanton, general manager; J. E. Gillmore, clerk. Organized May 19, 1900, under laws of Great Britain, and capitalization increased from £300,000 to £494,000, shares £1 par; issued, £309,082. Debentures, £20,000, first mortgage, at 6%, convertible at option of holders into shares at par, and £3,580 second-mortgage debentures, at 6%, similarly convertible. Has issued no financial statement since July 31, 1903.

Lands, 25 claims, area probably 25 hectares, in 2 groups. The Huiquintipa group of 13 claims at Huatacondo, carries dioptase and chrysocolla, these silicates of copper occurring as the cementing material in a conglomerate bed up to 85′ thick. Company estimates 6,000,000 long tons of 3.25% ore exposed.

The Copaquire group, which was the original property, has granite for country rock, showing an abundance of oxidized copper minerals, mainly copper sulphates and sub-sulphates averaging 2.5 to 3% in copper tenor. The management of the company always has stated that the deposits were natural bluestone, with some impurities mechanically mixed therewith, but, as a matter of fact, the ore deposits consist of a mixture of three different salts, very difficult of separation. Company's "experts" have estimated that the Copaquire deposits show upwards of 100,000,000 long tons of ore, worth £20,000,000. Development is by a 150′ shaft and about 1,000′ of open-cuts and trenches.

Equipment includes a 45-h. p. steam plant, warehouse, office and laboratory, of stone, to withstand numerous and severe earthquake shocks. The lixiviation plant, covering about 1 acre, is rated at 500 tons daily capacity, with a dehydrator for drying crystals of bluestone. Mine and leachery are connected by a 4,000′ tramline. Nearest railway is 70 miles distant, transport between being on the backs of mules, over rough mountain roads. Soft coal costs £8 15s. per ton, delivered, and this price being prohibitive, yareta is burned, mainly, for fuel. This is a gigantic club-moss, having a lob of resin, a single cluster occasionally weighing more than a ton.

The company ended 1905 about £30,000 in debt, but a proposed reorganization was voted down by shareholders. Reconstruction or bankruptcy seems inevitable. The property is not devoid of promise, but requires ample funds and technical ability in its management, if success is to be secured.

COPETE CONSOLIDATED COPPER CO. MEXICO.

Office: 1104-27 William St., New York, N. Y. Mine office: Pesqueira, Ures, Sonora, Mex. Col. Britton Davis, vice-president and managing director; Myra B. Martin, secretary and treasurer; preceding officers, Hollister Logan and Prof. Geo. A. Treadwell, directors. Organized 1906, under laws of West Virginia, with capitalization $1,000,000, shares $1 par.

Company was organized to finance the Copete Mining Co., under contract, and was to have one-half the net earnings therefrom, being practically an underwriting corporation for the Copete Mining Co. Company holds entire stock issue of Melczer Mining Co., which corporation holds direct title to the mines of the Copete Mining Co., this stock having been turned over by the Copete Mining Co., the former owner. The Copete Consolidated Copper Co. failed to comply with the consideration named in the transfer, which apparently was fraudulent, and suit has been instituted to set the matter right. Officers of the company are said to be creditors to the extent of $20,000, this being an old dodge of the Logan-Martin gang. Further particulars regarding the company will be found in description of the Copete Mining Co.

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COPETE & MELCZER MINING CO. MEXICO.

Dead. Succeeded (its only success), circa 1900, by Copete Mining Co. Formerly at Pesqueira, Ures, Sonora, Mex.

COPETE MINING CO MEXICO.

Office: 1104-27 William St., New York, N. Y. Mine office: Pesqueira, Ures, Sonora, Mex. Myra B. Martin, secretary; Chas. S. Speaker, general manager. Organized 1900, under laws of West Virginia, with capitalization $5,000,000, shares $5 par. Company apparently has invested about $1,000,000, but it is impossible to state how much of this has been diverted from legitimate channels of expenditure.

The Copete Mining Co. formerly owned the entire stock issue of the Melczer Mining Co., which holds direct title to the Copete lands, but this stock was turned over, Apr. 10, 1906, to the Copete Consolidated Mining Co., which promised sufficient money to put the property on a dividend basis, but failed to furnish same. Suit has been instituted in connection with this transfer, which apparently was fraudulent, Hugh M. Creighton, Lock Box 1398, New York, being in charge of the investigation for a shareholders committee. Under the transfer arrangement the Copete Mining Co. was to pay back to the Copete Consolidated money loaned, with interest at 6%, and any proceeds, through sale of stock of the Melczer Mining Co., was to be divided equally between the Copete Mining Co. and the Copete Consolidated Copper Co. The agreement between the two companies was signed by Myra B. Martin, a notorious petticoat grafter, as secretary for Copete Consolidated Copper Co., and by the late "General" Walter S. Logan, an equally notorious grafter of the other sex, now dead, for the Copete Mining Co. Apparently the Copete Mining Co. has been stripped of everything by the action of its officers, its only assets having been the stock of the Melczer Mining Co. The property is described under title of Melczer Mining Co.

The Copete Mining Co is a deliberate swindle, which has taken large sums from deluded shareholders, and its promoters, except Logan, who is dead, should be punished for their frauds.

COPIAPÓ MINING CO., LTD. CHILE.

Office: 138 Leadenhall St., London, E. C., Eng. Mine office: Copiapó, Atacama, Chile. Nicol Brown, chairman; preceding officer, Albert Straube, H. Loeffler, J. A. D. Hancke and Henry von Berg, directors; W. Hoeltzer, general manager; W. S. Bartlett, secretary. Organized June 21, 1836, under laws of Great Britain, and capitalization increased March, 1899, to £250,000, and later to £300,000, shares £2 par; issued, £225,000. Debentures, £50,000 authorized, February, 1907, in denominations of £100, convertible into shares at par. Last dividend, 1903, was 1s. 6d.

Lands include groups of mines in the valley of the Rio Copiapó, and at Puquios, also a half interest in the Republicana mine and a large hacienda near Copiapó. The company owns 1,200 meters of the strike of 6 veins, having development for circa 500 meters horizontally, with average development of approximately 400 meters depth. The Copiapó was one of the first British mining companies to operate in Chile.

The Dulcinea mine, at Puquios, on which work is now centered, was opened 1854, and has been, for some years, the largest copper producer of Chile. The mine is very deep, the Fletcher or main shaft being 960 meters deep on the incline, or 870 meters vertically, being the deepest in South America. The Weir shaft was 1,200' deep in 1906. Greatest extent of longitudinal workings is 1,642'. The Dulcinea has 2 parallel veins traceable 8 to 10 kilometers, with strike N. 60° E. and dip of 65°, separated by 8 to 10 meters of decomposed talcose porphyry. Veins average about 5' in width, with occasional enlarge-

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ments up to 20′ and even 25′, and one vein, in the bottom workings, is said to be circa 8′ wide and to average 11% copper. The oxidized zone, of about 220 meters depth, carries ores averaging circa 3.8 oz. silver with fair gold values, and occasional cerussite and wulfenite. The sulphide zone carries mainly chalcopyrite and cupriferous pyrite, with very small gold and silver values, having a gangue of quartz and occasional calcite. The mine makes very little water, but lower workings are very hot, and there was a serious mine fire, 1905, from spontaneous combustion. Ore reserves, to the 450-fathom level, are mainly depleted, and of rather indifferent grade, with a better showing below the 480-fathom level, the south drift on this floor showing a 3′ vein of 15% ore, average tenor of ore extracted, 1905, having been 14.8% copper.

The Descubridora mine, in the Checo district, opened 1825, was the company's original property, but produced, 1905, only 658 long tons of ore, as compared with 10,160 metric tons in 1903, and is now idle.

The Ojancos group, at Ojancos, Atacama, includes the Carmen Alto, San Francisco and Antonio mines. As a whole, this group has proven disappointing, and is now idle, though the Carmen Alto and San Francisco produced 30,470 metric tons of ore of good average grade in 1903. The Carmen Alto has a 400′ main shaft. The San Francisco has a 350′ main shaft, and ore produced, 1905, averaged 16% in copper tenor. The Antonio is as yet in the development stage. The Republicana was showing poorly, when closed down, and has been idle some years.

There is a 5,808-meter aerial tram from La Dulcinea to Llanos de Varas, whence ore is taken by cart to the works.

The concentrator, at Puquios, has 4 crushers, 2 Wilfley tables and other washing machinery, but has not given satisfactory work, losses in tailings being unduly large. There are extensive old dumps of low grade ore, estimated at 60,000 metric tons averaging 4.61% copper, and this ore is being treated at the new mill.

The works include an extensive lixiviation plant, near the mill, where oxidized ores of low average tenor are treated.

In 1903 the Dulcinea mine produced 14,850 metric tons of ore, averaging 15.54% copper, which was about 7% of the total production of Chile, and was the largest output made by any mine in the Republic. Production of the company was 3,131,520 lbs. fine copper in 1904, but, owing to damage from fire, was only 2,515,520 lbs. in 1905, and is estimated at 3,500,000 lbs. for 1907.

COPPER AGE & EDISON MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. C. J. Heidenrich, president and general manager. Organized 1906, under laws of Washington, with capitalization $250,000. Lands, 12 claims, 4 miles south of Saltese, lying just east of the Monitor and Richmond mines and carrying extension of the ledge of latter. Mine, opened December, 1906, has a 700′ tunnel cutting a 6′ vein of chalcopyrite giving assays up to 29.1% copper, with fair gold values.

COPPER AGE MINING & SMELTING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo. Described Vol. VII.

COPPER APEX MINING CO. **UTAH.**

Office: Salt Lake City, Utah. L. B. Wright, president; D. G. Scott, vice-president; A. A. Pike, secretary; Sherman Fargo, treasurer. Organized, 1906, to develop a group of claims in the Scott Hill district, between the Big Cottonwood and Uintah districts, in Summit county, Utah. Development is by a shallow shaft, showing argentiferous copper ore of good grade.

COPPER BAR MINING CO. **NEW MEXICO.**

Dead. Formerly at Organ, Donna Ana Co., N. M. Fully described Vol. VI.

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COPPER BAR MINING CO. **WYOMING.**

Office 206 Burr Blk., Lincoln, Neb. Mine office: Saratoga, Carbon Co., Wyo. W. J. Crane, president; H. M. Stratton, vice-president; Geo. E. Hibner, secretary and general manager; Fred Williams, treasurer; preceding officers, H. Schoettger, Fred Echenkamp and Ernst Hoppe, directors; J. B. Hassett, mine manager.

Lands include the original holdings, now idle, on Cow Creek, near Rudefeha, and the Charter Oak group of 14 claims, 5 patented, bought 1908, on California Creek, circa 16 miles southwest of Saratoga.

The Charter Oak mine, having a 488' main shaft, has circa 2,200' of workings. Development under former owners was misdirected, the shaft having been sunk at right angles to the vein. The Charter Oak has a shallow zone of oxidation, succeeded by sulphides in a schistose gangue, latter claimed to average 12% copper, several ounces silver and $6 gold per ton, with upward of 300,000 tons of ore blocked out, but these figures, made by the former owners, are greatly exaggerated. Has steam power and shipped a little ore, 1907. Property considered promising.

COPPER BASIN GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz. Described Vol. V.

COPPER BASIN MINING CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Ariz., Organized 1907, under laws of Arizona, with capitalization $1,250,000, by J. H. Brodrick, William Little and W. A. Hurst. Lands, 17 claims, adjoining the Commercial Mining Co., having a 140' shaft, showing auriferous and argentiferous copper ore.

COPPER BASIN MINING CO. **ARIZONA.**

Mine office: Yuma, Yuma Co., Ariz. Presumably idle.

COPPER BASIN MINING CO. **COLORADO.**

Office: care of B. B. Harlan, president, Chicago, Ills. Mine office: Placerville, San Miguel Co., Colo. Milton Evans, superintendent, at last accounts. Lands, 15 claims, opened by shaft. A carload of ore shipped to smelter returned 14% copper and $2.50 gold per ton. Idle for several years.

COPPER BASIN MINING & SMELTING CO. **NEVADA.**

Office: 45 Wells St., New York, N. Y. Eleanor Rawls-Reader, president and treasurer; Carroll D. Galvin, managing director; J. Mitchell Galvin, fiscal agent; Earle H. Matthis, superintendent; Chas. F. DeArmond, manager. Organized 1907, under laws of Maine, with capitalization $6,000,000, shares $1 par. Is controlled, through stock ownership, by Cerro de Pasco Tunnel & Mining Co. Lands were 20 claims, on Bald Mountain, in the southern end of the Ruby range, White Pine county, Nevada. Company claimed that these mines resembled both the Butte mines and the United Verde, which seems rather remarkable. Did a little development work, by shaft and 4 tunnels, and planned—in advertisements—a smelter, promising $600,000 net earnings yearly when smelter was built, but fell behind with pay-roll and lost lands. Moribund.

COPPER BELLE MINING CO. **ARIZONA.**

Office: 43 Wooster St., New York, N. Y. Mine office: Gleeson, Cochise Co., Ariz. Peter Quinn, president; Elie J. Monense, vice-president; preceding officers, Henry G. Mayer, Frank H. Hereford and Geo. E. Crawford, directors. Organized 1904, with capitalization $1,000,000, as a reconstruction of a company of the same name, which became bankrupt, circa 1903, under suspicious circumstances.

The mine was developed by John Gleeson, with fairly satisfactory results, but the eastern management foolishly superseded Gleeson, and began a policy of lavish expenditures that ruined the first company, and a continuation of which ruined the present company. Gleeson retired, taking a mortgage on the property for his interest, and considerable sums in cash were borrowed of

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Martin Costello. Property was leased, 1906, to the Shannon Copper Co., under a $1,500,000 bond. Judgment was rendered, June, 1907, for $272,299.04, in favor of Paine, Webber & Co., of Boston, for money advanced, secured by note. Minority shareholders intervened, alleging fraud in that the note lacked consideration, and a 30-day stay was granted. Property was sold, July, 1908, to satisfy a mortgage held by Martin Costello, and was bid in, by Nathan L. Amster, president of the Shannon Copper Co., presumably for that corporation. Company is hopelessly bankrupt, having reaped as it sowed.

COPPER BELLE MINE. **ARIZONA.**

Mine office: Gleeson, Cochise Co., Ariz. Nathan L. Amster, general manager; Geo. K. Reed, superintendent. Mine, formerly owned by Copper Belle Mining Co., was bought, at sheriff's sale, July 25, 1908, for circa $90,000, by Nathan L. Amster, presumably representing the Shannon Copper Co., which took the mine, September, 1906, under a $1,500,000 bond and lease.

Lands, 8 claims, in the Turquoise district, having a 2-compartment 200' shaft, showing ore claimed by former owners to average 7% copper, which is an overestimate, with fair gold and silver values.

The smelter, of 50 tons daily capacity, is a mistake, and of no value whatever. This formerly produced a 30% matte.

Mine employs circa 35 men, and, first half of 1908, shipped circa 2 carloads of ore daily. Production, 1907, was 64,982 lbs. fine copper, 20,843 oz. silver and 307 oz. gold. Property considered promising, and now in strong hands.

COPPER BELL MINING CO. **UTAH.**

Mine office: Brigham, Box Elder Co., Utah. F. M. Bishop, president; J. W. Duffield, vice-president; Alonzo Young, treasurer; Wm. Crabbe, secretary. Organized 1907, under laws of Utah, with capitalization $50,000, shares 10 cents par. Presumably idle.

COPPER BELLE MINING CO. **WASHINGTON.**

Dead. Lands sold, 1901, to Bunker Hill-Sullivan Mining Co. Formerly at Index, Snohomish Co., Wash.

COPPER BELL MILL & MINING CO. **MONTANA.**

Dead. Lands sold by sheriff Jan. 10, 1905, afterward going to Calumet & Montana Mining Co. Formerly at Clinton, Missoula Co., Mont., and Red Rock, Beaverhead Co., Mont.

COPPER BELL MINING & MILLING CO. **UTAH.**

Office: care of John P. Anderson, president, Springville, Utah. Mine office: Ibapah, Tooele Co., Utah. Robert Hutchinson, vice-president; T. R. Kelly, secretary and treasurer; preceding officers, Jas. Oakley and C. D. Palfreyman, directors. Organized 1906, with capitalization $50,000, shares, 25c par. Lands, in the Dugway district, are opened by a 112' shaft showing lead and copper ores said to assay up to $100 per ton in value.

COPPER BELT MINES CO. **WYOMING.**

Office: 407-135 Adams St., Chicago, Ills. Mine office: Lusk, Converse Co., Wyo. Edwin Hall, president; E. S. Averill, vice-president; Arthur A. Taylor, secretary and treasurer; preceding officers, B. L. Paine and Peter Nickell, directors. Organized June 25, 1906, under laws of Wyoming, with capitalization $2,000,000, shares $1 par; issued, $1,400,456. Property is held subject to an unpaid balance of $50,000, due the Copper Belt Mining & Milling Co., on Oct. 25, 1910, without interest. Company owns a controlling interest in the Lucky Strike Mining & Smelting Co.

Lands, 35 claims, area circa 600 acres, of which about 100 acres are timbered, with running water on the property, in the Rawhide Buttes district, 12 miles south of Lusk, the nearest railroad point. Property shows 4 parallel veins, 2 traceable nearly a mile, developed by a 620' main shaft and a 520' tunnel intersecting on the 400' level, with circa 1,400' of workings at this

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point, there also being 250′ tunnel and several shallow shafts with circa 2,400′ of workings, all told, showing ore assaying 3 to 60% copper, with small silver values, and $1.40 to $12 gold per ton, company estimating its ore to average circa 7% copper, mainly from carbonates to depth of nearly 600′, followed by sulphides in limonite.

Equipment includes a 54-h. p. Fairbanks & Morse gasoline engine, a 1,500′ hoist and a 5-drill Franklin air-compressor, with machine-shop, smithy, engine-house and several other small mine buildings.

The advertising done by this company, at the time of its flotation, was grossly exaggerated and highly censurable. These advertisements claimed that the Homestake gold mine, in the adjoining state of South Dakota, is apparently on the same ledge, which is one of the most remarkable geological discoveries of the century. Advertisements also stated that history does not record a single instance of a copper mine pinching out, which would be important, if true. Company's advertisements claim that the mine has enough ore to keep it going for centuries, which undoubtedly is correct, if progress is no more rapid in the future than formerly. Company figures, in advertisements, that on a product of 500 tons daily, a $100 investment should yield $1,500 yearly. It might be added that on an output of 500,000 tons daily the annual dividend from a $100 investment should be $1,500,000. When estimating possible profits it always is well to take the highest possible figures, as these are just as easy to make, and are more pleasing to the "investors" who buy lithographed stock certificates, on the basis of such estimates.

COPPER BELT MINING CO. **UTAH.**

Dead. Formerly at Marysvale, Piute Co., Utah. Fully described Vol. VII.

COPPER BELT MINING & MILLING CO. **WYOMING.**

Office: Grain Exchange, Omaha, Neb. Mine office: Lusk, Converse Co., Wyo. Edw. M. Weston, president; Wm. B. Parsons, vice-president; A. H. Merchant, secretary and treasurer; Edwin Hall, manager. Property was sold to Copper Belt Mines Co., and apparently only asset is a balance on purchase price of $50,000, due Oct. 25, 1910, from the Copper Belt Mines Co.

COPPER BLUSH MINING CO. **COLORADO.**

Mine office: Jamestown, Boulder Co., Colo. S. C. Bashor, president. Lands, on Longfellow Hill, show milling ores said to carry stringers of high-grade copper tellaride.

COPPER BOND COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized 1907, under laws of Arizona, with capitalization $1,500,000. Lands, west of the Veteran mine, are said to have been prospected with a 6" churn drill, which is said to have struck ore assaying 18% copper and $2 to $20 gold per ton.

COPPER BOTTOM MINING & REDUCTION CO.

Letter returned from former office, Pueblo, Colo. Organized 1906, under laws of Colorado, with capitalization $2,000,000, by Thos. M. Bowen, R. F. Lytle, O. H. P. Baxter, M. P. Bowen and Henry C. Royce. Location of lands, if any, unknown.

COPPER BOY CONSOLIDATED MINING & MILLING CO., WASHINGTON.

Mine office: Valley, Stevens Co., Wash. Lands, 20 claims, showing ore assaying up to 4.5% copper and $5 to $20 gold per ton, with gross average values of about $10 per ton. Is said to plan a 50-ton mill.

COPPER BULLION MINING CO. **ARIZONA.**

Dead. Formerly at Pearce, Cochise Co., Ariz. Fully described Vol. VI.

COPPER BULLION MINING CO. **UTAH.**

Office: care of J. N. Christensen, president, Provo, Utah. Robt. Anderson, secretary; P. P. Hindmarsh, treasurer. Organized 1907, with capitalization

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$1,000,000, shares 5 cents par. Lands, 13 claims, in the Santaquin district of Utah.

COPPER BULL MINING CO. COLORADO.

Offices: 211 North 7th St., St. Louis, Mo., and Lock Box 507, Pueblo, Colo. Mine office: Walsenburg, Huerfano Co., Colo. Chas. R. Mason, president; Isaac M. Mason, secretary and treasurer; Chas. O. Unfug, general manager; H. S. McIntyre, superintendent. Organized 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 32 claims, patented, area 320 acres, on Copper Bull Mountain, showing five 7′ fissure veins, carrying oxide ores, with claimed values of 10% copper, 2 oz. silver and $80 gold per ton, which is much too high. Has shafts of 202′ and 238′, and tunnels of circa 300′ and 700′. Has 4 mine buildings and has been said to be erecting an 80-ton smelter. Advertising was deceptive and company is not regarded favorably. Idle and presumably moribund.

COPPER BUTTE MILLING CO. IDAHO.

Office; Ninde Bldg., Ft. Wayne, Ind. Mine office: Weiser, Washington Co., Idaho. O. P. Eversole, secretary; J. Harvey Allen, superintendent. Was offering, February, 1908, an issue of $600,000 ten-year 6% bonds, with 100% stock bonus, subject to redemption at 106, after 3 years. Lands, apparently 1 claim only, with millsite and water right, including the Peacock mine, formerly held by Peacock Copper Co., held under 10-year lease, circa 3 miles from the Snake river and about 50 miles northwest of Weiser, the nearest railroad point, connected therewith by a fair wagon road. Mine, discovered 1869, with about 1,500′ of openings, is said to have about 100,000 tons of ore of all grades in sight, and shipped, by wagon, under former ownership, a little ore of 40 to 70% copper tenor. It is claimed to have shipped about 15,000 tons of high-grade ore, and to have, on the dumps, upwards of 100,000 tons of ore averaging 6% copper, with small gold and silver values. Ten shipments, 1903, to Bingham smelter, returned 13.3 to 18.3% copper, from 3 to 5 oz. silver and from nothing to $1.33 gold per ton, and 11 shipments to Oregon Smelting & Refining Co. gave returns of 20.5 to 40.2% copper, 1.15 to 8.7 silver and $1.20 to $3.40 gold per ton. A 50-mile narrow-gauge railroad, from Council to the Peacock mine, has been planned by other interests. Company's prospectus states that this property includes the purchase of a 200-ton smelter near the Weiser river, on a tract of circa 550 acres, with townsite and available water power. The Peacock is a high-grade mine of much promise, but is handicapped by lack of adequate transportation facilities.

COPPER BUTTE MINES. ARIZONA.

Office: 523 Lyceum Bldg., Duluth, Minn. Mine office: Phoenix, Maricopa Co., Ariz. Capt. Harry Roberts, president and general manager; Geo. H. Abeel, vice-president; Benj. C. Shelden, secretary; Henry W. Knoche, treasurer. Organized July 21, 1900, under laws of Arizona, as the Arizona Copper Mountain Mining Co., name being changed, June, 1904, to present title, with capitalization $6,000,000, shares $10 par.

Lands, 34 claims, unpatented, and a 5-acre millsite, on the Gila river, in the Walnut Grove district of Pinal county, Arizona, with a good wagon road 1½ miles from mine to the Phoenix & Eastern railway. Property shows granite and limestone, intruded by an immense cupriferous breccia, of 1,300′ to 3,000′ width, traceable circa 7,000′, carrying oxidized ores for some little depth, with sulphides shown in lowest workings. Average of 39 assays was 7.39% copper and circa $2 gold per ton, but actual extraction would be very much lower.

Property was worked, 1879-1881, for silver. Present development is by about twenty 15′ pits, 6 shafts of 30′ to 60′ depth, and shafts of 175′ and 465′, also by 6 tunnels, longest 275′ and 300′, with circa 2,000′ of workings, estimated by management to show 5,000,000 tons of ore.

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Equipment includes a 60-h. p. steam plant, with 2 hoists, a 20x30′ machine-shop and 2 bunk-houses.

Production, for year ending July, 1907, was circa 650 tons of ore, of 7.5% average copper tenor, equal to about 100,000 lbs. fine copper. Suspended work October, 1907, on account of the low price of copper. Property considered promising and management good.

COPPER BUTTE MINING CO. **SOUTH DAKOTA.**

Mine office: Custer, Custer Co., South Dakota. Idle.

COPPER BUTTE MINING CO. **WASHINGTON.**

Mine office: Orient, Ferry Co., Wash. J. D. Gampper, president; H. J. Miller, secretary; Willis Townsend, general manager. Organized December, 1905, under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, patented, in the Pierre Lake district south of Orient, opened by 4 pits and shafts of 10′ to 75′ depth, with about 700′ of workings, showing a little low-grade ore, with some ore giving good assays.

COPPER BUTTES CONSOLIDATED MINING & SMELTING CO. **CALIFORNIA.**

Dead. Formerly at Bagdad, San Bernardino Co., Cal. Fully described Vol. VII.

COPPER CAÑON MINING CO. **NEW MEXICO.**

Mine office: Abiquiu, Rio Arriba Co., N. M. J. E. Irvine, superintendent. Lands, 100 acres, undeveloped. Idle several years.

COPPER CANYON MINE. **BRITISH COLUMBIA.**

Mine office: Mt. Sicker, Vancouver Island, B. C. Lands, sundry claims near the foot of Mt. Sicker, in the Nanaimo district, opened by 2 tunnels, cutting a 4′ vein of good ore. Idle several years.

COPPER CANYON MINING CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Arizona. S. T. Allen, president; L. T. Carr, vice-president; E. A. Girvin, secretary; C. A. Westenberg, treasurer; preceding officers, J. F. Littlefield, C. H. Haight and Wilbur Treadwell, directors. Organized under laws of Arizona, circa 1905, with capitalization $15,000,000, shares $1 par. Lands, 5 claims and a millsite, in the Black Canyon district, formerly held by the Black Canyon Copper Co., Ltd., which went out of business without paying its debts. Claims considered promising, but capitalization is excessive, and company is not regarded with favor. Idle and apparently moribund.

COPPER CAVE MINING CO. **WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. J. F. Crawford, manager. Idle several years and apparently moribund.

COPPER CENTER MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho.

COPPER CENTURY MINE. **ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. Geo. A. Lonsberry, superintendent. Ores are argentiferous copper, lead and zinc sulphides. Has gasoline power. Idle.

COPPER CHIEF MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Arthur Hendy, superintendent. Lands, near the Equator, circa 5 miles south of Jerome, show a large body of auriferous and argentiferous copper ore, and mine is claimed to have upwards of $3,000,000 worth of ore blocked out, which is a serious overestimate. Ore is pyritic and difficult of reduction. Property is developing slowly, but is considered of some promise.

COPPER CHIEF MINING CO. **MONTANA.**

Mine office: Borax, Saltese Co., Mont. J. H. Nordquist, president; Otto Freeman, secretary and treasurer. Lands, 11 claims, in the St. Joe district,

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supposed to carry the extension of the Bullion vein, which company plans to open by a crosscut tunnel, at circa 700′ depth.

COPPER CHIEF MINING CO. NEW MEXICO.

Dead. Succeeded, 1903, by Sater Copper Co. Formerly at Clayton, Union Co., N. M. Described Vol. III.

COPPER CHIEF MINING CO. WASHINGTON.

Office: Everett, Wash. Mine office: Index, Snohomish Co., Wash. Lands, 4 claims, between Galena and Mineral City, in the Silver Creek camp, having a 600′ tunnel showing an 8′ vein with a 2′ paystreak. Idle.

COPPER CHIEF MINING CO., LTD. MONTANA.

Office: 604 The Rookery, Spokane, Wash. Letter returned unclaimed from former mine office, Dillon, Beaverhead Co., Mont. H. A. Fesselman, president; J. S. Graves, vice-president; F. M. Longshore, secretary and general manager; F. M. Dudley, treasurer. Organized June, 1901, under laws of Washington, with capitalization $375,000, shares 25 cents par. Lands, 7 claims, area 130 acres, in the Silver Star district of Madison county, Montana. Country rocks are granite and limestone, showing 5 contact veins, with some work on each, mine having 9 pits and shafts of 10′ to 112′ depth. Main vein, estimated by company to average 10′ width, shows carbonates at surface, with chalcocite and chalcopyrite at a little depth, giving average assays of 10% copper, 2 to 5 oz. silver and $1.60 to $31 gold per ton. Has a 40-h. p. hoist, good for 1,000′, and necessary mine buildings. Idle.

COPPER CITY MINE. ALASKA.

Office: Coppermount, Prince of Wales Island, Alaska. Lands, sundry claims on the beach, at Cordova Bay, 6 miles south of Coppermount. Has fair mine buildings, and shipped some good ore to the Crofton smelter, circa 1905. Presumably idle.

COPPER CLIFF MINES OF MONTANA, LTD. MONTANA.

Office: 8 Broad Street Avenue, London, E. C., Eng. Mine office: Elliston, Powell Co., Mont. S. E. Illingsworth, chairman; B. S. Illingsworth, mine manager; A. Hebden, secretary. Organized Sept. 11, 1903, under laws of Great Britain, with capitalization £200,000, shares £1 par, in £65,000 "A" preference shares and £135,000 common shares, preference shares taking all profits up to par value of stock, after which preferred becomes common stock. Issued, £30,282. Lands, 140 acres, bought of the Copper Cliff Mining Co., having an 186′ shaft and tunnels of 300′, 500′ and 800′, showing contact veins of fair width, carrying oxide, carbonate and sulphide ores, which are claimed to give average assay values of 10% copper and $10 gold per ton. Claims ore reserves of 72,140 long tons.

COPPER CLIFF MINING CO. ARIZONA.

Dead. Lands sold, 1902, to Catalina Copper Mining Co., also dead. Formerly at Tucson, Pima Co., Ariz.

COPPER CLIFF MINING CO. BRITISH COLUMBIA.

Office: Seattle, Wash. Mine office: Heriot Bay, Nanaimo district, B. C. Wm. Simison, president and general manager; C. W. Carter, secretary. Organized 1906, presumably under laws of Washington, and registered under laws of British Columbia as an extra-provincial company, with capitalization $10,000, shares $1 par. Property, on Heriot Bay, Valdes Island, has a strong ledge, with a paystreak of about 10′ of chalcopyrite, of smelting grade, with considerable development. Shipped 120 tons of ore, 1906, to the Tyee smelter.

COPPER CLIFF MINING CO MONTANA.

Dead. Succeeded, Sept. 11, 1903, by Copper Cliff Mines of Montana, Ltd. Formerly at Elliston, Powell Co., Mont.

COPPER CLIFF MINING CO. SOUTH DAKOTA.

Dead. Formerly at Rochford, Pennington Co., S. D. Described Vol. VI.

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COPPER CLIFF SYNDICATE, LTD.

Office: 14 Queen Victoria St., London, E. C., Eng. Organized Oct. 17, 1906, under laws of Great Britain, with capitalization £5,000, in 4,900 ordinary shares of £1 par, and 2,000 deferred shares of 1s. par, to acquire copper mines in the United States. Location of lands, if any, unknown.

COPPER COBRE MINING CO. **ARIZONA.**

Dead. Succeeded by Bradshaw Mountain Copper Mining & Smelting Co., also dead. Formerly at Middelton, Yavapai Co., Ariz.

COPPER COMPANY OF ARIZONA. **ARIZONA.**

Dead. Was organized circa 1907, under laws of Arizona, with capitalization $1,000,000, shares $5 par, as reconstruction of the Arizona Amalgamated Copper Company, and was reorganized, circa 1907, as the Coppermines Company of Arizona. Formerly at Clifton, Graham Co., Ariz.

COPPER COMPANY OF BRITISH COLUMBIA, LTD. **BRITISH COLUMBIA.**

Office: 11 Grocers' Hall Ct., London, E. C., Eng. Formerly in the Kootenay district of British Columbia. Moribund.

COPPER CONCENTRATING CO. **MICHIGAN.**

Dead. Succeeded August, 1907, by Mason Manufacturing Co., entire stock of which is owned by Houghton Concentrating Co. Formerly at Houghton, Houghton Co., Mich. Very fully described Vol. VII.

COPPER CORPORATION OF CHILI, LTD. **CHILE.**

Dead. Voluntarily liquidated, December, 1906. Lands sold to Las Animas Copper Mining & Smelting Co., Ltd. Formerly at Las Animas, Chañaral, Atacama, Chile. Described Vol. III.

COPPER CREEK CONSOLIDATED COPPER CO. **ARIZONA.**

Dead. Lands were sundry claims between the Brooklyn and Rosalie, circa 25 miles east of Mayer, in the Black Hills range. Formerly at Big Bug, Yavapai Co., Ariz.

COPPER CREEK CONSOLS, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Ashcroft, Yale district, B. C.

COPPER CREEK DEVELOPMENT CO. **ARIZONA.**

Mine office: Hillside, Yavapai Co., Ariz. Lands, 35 miles northeast of Hillside, opened by tunnel, are said to show ore of good average tenor, with copper values increasing at depth.

COPPER CREEK MINING CO. **ARIZONA.**

Office: 407 Metropolitan Bldg., Minneapolis, Minn. Operating office, Tucson, Ariz. Mine office: Copper Creek, Graham Co., Ariz. Frank J. Sibley, president and general manager; Chas. H. Robinson, vice-president; John E. Wright, secretary; R. Roy Sibley, treasurer and superintendent; preceding officers, M. W. Atwood and D. C. Reynolds, directors; W. H. Salisbury, mine foreman; C. N. Carter, mill superintendent; C. S. Gelser, engineer; F. Fay Sibley, master mechanic. Organized June 18, 1903, under laws of Arizona, with capitalization $2,000,000, shares $1 par; issued, $1,725,000. On Aug. 1, 1908, cash on hand was $9,500, with $30,500 cash due the company. Paid, July, 1904, to July, 1905, inclusive, 5 quarterly dividends of 1½% on preferred stock, amounting to $1,735.69, but preferred stock apparently since retired, very wisely, as no mining company has any business to pay dividends except from earnings.

Lands, 80 claims, area 1,500 acres, also 300 acres in mill and smelter sites, 14 miles east of Mammoth, in the Bunker Hill district of the Galurio Mountains. Country rock is diorite, with immense porphyritic intrusions, showing a large number of ore bodies, occurring as fissure veins in rhyolite and as contact deposits between rhyolite and porphyritic rocks, 3 ore bodies being under development. Property is in 3 groups, the upper group, of circa 800 acres, near the apex of the Galurio Mountains, showing rhyolite and basalt, with fissure

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veins carrying cuprite, melaconite, malachite, chalcocite and chrysocolla. The Middle Basin group, area circa 500 acres, shows 3 strong hematite gossans, carrying copper, along a granite-porphyry and limestone contact. The lower camp, 2 miles from Middle Basin, shows mainly diorite, ore being principally chalcopyrite, with small quantities of chalcocite and cuprite. The Sioux Chief group shows an outcrop traceable one-half mile, vein carrying chalcocite said to have given mill returns on test of 40% copper and 50 oz. silver per ton. Property includes a water-right, 16 miles from the mines, estimated to be capable of developing 500 h. p. at low stage of water.

The mines have shafts as follows: Sioux Chief, 220′; Iroquois, 232′; American Eagle, 300′. There are tunnels as follows: the Pettit, 718′; Ute Chief, 300′, and on the American Eagle group, the Upper, Middle, Lower and No. 1 tunnels, with combined length of 800′. The mines have circa 7,000′ of workings, with 55 different openings, estimated to put 500,000 tons of ore in sight, with 150,000 tons blocked out for stoping.

Equipment includes a 240-h. p. steam plant, 200-h. p. electric plant and a 60-h. p. gasoline plant, with 1 gasoline and 3 electric hoists, largest of latter, of 82 h. p., good for 1,000′ depth, having a hoisting capacity of 5,000 lbs. at 600′ per minute. Machinery includes a 3-drill Rand air-compressor.

There are about 50 buildings including an engine house, boiler-house, smithy, machine-shop, warehouse, a 52x60′ stone store, and dwellings for employes.

A 200-ton concentrator, of wood, with galvanized iron roof, has one 9x15″ Blake crusher, three 16x36″ rolls, 3 Wilfley tables, 10 Card tables, Callow screens and a 6-compartment 4′ Richards pulsator classifier.

Nearest railway is the Phoenix & Eastern, at Winkelman, 30 miles distant, but survey was made, 1908, for a railroad to the mine, planned to be built shortly. An aerial tram is being built across the Gila river, latter making trouble at times of high water, and the company plans a 2-mile electric surface line from the mine to the smelter site.

Forces average 90 men, and work is being pushed systematically. Company plans deepening the American Eagle 2-compartment shaft to 700′ and doing extensive drifting and crosscutting, also adding to the central electric power plant, and building a smelter of at least 150 tons daily capacity, or doubling size of mill to 300 tons, though probably the smelter will be built in preference.

Production, 1905, was 49,000 lbs. fine copper, but no production was secured 1906 or 1907, though a little ore was shipped, on test, to Denver, in 1908. Company estimates 1909 production as probably 5,000,000 lbs. fine copper, from ore averaging 4 to 5.5% in tenor. Estimated costs are $2 per ton for mining, 50 cents for concentrating and $3.90 for smelting. Property has been developing for several years, and large ore bodies have been opened. Mine considered valuable and management good.

COPPER CREEK MINING CO. **CALIFORNIA.**

Dead. Formerly at Kaweah, Tulare Co., Cal.

COPPER CREST MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Redding, Shasta Co., Cal. Organized 1905, to operate the Milton mine, and to develop the Copper Crest group. Idle.

COPPER CROWN OF ARIZONA MINING CO. **ARIZONA.**

Dead. Lost lands Jan. 1, 1905, through failure to do annual assessment work. Formerly at Pearce, Cochise Co., Ariz. Described Vol. V.

COPPER CROWN MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. F. Albert Massing, president. Organized Dec. 11, 1907, under laws of

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Arizona, with capitalization $125,000, shares 10 cents par, as a reconstruction of the Iron Crown Mining & Milling Co. Lands, east of Mullan, have an 800′ tunnel with a 600′ back, said to show a vein of high grade ore, with 2 small veins carrying medium grade copper ore.

COPPER CROWN MINING CO. OF MICHIGAN. **MICHIGAN.**

Office: 1013 Easton Ave., St. Louis, Mo. Mine office: Matchwood, Ontonagon Co., Mich. Dr. M. J. Hopkins, president; J. E. Allen, vice-president and treasurer; W. R. Hopkins, secretary; Baxter L. Brown, general manager; preceding officers, F. O. Cutler and F. L. Huntoon, directors; Enoch Henderson, superintendent. Organized July 18, 1902, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Annual meeting, second Tuesday in July.

Lands, 3,740 acres, 6 to 8 miles west of the Victoria and 8 miles north of Matchwood, the nearest railroad point, including a number of old mines on which more or less work was done, 1850-1860, principal properties being the Hamilton, Norwich and Lafayette. First work of present company was on the Hamilton, where a 602′ tunnel was driven and a 270′ shaft sunk on the Meads vein, the tunnel of 602′ securing a back of only circa 300′, and a shaft was sunk mistakenly on a drift boulder in sandstone. Later work has been on the Norwich, which, next to the Victoria, is the most extensively developed and promising mine west of the Ontonagon river. The Norwich tunnel is 950′ long, with circa 1,000′ of drifts that give an encouraging copper showing. The Norwich mine, worked 1850-1865, produced 496 tons 1,360 lbs. fine copper, securing masses of native metal up to 10 tons in weight. The lode is bunchy, but shows considerable promising stamp-rock. The Meads lode was located by a series of prehistoric pits along the outcrop, the 270′ shaft thereon showing a strong bed, up to 25′ in width, with a 720′ drift to the westward on the fourth level.

Equipment includes a power-house, pumphouse, toolhouse, smithy, barn and 9 dwellings, with 250-h. p. and 120-h. p. engines, 40-kw. dynamo, 250-h. p. boiler and 6-drill and 5-drill air-compressors.

The company began life as a wildcat, doing some remarkably misleading advertising, and the early mining work was very badly planned. Later the company gave satisfactory evidences of genuine reform, and for several years past its work has been along legitimate lines, especially since Mr. Henderson took charge of the property, when the mining practice was vastly improved, and sinking was done that should have been begun years earlier. Operations were suspended, January, 1908, through lack of funds, and 28 labor liens, aggregating nearly $4,000, were filed. Property is considered promising, but the company has no particular prospects of success unless thoroughly reorganized and given adequate working capital, as copper mining operations in the Lake Superior district are the most expensive in the world, with the possible exception of gold mining on the Witwatersrand of South Africa.

COPPER CROWN OF NOVA SCOTIA MINING CO. **NOVA SCOTIA.**

Dead. Formerly at Pictou, Pictou Co., N. S. Described Vol. VI.

COPPER CZAR MINING CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Ariz. Loyal A. Osborne, manager; E. W. McClave, superintendent. Has gasoline power.

COPPER EAGLE MINING CO. **OREGON.**

Mine office: Merlin, Josephine Co., Ore. R. J. Ginn, president; N. P. Hansen, secretary; J. C. Mattison, superintendent. Lands, in the Galice district, show a 10′ quartz vein giving assays of 10 to 20% copper, opened by a tunnel of circa 300′.

COPPER EAGLE MINING & SMELTING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. A. W. Burnett, president; Patrick Mullins, vice-president; A. Dome, secretary and treasurer. Organized

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1907, with capitalization $500,000, shares 50 cents par, as a reconstruction of the Eagle Mining & Smelting Co. Property is the Eagle claim, north of Walkerville, and about a quarter mile north of the Alice mine, having a 265′ shaft, with about 300′ of drifting on the 200′ and 250′ levels, ore carrying mainly silver, with small copper values, commercial copper ore being expected at depth of circa 600′. Shipped, 1907, a little ore ranging up to 90 oz. silver and $6.50 gold per ton. Has a steam hoist and smithy. Resumed work, August, 1908.

COPPER ESTATES OF WESTERN AUSTRALIA, LTD. **AUSTRALIA.**

Office: 66 Finsbury Pavement, London, E. C., Eng. Mine office: Northampton, Western Australia. Jas. Barrie, chairman; John McLaren, secretary. Organized March 4, 1903, under laws of Great Britain, as reconstruction of company of some title, which, in turn, succeeded the Derby Syndicate, Ltd., with capitalization £15,000, shares 5s. par. Lands, 1,050 acres, freehold. Idle since circa 1904.

COPPER EXPLORERS, LTD. **AUSTRALIA.**

Office: Winchester House, London, E. C., Eng. Mine office: Cobar, Robinson Co., N. S. W., Australia. A. E. Barton, chairman; E. Jacobs, secretary. Organized Jan. 1, 1900, with capitalization £40,000, shares £1 par, to acquire the North Cobar mine, in New South Wales. Idle for several years.

COPPER FACE MINING & POWER CO. **IDAHO.**

Office: care W. H. Hoefenger, Spokane, Wash. Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Organized 1907, with capitalization $1,500,000. Lands, 14 claims, between Saltese and Mullan, showing 3 veins. Has a short tunnel, planned to cut the main vein at a distance of circa 1,700′.

COPPER FALLS MINING CO. **MICHIGAN.**

Dead. Absorbed, 1898, by Arnold Mining Co. Formerly at Copper Falls, Keweenaw Co., Mich. Fully described Vol. I.

COPPERFIELD MINE. **ARIZONA.**

Mine office: Salome, Yuma Co., Ariz. Lands, 103 claims, in the Greenstone camp.

COPPERFIELD MINES. **VERMONT.**

Office: 820 Pennsylvania Ave., Pittsburg, Pa. Mine office: Vershire, Orange Co., Vt. Geo. Westinghouse, owner. Property includes the old Ely and Copperfield mines, having a strong ore body carrying low-grade disseminated chalcopyrite. Has a 3,700′ main shaft, sunk at 23°, equal to circa 1,500′ vertical depth, and a 1,000′ tunnel, leading from the 300′ level to mill. Reduction plant includes a combined mill and smelter, connected with the mine by a gravity tram. Smelter has 2 water-jacket blast-furnaces, one reverberatory furnace and one converter stand. Property was worked on a considerable scale, previous to circa 1860, and was reopened, 1900, by present owner, who spent large sums thereon, but met with disappointment. Best ore has been stoped, ore growing markedly leaner with depth. Mine has perhaps 20,000 tons of low-grade ore in sight. Idle since circa 1903.

COPPERFIELD MINING CO. **COLORADO.**

Office: Colorado Springs, Colo. Mine office: Copperfield, Fremont Co., Colo. Lands, 9 miles from Cotopaxi, in the western part of Fremont county, adjoin the Copper Prince and the Colorado Mining & Smelting Co. Company said to plan sinking a 750′ shaft. Presumably idle.

COPPERFIELD MINING CO. **UTAH.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah.

COPPER FIELDS OF NAMAQUALAND, LTD. **CAPE COLONY.**

Office: Dashwood House, London, E. C., Eng. J. Eustace, chairman; N. A. Eustace, secretary. Organized Sept. 3, 1897, under laws of Great Britain,

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with capitalization £100,000, shares £1 par; issued, £88,432. Lands, 354 acres, in Little Namaqualand, Cape Colony, South Africa, known as the Buffalo River mine. Idle.

COPPER FLAT MINING CO. **NEVADA.**

Dead. Expired circa 1904. Formerly at Ely, White Pine Co., Nev.

COPPER FLOAT MINING & MILLING CO. **WYOMING.**

Office: care of P. N. Hodgins, Denver, Colo. Mine office: Tie Siding, Albany Co., Wyo. Organized, September, 1906, under laws of Wyoming, with capitalization $1,000,000. Lands are on Sherman Hill.

COPPER GIANT GOLD & COPPER MINING CO. **WYOMING.**

Dead. Lands sold, 1908, by sheriff, to satisfy a judgment for $1,642.71. Formerly at Encampment, Carbon Co., Wyo.

COPPER GIANT MINING CO. **ARIZONA.**

Office: care of O. Z. Kane, general manager, Tucson, Ariz. Mine office: Silver Bell, Pima Co., Ariz. Lands, 50 claims, in several different groups, lying south of the Imperial mine and to the eastward of the Silver Hill Mountains, opened by about 500′ of shafts and tunnels, with a 100′ shaft on the Copper Giant claim. Property shows a contact vein, with bold outcrops, between limestone and quartzite. Ore is chalcopyrite, with occasional chalcocite, and ores from the Copper Giant shaft are claimed to average 15% copper, 20 to 40 oz. silver and $4 to $7 gold per ton, which estimate is excessive. Is said to be under option to the Calumet & Arizona Mining Co.

COPPER GIANT MINING CO. **UTAH.**

Mine office: Promontory, Box Elder Co., Utah. W. E. Headings, president; L. D. Seager, vice-president; G. A. Livingston, secretary; J. H. Kidd, treasurer; preceding officers, S. S. Buckwalter and Ernest D. Sadler, directors. Organized circa January, 1907.

COPPER GIANT MINING CO. **WASHINGTON.**

Dead. Formerly had an office in Spokane, Wash.

COPPER GLANCE CONSOLIDATED MINING CO. **UTAH.**

Dead. Reorganized January, 1907, as Bingham Copper Glance Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

COPPER GLANCE MINING CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. S. W. Clawson, president and treasurer; A. S. Barker, secretary; C. L. Beckwith, general manager. Organized March, 1901, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, 24 patented claims, area 480 acres, in the Warren district, about 7 miles southeast of Bisbee. Has shafts of 50′, 100′, 140′ and 560′, and tunnels of 75′ and 150′. Idle since circa 1904. Very fully described Vol. IV.

COPPER GLANCE MINING CO. **NEW MEXICO.**

Dead. Formerly at Taos, Taos Co., N. M.

COPPER GLANCE MINING & MILLING CO. **COLORADO & WYOMING.**

Dead. Lost Colorado lands through inability to pay for them, and lost Wyoming lands through failure to do annual assessment work. Formerly at Cashin, Montrose Co., Colo., and Encampment, Carbon Co., Wyo. Fully described Vol. VI.

COPPER GLOBE MINING CO. **UTAH.**

Dead. Lost lands November, 1902. Formerly in Emery county, Utah.

COPPER-GOLD MINING CO. **WASHINGTON.**

Dead. Formerly at Bossburg, Stevens Co., Wash.

COPPER-GOLD MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Hecla, Laramie Co., Wyo.

COPPER GORGE DEVELOPING CO. **NEW MEXICO.**

Office: 82 Wisconsin St., Milwaukee, Wis. Mine office: Santa Rita, Grant Co., N. M. Lands, 12 claims. Company was asserted, in the press, to have put

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in a big machinery plant and concentrator, and to plan shipping concentrates to the Comanche smelter, at Silver City, but these statements apparently were merely the vain imaginings of one C. T. McElroy, of Milwaukee, a proficient promoter of more than dubious "mining" schemes.

COPPER GULCH MINING & REDUCTION CO. **COLORADO.**

Mine office: Ouray, Ouray Co., Colo. Lands, 67 claims, in Gray Copper Gulch, on both Red and Brown mountains, area circa 600 acres. Has 3 tunnels, showing chalcopyrite assaying up to 14% copper and 41 oz. silver per ton.

COPPER GULF DEVELOPMENT CO. **NEW MEXICO.**

Dead. Reorganized, circa February, 1908, as Copper Gulf Mining Co. Formerly at Tyrone, Grant Co., N. M.

COPPER GULF MINING CO. **NEW MEXICO.**

Office: 616 Lonsdale Bldg., Duluth, Minn. Mine office: Tyrone, Grant Co., N. M. David L. Fairchild, president; H. B. Hovland, vice-president; Lucian Merritt, treasurer; preceding officers, W. A. Barnes, Jr., and E. A. Wayne, directors; C. S. Morris, general manager. Organized circa February, 1908, with capitalization $500,000, shares $10 par.

Lands, circa 1,500 acres, including the original Copper Gulf group of about 120 acres, and the Virginia group of circa 40 acres, to which were added, 1907, the Alessandro group of 30 claims, the Bentley group, and 6 claims of the Leopold-Tyrone Copper Co. The Alessandro lands, said to be held under $20,000 bond, apparently have been bought outright.

The Copper Gulf has a 300′ main shaft, developing considerable ore of 4 to 5% copper tenor.

The Virginia mine, opened to depth of 300′, is an old property, showing considerable good ore, and was said, late 1907, to have circa 100,000 tons of ore developed on the 200′ level. The Virginia shipped, to the Calumet & Arizona smelter, during the summer of 1907, circa 3 carloads of ore weekly, said to average $23.25 per ton in value.

The Alessandro mine is said to have 9 ore bodies, near porphyritic intrusions, reported, by old company, to give average assays of 8% copper and 5 to 40 oz. silver, from carbonate and sulphide ores, which figures probably are much too high. The mine has 5 shafts, deepest 225′, with total workings of 1,300′.

The works, taken over with the Alessandro, include a 50-ton concentrator and leaching plant, now idle.

In September, 1908, it was planned to merge the Copper Gulf with the Comanche Mining & Smelting Co., under title of Savanna Copper Co. Property considered promising and management good.

COPPER HEAD MINING & MILLING CO. **IDAHO.**

Office and mine: Wallace, Shoshone Co., Idaho.

COPPER HILL MINE. **ARIZONA.**

Owned by Arizona Commercial Copper Co.

COPPER HILL MINE. **CALIFORNIA.**

Office and mine: care of W. F. Detert, owner, Jackson, Amador Co., Cal. Lands, circa 1,000 acres, patented, on the Consumnes river, showing a quartz porphyry dyke of 500′ to 600′ width, carrying chalcopyrite, associated with pyrrhotite and surmounted by a heavy gossan. Mine was opened 1861, and suspended circa 1881, after securing a considerable production, as evidenced by extensive mine openings, with deepest shafts 200′ and 400′, and extensive slag dumps. Idle since circa 1881.

COPPER HILL MINES CO. **NEW MEXICO.**

Office: St. Joseph, Mo. Mine office: Orogrande, Otero Co., N. M. Dr. Jacob Geiger, president; R. M. Ladwig, vice-president; M. H. Dirks, secretary, treasurer and general manager; Geo. Stagner, superintendent. Organized 1907.

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Lands include the High Five group, and the Red Hill group of 4 claims, latter said to have a fair surface showing of auriferous and argentiferous copper ore, opened by a 140′ shaft.

COPPER HILL MINING CO. **ALABAMA.**

Dead. Formerly at Stone Hill, Cleburne Co., Ala. The property, known also as the Woods mine and Stone Hill mine, was opened in 1870 and closed in 1879, after securing a production valued at about $1,300,000, mainly from high-grade surface ores, the mine being closed when these were exhausted. The vein, of about 24′ average width, had paystreaks on the walls carrying 3 to 7% copper ore. Idle since 1879.

COPPER HILL MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Organized circa August, 1907, to develop sundry claims in the vicinity of Mullan.

COPPER HILL MINING CO. **NEW JERSEY.**

Mine office: Copper Hill, Hunterdon Co., N. J. Idle for many years.

COPPER HILL MINING CO. **NEW MEXICO.**

Dead. Lands sold, November, 1903, to A. B. Renehan, for $7,600. Formerly at Rinconada, Rio Arriba Co., N. M. Described Vol. II.

COPPER HILL MINING CO. **UTAH.**

Dead. Succeeded, circa 1907, by Bingham-Butte Copper Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

COPPER HILL MINING & MILLING CO. **IDAHO.**

Dead. Formerly at Mullan, Shoshone Co., Idaho.

COPPER HILL MINING & MILLING CO. **WASHINGTON.**

Office: 504 Empire Bldg., Spokane, Wash. Letter returned unclaimed from former mine office, Newport, Stevens Co., Wash. F. J. Heller, president; G. O. Nettleton, secretary. Organized 1899, with capitalization $75,000, shares 5c par. Lands, 4 claims, area 80 acres, opened by a 230′ shaft and a 260′ tunnel, showing an 18′ vein carrying chalcopyrite, disseminated in pyrrhotite. Idle for several years and apparently moribund.

COPPER HILL MINING & SMELTING CO. **ARIZONA.**

Dead. Formerly at Jerome, Yavapai Co., Ariz. Described Vol. VI.

COPPER INDEPENDENT CONSOLIDATED MINING CO. **WASHINGTON.**

Dead. Bondholders foreclosed, circa 1907. Paid dividends from stock sales. Formerly at Silverton, Snohomish Co., Wash. Fully described Vol. VI.

COPPER JACK MINING CO. **UTAH.**

Office and mine: Eureka, Juab Co., Utah. J. C. Jensen, president; J. T. Williams, vice-president; Geo. A. Udall, secretary; D. D. Hanks, treasurer; C. C. Griggs, general manager. Organized July 31, 1905, under laws of Utah, with capitalization $75,000, shares 10 cents par. Lands, 24 claims, area 480 acres, 4 miles west of Eureka, in the Erickson district of Tooele county, Utah, opened by a 22′ shaft, showing a 30″ fissure vein in granite with a paystreak carrying oxidized and sulphide copper ores, assaying 13% copper, associated with pyrite in a quartz gangue. Idle.

COPPER JIM MINING & MILLING CO. **COLORADO.**

Office: 417 Quincy Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. A. G. Rummel, president; Fred C. Wagner, vice-president; John Stewart, treasurer; J. G. Brandett, secretary; J. A. McCracken, mine superintendent; preceding officers are directors. Organized June 15, 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 6 claims, on Gray Copper Mountain, in the Wisconsin district, showing a 4′ vein with 22″ paystreak of sulphide ore giving good assays in copper, with fair gold and silver values, opened by a few shallow pits and shafts and a 70′ tunnel.

COPPER KEY MINING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Republic, Ferry Co., Wash. J. L.

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Prickett, president; G. D. Russell, vice-president; E. L. Tate, secretary, treasurer and manager; preceding officers, T. E. McBroom, E. L. Dyer and H. L. Jones, directors. Organized under laws of Washington. Lands, 7 claims, 1 fractional, on Belcher Mountain, adjoining the Oversight group on the north, having a 145′ shaft and 3 tunnels, longest 571′, showing low-grade auriferous chalcopyrite, of 1 to 3% copper tenor, associated with pyrite, marcasite, hematite and magnetite. Has a 7-drill air-compressor. Property, though low in grade, is considered promising.

COPPER KING OF ARIZONA. **ARIZONA.**

Dead. Lands sold under foreclosure, Aug. 28, 1905, to former shareholders, and reorganized under title of Arizona Copper Syndicate of Providence. Formerly at Pearce, Cochise Co., Ariz. Fully described Vol. V.

COPPER KING OF ARIZONA MINING CO. **ARIZONA.**

Dead. Reorganized, 1903, under title Copper King of Arizona, also dead. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. IV.

COPPER KING GOLD & COPPER MINING CO. **NEVADA.**

Mine office: Mizpah, Elko Co., Nev. Made a few shipments of auriferous and argentiferous copper ore, claimed to average about $100 per ton in value, during latter half of 1907.

COPPER KING, LTD. **CALIFORNIA.**

Mine office: Letcher, Fresno Co., Cal. Geo. W. Ade, receiver; C. E. Leavitt, superintendent. Company, organized under laws of Great Britain, was said to have been liquidated, 1903, but the estate remains in process of adjustment, and considerable dividends have been paid to creditors, from operations under the receiver. Was expected, 1908, that receiver would be discharged shortly, and company take possession.

Lands, 90 acres, circa 20 miles from Fresno, having a 250′ working shaft with 6 levels opened, having about one-half mile of drifts. Property has a schistose vein, of circa 100′ width, carrying a 2′ to 20′ paystreak, with oxidized ores above and sulphides below, of about 7%. average copper tenor.

The reduction plant included a concentrator and smelter, at Martinez, known as the Bay Point smelter, which was sold in 1907. Ore produced later was sent to the Tacoma smelter.

The old management squandered about £250,000, ending with a net indebtedness of £100,000, but, under the able management of Mr. Ade, this debt was liquidated, and company put in good shape financially. Employed circa 50 men before suspending operations, October, 1907

COPPER KING MINE. **ARIZONA.**

Office and mine: care of Peter Johnson, owner, Bisbee, Cochise Co., Ariz. This is the property first held by the Copper King of Arizona, abandoned circa 1902, and relocated, 1903, by present owner. Has a 625′ shaft, in porphyry, which has cut a number of small stringers of copper ore. Property, which lies between the Denn-Arizona and Cochise Development tracts, was generally regarded as worthless, until circa 1904, when developments on the Junction lands of the Superior & Pittsburg indicated the possibility of considerable ore bodies underlying the conglomerate over the porphyry and limestone contact. Material on dump, taken from shaft, is altered and slightly mineralized porphyry, carrying considerable iron pyrites. Idle since circa 1902.

COPPER KING MINE. **BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Nelson, Kootenay district, B. C. Lands, 6 claims, near the Queen Victoria property, at Beasley, 7 miles west of Nelson, showing several exposures of sulphide ore. Has a gravel overburden, carrying considerable float ore. Idle since circa 1902.

COPPER KING MINE. **BRITISH COLUMBIA.**

Mine office: Kamloops, Yale district, B. C. Lands, sundry claims, 16 miles

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west of Kamloops, showing ore giving assays of 5 to 20% copper, 1 to 6 oz. silver and $10 to $20 gold per ton. Shipped 500 tons to the Crofton smelter, May, 1904. Idle since circa 1905.

COPPER KING MINE. **CALIFORNIA.**

Office: care of Wm. Purdue, Spokane, Wash. Mine office: Hutton, Siskiyou Co., Cal. Has a vein of about 75′ width opened by a 659′ tunnel giving a back of about 350′, showing auriferous copper ores, ores and nature of their occurrence strongly resembling the Blue Ledge property, in the same district. Is claimed, in press, to have $25,000,000 worth of ore in sight, which, of course, is a gross exaggeration.

COPPER KING MINE. **COLORADO.**

Mine office: Twin Lakes, Lake Co., Colo. Jas. Harrison, manager. Lands, 11 claims, on Middle Mountain, circa 13 miles from Twin Lakes, showing, in micaceous granite and porphyry dykes, a 20′ fissure vein, with a 12″ hanging-wall paystreak carrying medium grade auriferous and argentiferous copper ore, slightly developed by tunnel.

COPPER KING MINE. **IDAHO.**

Mine office: Landore, Washington Co., Idaho. Is said to have a 15′ vein showing a 3′ paystreak of bornite. Idle.

COPPER KING MINE. **MONTANA.**

Mine office: Parrot, Madison Co., Mont. Lands, 1 claim, 2 miles southeast of Parrot, showing ores assaying up to 12.5% copper, 0.85 oz. silver and $2.80 gold per ton. Idle for several years.

COPPER KING MINE. **OREGON.**

Mine office: Comer, Grant Co., Ore. Property, slightly prospected, is located in a little-known district. Idle.

COPPER KING MINE. **PHILIPPINES.**

Mine office: Benguet, Luzon, Philippines. Hanson & Meade, owners. Lands, on the Bued river, show refractory ores carrying fair copper and gold values. A small stamp mill was planned, at last accounts, to treat ores for their gold values.

COPPER KING MINE. **TASMANIA.**

Owned by Burnie Copper Mines.

COPPER KING MINE. **YUKON.**

Mine office: Whitehorse, Yukon, Canada. Lands include the Copper King, Rabbit Foot, Anaconda, Spring Creek and miscellaneous claims, in the Wheaton district, near Whitehorse. Is said to be owned by Pittsburg capital. Mine has several shallow shafts and open-cuts, and a crosscut tunnel, in limestone, cutting ore 150′ from the portal. Property shows high-grade ore, in small quantities, at numerous points. Has a hoist and air-compressor. To end of 1907, had shipped, to British Columbia smelters, circa 400 tons of ore, averaging about 15% copper and $1 to $2 combined gold and silver values per ton. Shipped no ore, 1907, but stocked several thousand tons. Employs circa 30 men. Property considered promising, but requires further development.

COPPER KING MINING CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Lands are in the Tucson Mountains. Idle several years and apparently moribund.

COPPER KING MINING CO. **COLORADO.**

Dead. Formerly at Boulder, Boulder Co., Colo.

COPPER KING MINING CO. **COLORADO.**

Dead. Succeeded, circa, 1904, by Pearl Copper Mining & Smelting Co. Formerly at Pearl, Larimer Co., Colo.

COPPER KING MINING CO. **IDAHO.**

Office and mine: Shoup, Lemhi Co., Idaho. Earl Gilbreath, manager. Is a limited partnership, not an incorporation. Lands, 11 claims, area 220 acres,

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also 260 acres miscellaneous lands, on Beaver creek, in the Mackinaw district, showing numerous fissure veins in quartzite, of which three, with average width of 10′ to 12′, are opened by 2 shallow shafts and 7 tunnels, of which 3 are 300′ each in length, with a total of about one-half mile of openings, showing cuprite and malachite giving average assays of 7% copper, up to 30% lead, 1 to 30 oz. silver and $1 to $3 gold per ton, ore, as shipped, averaging about $43 per ton in total values.

COPPER KING MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Idle.

COPPER KING MINING CO. **OREGON.**

Dead. Formerly at Pendleton, Umatilla Co., Ore.

COPPER KING MINING CO. **UTAH.**

Dead. Lost lands, 3 claims, 1902. Formerly at Brighton, Salt Lake Co., Utah.

COPPER KING MINING CO. **WASHINGTON.**

Mine office: Sumas, Whatcom Co., Wash. Idle.

COPPER KING MINING CO. **WYOMING.**

Dead. Formerly at Rawlins, Carbon Co., Wyo.

COPPER KING MINING & MILLING CO., LTD. **IDAHO.**

Office: Kellogg, Idaho. Mine office: Iron Springs, Idaho Co., Idaho. P. P. Webber, president; Peter Mason, vice-president; Chas. W. Simmons, secretary; Ed. Hearing, treasurer; Chas. McKinnis, general manager; Jos. Rogers, superintendent. Organized March 2, 1902, under laws of Idaho, with capitalization $1,250,000, shares $1 par. Lands, 7 claims, area 140 acres, also a 10-acre mill-site, 2 water rights and 80 acres timber lands, with total landed holdings of 230 acres, on the west fork of the Rapid river, in the Seven Devils district. Has 2 fissure veins, in phonolite, of which one, of 8′ width, is opened by 7 pits and shafts, deepest 50′, and by tunnels of 55′, 200′ and 300′, showing argentiferous and auriferous bornite, and medium grade chalcopyrite, giving assays up to 45% copper, 445 oz. silver and $45 gold per ton.

COPPER KING MINING & MILLING CO. **WASHINGTON.**

Office and mine: Vancouver, Clark Co., Wash. Organized January, 1904, with capitalization $1,000,000, shares $1 par. Idle.

COPPER KING MINING & MILLING CO. **WASHINGTON.**

Dead. Formerly had an office at Spokane, Wash.

COPPER KING MINING, MILLING & DEVELOPMENT CO. **MONTANA.**

Mine office: Cooke, Park Co., Mont. J. Nelson, president; R. M. Manderville, vice-president; B. R. Holland, secretary and treasurer. Organized December, 1905, under laws of Montana, with capitalization $150,000, shares 15 cents par. Lands, 4 claims, in process of patenting, in the Goose Lake basin, developed by a 50′ trench of 18′ depth, showing ore of low to medium grade.

COPPER KING MINING & SMELTING CO. **IDAHO.**

Office and mine: Mullan, Shoshone Co., Idaho. E. B. Crawford, president; Hon. H. W. Ingalls, secretary and general manager; Wm. Commerilh, treasurer; Jos. Carson, superintendent. Organized Aug. 28, 1905, under laws of Idaho, with capitalization $1,500,000, shares $1 par. Is raising money for a new tunnel, by 1-cent assessments at 6-month intervals.

Lands, 13 claims, 2 fractional, in the Hunter and Leland districts, near the Snowstorm mine, showing a 5′ to 6′ contact vein, between quartzite and limestone, with a paystreak of 6″ to 2′ carrying massive galena assaying circa 5% copper, 28% lead and 18 oz. silver per ton, and a vein of 10′ to 40′ width, between quartzite and limestone, carrying a 4′ paystreak of argentiferous copper ore, with some native silver. Has about 3,000′ of workings, mainly tunnels on the Copper Queen vein, on the Burke side of the range, and, July, 1908,

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started a new tunnel on the west fork of Deadman Gulch, planned to be driven 3,600′, at depth of 927′ below the old tunnel, to be completed circa January, 1910.

Equipment includes a 30x60′ engine-house, 30x60′ boarding-house, and a 4-drill air-compressor. Property considered promising.

COPPER KING MINING SYNDICATE. **WASHINGTON.**

Office: Tacoma, Wash. R. E. McFarlane, president; C. L. Judd, vice-president; E. Areith, secretary and treasurer; D. E. Guiley, superintendent. Capitalization, $10,000,000. Lands, 64 claims in Pierce county, Washington, including the old Eastlick mine, opened by a 130′ crosscut tunnel, with a small amount of drifting, which produced some good ore years ago. District is said to be rich but not easily accessible. Idle and apparently moribund.

COPPER KINGS MINING CO. **UTAH.**

Dead. Succeeded by Consolidated Mining & Smelting Co., also dead. Formerly at Brigham, Box Elder Co., Utah.

COPPER KNOB MINE. **NORTH CAROLINA.**

Office: Salisbury, N. C. Mine office: Hopkins, Ashe Co., N. C. Richard Eames, Jr., owner. Lands, 160 acres, freehold, also 90 acres miscellaneous lands, showing a 3′ fissure vein in hornblendic slate, carrying carbonate and sulphide ores, mainly bornite, estimated to average 6 to 8% copper, 15 oz. silver and $12 gold per ton. Property was opened circa 1880. Has steam power, with hoist and 2-drill air-compressor, and a 5-stamp mill. Management plans further development by an adit cutting Copper Knob Mountain.

COPPER KNOB MINING CO. **NORTH CAROLINA.**

Dead. Succeeded, circa 1902, by Blue Ridge Copper Mining Co. Formerly at Hopkins, Ashe Co., N. C.

COPPER LEDGE MINING CO. **UTAH.**

Office: care of James Courtney, secretary and treasurer, Salt Lake City, Utah. E. F. Marshall, president. Organized 1907, with capitalization $125,000, shares 25 cents par. Lands, 9 claims, in the Henry district of Sevier county, Utah.

COPPER MILLS SYNDICATE, LTD. **AUSTRALIA.**

Dead. Organized 1906 to operate in New South Wales. Formerly had an office at 6 Gresham St., London, E. C., Eng.

COPPERMINES CO. **NEVADA.**

Office: 66 Broadway, New York, N. Y. Mine office: Ely, White Pine Co., Nev. Wm. B. Thompson, president; Jas. Phillips, Jr., vice-president; Frank W. Holmes, treasurer; T. M. Harriman, secretary; preceding officers, W. Hinkle Smith, Louis Marshall and F. L. Hermann, directors.

Organized May, 1907, under laws of Delaware, with capitalization $50,000,000, as Consolidated Copper Co., and name changed, 1907, to present title, and capitalization increased, April, 1908, to $60,000,000, shares $5 par. Was planned as a holding company, to control, through stock ownership, the properties in the Ely and Bingham camps known as the Guggenheim mines, these being the Nevada Consolidated Copper Co. and Cumberland-Ely Copper Co. at Ely, and the Utah Copper Co. at Bingham. Company was said, August, 1908, to have no floating or current indebtedness, but it is not known whether or not the various properties named are controlled through ownership of stock.

The lands of the Ely Mines Co., 33 claims, area 500 acres, were taken over Aug. 8, 1907, and circa 25 men are employed on development work at that property.

COPPERMINES CO. OF ARIZONA, LTD. **ARIZONA.**

Office: 27 William St., New York, N. Y. English office: 13 Queen Victoria St., London, E. C., Eng. Mine office: Clifton, Graham Co., Ariz. Thos. B. Taylor, president; Wm. C. Shires, vice-president; Luther Martin, second vice-

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president; Fred E. Rittman, secretary and treasurer; Maj. Henry Catlin and Alex. Veitch, consulting engineers.

Organized Aug. 5, 1907, under laws of Arizona, with capitalization $10,000,000, shares $5 par, in $5,000,000 cumulative 7% preferred stock and $5,000,000 common shares, under title of Copper Co. of Arizona, as a reconstruction of the Arizona Amalgamated Copper Co., which was organized under laws of Maine, circa 1906, and name changed, circa 1908, to present title. Annual meeting, first Monday in April.

Company was planned to merge the Stevens, Bonanza, Celtic, Monte Carlo, Keystone-Merritt, Corona, Becker, O'Donnell and Crystalina mining companies, in the Clifton district of Graham county, Arizona, for which properties $4,000,000 of stock was to be exchanged. Apparently this was to be common stock, as company states that $5,000,000 preferred stock is at the disposal of the treasury. In December, 1907, predecessor of present company secured extensions of the bonds on properties under option.

Lands are reported by the company as 168 claims. The Copper Co. of Arizona claimed to have upwards of 4,000 acres, with a total of about 4 miles of workings, and upwards of 1,000 acres of available mill and smelter sites, and claimed ore reserves exceeding 200,000,000 tons, which was a gross and utterly indefensible exaggeration. Company is not regarded favorably.

COPPER MINES OF MOUNT LYELL WEST, LTD. **AUSTRALIA.**

Dead. Succeeded, Oct. 2, 1907, by West Mount Lyell, Ltd. Formerly at Gormanston, Montagu Co., Tasmania. Described Vol. VI.

COPPER MINES & SMELTERS CORPORATION OF AMERICA. **CALIFORNIA.**

Office: 417 Montgomery St., San Francisco, Cal. Letter returned unclaimed from former mine office, Vontrigger, San Bernardino Co., Cal. E. H. Kramer, president; C. H. Dunsmoor, vice-president; T. Wilkinson Tetley, secretary and treasurer; preceding officers, W. E. Ewing, E. H. Geary, Louis Hogan and E. W. Sichel, directors. Organized July 16, 1907, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Annual meeting, first Monday in January.

Is said to have absorbed, circa September, 1907, the Green Dragon Copper Co. and the Dessie Boyer Copper & Gold Mines, Ltd. Lands, 12 claims, one fractional, area 220 acres, in the Signal district, opened by shafts of 30′ and 90′ on the Humming Bird claim, 2 miles from Vontrigger. C. Marcereau Garrison is reported by company to have estimated 9,000,000 tons of ore in sight, but either Mr. Garrison is subject to strange optical illusions, or has been grossly slandered. Company is not regarded favorably.

COPPER MINING & DEVELOPING CO. **CALIFORNIA.**

Office: care of J. B. Campbell, president, Fresno, Cal. Mine office: Kaweah, Tulare Co., Cal. Lands, 50 claims, area circa 1,000 acres, on Kearsarge Peak, 35 miles east of Kaweah, slightly developed, showing carbonate and sulphide ores, assaying 2 to 25% copper. Idle several years and moribund.

COPPER MINING & SMELTING CO. OF ONTARIO, LTD. **ONTARIO.**

Office: 6 Broad Street Place, London, E. C., Eng. Mine office: Bruce Mines, Algoma, Ont. T. Hayes Sheen, president and general manager; C. E. Osborn, secretary; H. J. Carnegie-Williams, superintendent. Organized Aug. 16, 1905, under laws of Ontario, with capitalization $1,000,000, shares $5 par. Property is the old Bruce mines, area 12,800 acres, freehold, on Georgian Bay. Mine, worked 1846-1876, producing copper to value of circa $3,500,000, has several tunnels and 10 shafts of 75′ to 450′ depth, with about 3 miles of workings. Mine has several parallel veins, with strike of 15° West of North and dip of 85° to 90°, there being 6 known veins, of which 2, of 4′ to 10′ width, traversing diabase, are developed, carrying mainly chalcopyrite with occasional bornite and chalcocite, with quartz gangue, estimated to average 5% copper.

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Principal workings are shafts Nos. 2, 3 and 4, latter 453′ deep, upper levels of mine being stoped out. Waste burrows of mine contain about 125,000 tons, estimated to carry 1.5% copper.

Equipment includes a 400-h. p. steam plant, with 4 hoists of 25 to 150-h. p. each, latter with double drums of 36″ face and 60″ diameter. Has a 16-drill Rand air-compressor, 35-kw. dynamo and 14 mine buildings, including a 25x60′ machine shop.

Mine and mill, 1½ miles apart, are connected by the tracks of the Bruce Mines & Algoma Railway. The 200-ton concentrator, of wood and iron, 75x192′, has an Austin crusher, 5 sets of rolls, 12 Hartz jigs, 18 Frue vanners, 2 double-deck slime tables and 18 sizers. Miscellaneous improvements include 3 docks, a coal wharf, merchandise wharf, electric light plant and telephone system. Total production of mine, under old management, was 40,461 long tons of concentrates of about 20% average copper tenor, equivalent to circa 8,000 long tons fine copper.

COPPER MOUNTAIN CONSOLIDATED MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Copley, Shasta Co., Cal. Fred Grotofend, superintendent. Property is the Sugar Loaf mine. Has electric power. Idle.

COPPER MOUNTAIN COPPER CO. **ALASKA.**

Mine office: Nome, Alaska. Property is sundry claims near the head of the Nome river, on which development work was in progress, late 1907.

COPPER MOUNTAIN DEVELOPMENT CO. **CALIFORNIA.**

Dead. Succeeded by Copper Mining & Developing Co. Formerly at Kaweah, Tulare Co., Cal.

COPPER MOUNTAIN MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, 310 Laughlin Bldg., Los Angeles, Cal. Mine office: Victor, San Bernardino Co., Cal. W. A. Cooper, president; J. S. Longley, secretary; J. A. Morlan, manager. Lands, 10 claims, including the Amazon mine, showing a 200′ gossan outcrop, opened circa 1873, reopened 1901. Main shaft, 200′, shows sulphide ores assaying 8 to 10% copper. Is claimed to have about 10,000 tons of ore on the dump, which is doubtful. Idle and apparently moribund.

COPPER MOUNTAIN MINING CO. **COLORADO.**

Office: Ward, Boulder Co., Colo. Geo. W. Barnhardt, superintendent. Lands, about 1 mile north of Ward, have a 50′ tunnel, showing a 6′ vein, assaying well in gold and silver.

COPPER MOUNTAIN MINING CO. **NEVADA.**

Dead. Formerly at Tecoma, Elko Co., Nev.

COPPER MOUNTAIN MINING CO. **UTAH.**

Office: care of B. T. Lloyd, superintendent, 323 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Lands, 6 claims, owned formerly by Copper Mountain Mining & Milling Co., having open-cuts and shallow shafts of 5′ to 60′, and a main shaft, of peculiar construction, about 250′ in depth, showing an iron ore vein of 4′ to 14′ width, giving assays of 18 to 28% copper. Shaft is vertical for about 100′, thence drops 100′ at an angle of 75°, thereafter has 50′ sunk at an angle of 70°, which is excellently bad engineering. Has gasoline power. Presumably idle.

COPPER MOUNTAIN MINING CO. **WYOMING.**

Dead. Formerly at Big Horn, Sheridan Co., Wyo., and Rudefeha, Carbon Co., Wyo. Described Vol. VI.

COPPER MOUNTAIN MINING & DEVELOPMENT CO. **IDAHO.**

Office and mine: Mullan, Shoshone Co., Idaho. James I. Dickinson, president. Organized 1906, under laws of Idaho, with capitalization $1,500,000,

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shares $1 par. Lands, 8 claims, 1 fractional, on Copper Mountain, just east of Mullan, having a 500′ tunnel, showing bornite.

COPPER MOUNTAIN MINING & DEVELOPMENT CO. **WASHINGTON & BRITISH COLUMBIA.**

Office: 5406 Union Ave., South Tacoma, Wash. Mine offices: Ryan, Stevens Co., Wash., and Quatsino, Atlin district, B. C. B. S. Cowles, president; Jos. Hutchinson, secretary; B. D. Holcomb, general manager; A. T. Macaulay, superintendent. Capitalization $200,000, shares 10 cents par. The Washington group has 4 claims, area 90 acres, with 3 ore bodies, one lens 75′ wide being opened by a 300′ shaft and a 115′ tunnel. The June group, at Quatsino Sound, includes 5 claims, area 258 acres, showing an ore body said to be 100′ wide, with measured length of 3,000′, giving assays of 6 to 8% copper, 3 oz. silver and $2 gold per ton, from chalcopyrite. A large amount of ore is shown on surface, and the deposit has been worked open-cast. British Columbian group considered promising. Both groups idle for several years.

COPPER MOUNTAIN MINING & MILLING CO. **IDAHO.**

Office and mine: Mullan, Shoshone Co., Idaho. J. A. Grenier, president; W. Wyman, secretary. Lands, 8 claims, on Copper Mountain, east of the Snow Storm, developed by tunnel.

COPPER MOUNTAIN & MILLING CO. **UTAH.**

Dead. Was bankrupted, 1904, by bad management. Formerly at Milford, Beaver Co., Utah. Fully described Vol. IV.

COPPER MOUNTAIN MINING & SMELTING CO. **MONTANA.**

Office: Phoenix Bldg., Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. J. H. McCabe, manager; J. S. Cohen, secretary. Organized 1907, with capitalization $1,000,000. Lands, circa 50 claims area about 1,000 acres, including 5 claims on Valparaiso Hill, also claimed by Butte & Corbin Consolidated Mining Co., and title vested in latter by judgment of court June 7, 1908. Has a shallow shaft, showing numerous stringers of ore assaying circa 6% copper, with small silver values, and is said to have a 15′ vein with 15″ paystreak. Idle.

COPPEROPOLIS COPPER CO. **OREGON.**

Letter returned unclaimed from former office, 503 McKay Bldg., Portland, Ore. Mine office: Prairie City, Grant Co., Ore. J. L. Hartman, president; H. W. Prettyman, vice-president; W. W. Gibbs, treasurer and general manager; N. A. Butcher, secretary. Organized 1900, under laws of Oregon, with capitalization $120,000, shares 10 cents par.

Lands, 10 claims, 2 patented, area 200 acres, and a 2-acre millsite, in the Quartzburg district, showing 2 ore bodies between diorite and porphyry, of which one, of 50′ to 60′ estimated average width, is opened by a 1,500′ tunnel, showing chalcopyrite giving average assays of 3% copper, 1.5 oz. silver and $1.50 gold per ton. Has steam and gasoline power, a 2-drill air-compressor and 8 mine buildings.

A 50-ton mill, 50x60′, of wood, equipped with crusher, rolls and jigs, puts about 10 into 1, concentration not being very close, with heavy losses in tailings, concentrates ranging in tenor from 19 to 24% copper, 3 to 22 oz. silver and $2.16 to $6.40 gold per ton. Property considered promising, but mill was built before the mine was opened adequately. Idle from lack of funds, and apparently moribund.

COPPEROPOLIS MINING CO. **NEVADA.**

Office: Nixon Blk., Goldfield, Nev. J. W. McLisle, president; H. Tidwell, vice-president; H. C. Hamlin, secretary; J. P. Marshall, treasurer. Lands, supposedly in Esmeralda County, Nevada, are said to have a 30′ vein, between limestone and schist, with schistose gangue, carrying good gold and silver values.

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COPPEROPOLIS MINING & LEASING CO. **WASHINGTON.**

Office: 3 Marion Blk., Indianapolis, Ind. Mine office: Keller, Ferry Co., Wash. H. Hibschman, president; Geo. P. Garwood, secretary and manager; preceding officers, F. E. Stone, G. D. McClain and M. Hibschman, directors. Organized circa 1907, under laws of Washington, with capitalization $3,000,000, shares $10 par. Lands, 6 claims, 3 fractional, area circa 90 acres, 5 miles west of Keller, opened by a 60′ tunnel, showing low grade chalcopyrite.

COPPEROSITY MINE. **ARIZONA.**

Mine office: Vekol, Pinal Co., Ariz. Wm. Forbach, superintendent. Has a power plant, installed 1907.

COPPER PLATE & ARIZONA MINING CO. **ARIZONA.**

Letter returned unclaimed from former office, Duluth, Minn. Mine office: Metcalf, Graham Co., Ariz. Ambrose Burke, superintendent, at last accounts. Organized 1904, with capitalization $5,000,000. Lands are the Copper Plate group, on Chase Creek, said to show a 5′ vein of milling ore in the breast of a 200′ tunnel. Idle.

COPPER PLATE MINING CO., LTD. **IDAHO.**

Dead. Formerly at Mullan, Shoshone Co., Idaho.

COPPER PRINCE CONSOLIDATED MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. Anthony O. Jacobson, president; Clarence K. McCornick, vice-president; Chas. H. Post, secretary. Organized 1904, with capitalization $500,000, shares $1 par. Lands, 3 groups, near the Continental-Alta and Columbus Consolidated, from which $900,000 worth of ore is said to have been shipped in the past. Apparently moribund.

COPPER PRINCE MINING CO. **CALIFORNIA.**

Office: care of J. C. Ruddock, secretary, Ukiah, Cal. Mine office: Middletown, Lake Co., Cal. E. Lobree, president, at last accounts. Lands, 3 claims, opened by tunnel and trenches. A vein of 6′ to 8′ width, in limestone, has given assays of 5% copper, 1 oz. silver and $3 gold per ton. Idle for some years, and apparently moribund.

COPPER PRINCE MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Daggett, Cal. Mine office: Crackerjack, San Bernardino Co., Cal. Frank Durham, Jr., president; Chas. Melini, vice-president; L. W. Flournoy, treasurer; Col. D. K. B. Sellers, secretary; preceding officers, Theron Flower and Washington Hall, directors. Organized May, 1907. Presumably idle.

COPPER PRINCE MINING & SMELTING CO. **COLORADO.**

Mine office: Copperfield, Frémont Co., Colo. Mine, in the Red Gulch district, shipped ore, 1907, running 31% copper.

COPPER QUEEN CONSOLIDATED MINING CO. **ARIZONA.**

Office: 99 John St., New York, N. Y. Mine office: Bisbee, Cochise Co., Ariz. Works office: Douglas, Cochise Co., Ariz. Prof. Jas. Douglas, president; A. C. James, vice-president; Geo. Notman, secretary and treasurer; Walter Douglas, general manager; Arthur Woodman, assistant general manager; Gerald Sherman, mine superintendent; Geo. B. Lee, smelter superintendent; J. B. Moulton, assistant smelter superintendent; G. H. Dowell, ore purchaser; W. F. Crane, auditor; W. H. Brophy, store manager; J. S. Taylor, Jas. Finley and Thos. Devine, mine foremen.

Organized August, 1885, under laws of New York, with capitalization $2,000,000, shares $10 par. Was said to have paid $5 per share quarterly dividends in 1906. Is operated as a close corporation, and is said to have only about 15 shareholders.

About 4,000 men are employed, of whom approximately 2,500 are at the mines and 1,500 at the smelter.

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Lands are upwards of 1,000 acres, including various mines hereinafter described in detail. The mine is opened ahead for about 8 years, present ore reserves being among the richest and most extensive ever developed in any property. In December, 1907, new openings aggregated 5,600′. Ore bodies are so soft that it is difficult to secure the mine openings, especially as the entire hill above the mine is creeping, and serious crushes can be avoided only by heavy timbering and the exercise of great care. Many of the stopes are bulkheaded throughout, and the mine is timbered with square sets of 10x10″ and 12x12″ timber, mainly Washington fir, an average of 30′ of timber, board measure, being required for each ton of ore won. All ore is hand-sorted underground, after breaking, and culls used for filling in worked-out stopes, this material standing remarkably well. Notwithstanding numerous disadvantages of operation and menaces to life, the Copper Queen is one of the safest of mines for underground workmen, an evidence of able and experienced management.

The mine has electric pumps, there being three 300-gallon pumps at the Czar shaft, two of 100 gallons each at the Holbrook, two 50-gallon pumps at the Silver Spray, and two 100-gallon pumps at the Lowell. Lead-lined pump columns are used, to obviate excessive corrosion from acid mine-waters. The mine, as a whole, is not especially wet, the district being drained largely by the Superior & Pittsburg.

The entire system of mine operation was changed, radically, in 1908. Formerly each of the principal shafts was operated as a separate mine, but the 5 old shafts are now used only for men, waste, timber and supplies, all ore extraction being through the Sacramento shaft. The haulage system has circa 6 miles of tracks, on the 400′, 600′, 800′, 1,000′ and 1,200′ levels. In order to complete this traction system it was necessary to open many new drifts and crosscuts, which have been located in solid ground, wherever possible, as the electric tram-lines are the arteries of the mine. The haulage system has Goodman locomotives and side-dumping ore cars. Chutes have been installed throughout the mine, for loading the motor-cars, which discharge into large storage bins, from which the skips are loaded.

The mine was opened, 1880, on a solid outcrop of oxidized copper, iron and manganese, opposite the Copper Queen hotel in Bisbee. The original ore body, since removed, leaving a large artificial cave, gave average returns of 23% copper, smelted in a 30″ water-jacket furnace, with English coke, brought via San Francisco, but was exhausted in three or four years, and the mine experienced many vicissitudes, until additional and far larger ore bodies were developed, by following seams and stringers of ore wherever occuring, these almost invariably leading to further large and rich ore deposits. The formation of the Copper Queen, and other mines of the district, consists essentially of two dolomitic limestone beds, of Carboniferous age, the upper white and the lower blue, dipping to the southward and flanking a granite-porphyry core, with intrusive porphyritic dikes. Until 1902 the principal ore bodies were found at the base of the upper limestone bed, which is much broken and interrupted by feldspathic, igneous, intrusive rocks, that evidently have a considerable bearing upon the ore deposits, which occur in pockets, lenses, chimneys, bunches, chutes, veins, stringers and seams, the larger bodies being connected, in most cases, by small veins, or mere knifeblade seams. The limestone and its included ore bodies have a general pitch to the southeast, somewhat sharper than the pitch of Tombstone Cañon, necessitating deeper shafts as distance is made toward the southeast. Extensive bodies of high-grade ore have been found, since 1902, in the underlying limestone strata, and developments prove these underlying ore bodies to be persistent to great depth.

All of the Copper Queen's deep shafts are bottomed in disseminated sul-

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phide ores of high grade, consequently the depth of the ore bodies, while already proven great, is conjectural. The mines show numerous beautiful caves, lined with calcite, some of these being of considerable size, and frequently found in close association with good ore bodies. Rich oxidized ores are found on the lowest level, with chalcocite and bornite occuring above azurite, malachite, cuprite and even considerable bodies of native copper. The larger masses of native metal, ranging up to several hundredweights, and even tons, have been found mainly, not in the upper levels, as might have been expected, but at considerable depth. There is much talc and hematite, with frequent occurrences of manganese, in connection with the ore bodies. Only oxidized ores were worked, until 1893, when converters were added to the smelting plant, since which time the furnaces are charged with a mixture of oxide, carbonate and sulphide ores, perhaps one-third of the charges being sulphide ores, the ores smelted giving average returns of better than 7%. The system of assaying used by the mine gives no figures regarding ores richer than 15%, and the frequent occurrence of the figures "15+," on the assay books of every shaft, testifies to the wonderful richness of the ore bodies.

The Czar shaft, the oldest of the present workings, is 400′ deep, with an electric hoist. The old shops and smelter were located on a narrow bench of ground, made by grading the steep hillside above the Czar. The old smelter has been dismantled, but some of the shops remain.

The Holbrook mine lost its old shaft, by fire and caving, this being replaced, 1907, by a new 4-compartment shaft, 540′ deep, located circa 1,100′ southeast of the Czar. Surface equipment includes a steel gallows-frame and a 750-h. p. hoist actuated by compressed air. The Holbrook is the principal mine of the Copper Queen, having large and numerous bodies of exceptionally nigh grade ore.

The Hayes shaft, between the Holbrook and Silver Spray, is out of commission, having been replaced by the latter some years ago.

The Silver Spray shaft, commonly known as the Spray, circa 1,400′ southeast of the Holbrook and near the Irish Mag shaft of the Calumet & Arizona, is 954′ deep, with 3 compartments, retimbered, 1907, having become badly drawn. This shaft shows rich ores from the fourth level to the bottom, the upper workings carrying mainly chalcocite, which changes to bornite on the fifth level, with oxidized ores and a continuance of sulphides on the sixth and seventh levels, ores being mainly sulphide on the eighth level. The ore bodies are very extensive and persistent, but most erratic in nature, with frequent porphyry dykes. A considerable body of native copper was cut on the 700′ and again on the 800′ level, thus setting at defiance some deeply cherished geological theories regarding ore deposition. A 20x60″ Nordberg Corliss hoist, actuated by compressed air, operates 3-deck cages.

The Lowell shaft, southeast of the Irish Mag, is 1,447′ deep, showing no important ore bodies above the 900′ level, but having high grade sulphide ores on the lower workings, the 1,000′ level showing high grade oxidized ores below sulphides. This shaft makes circa 175,000 gallons of water daily, which is forked to surface by a Prescott station pump on the 1,000′ level. A 20x60″ Nordberg hoist, operated by compressed air, raises 3-deck cages, and the shaft has a steel headgear.

The 3-compartment 1,100′ Gardner shaft, 1,450′ southeast of the Silver Spray, has large bodies of high grade sulphide ore. Surface equipment includes a 100′ steel gallows-frame and a 750-h. p. Nordberg 20x60″ hoist, actuated by steam.

The 700′ Cuprite shaft, circa 1,400′ west of the Silver Spray, is connected underground with the Czar. No large ore bodies have been located by this

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shaft, though it should find the extension of the ore bodies of the Shattuck-Arizona.

The Uncle Sam has an old shaft, and a new shaft, sunk 1907-1908, to circa 500′ depth, connected with the Czar and Holbrook mines.

The White Tail Deer shaft, lying some distance south of the main workings, is reached by road through a detour of several miles, and was opened, circa 1893, to 100′ depth on the incline, and some high grade ore was shipped, 1904, by lessees, running 12 to 15% copper. The mine shows a large body of low grade ore.

The 4-compartment 1,200′ Sacramento shaft is planned to handle the entire output of the mine, having a hoisting capacity of 4,000 tons daily, with ore-loading bins on the various levels served by the electric haulage system, the Sacramento being connected with all the other workings of the mine. The shaft was sunk in rock for practically the entire distance, insuring as great a degree of immunity from drawing as is possible in this district. The Sacramento hoist is a powerful Nordberg tandem compound engine, with 7′ drums having a 5′ face, the hoist being operated by steam, with 6 auxiliary engines actuated by oil, under 150 lbs. pressure. Hoisting is by 3-ton skips, and the arrangements for uninterrupted hoisting, to the capacity of the shaft, are unusually complete.

The Sacramento shaft has perhaps the most elaborate and best devised system for mixing and loading ores to be found at any copper mine. On reaching surface, in the shafthouse, ore is dumped automatically upon a Stephens-Adamson belt conveyor, which carries the ore about 150′ down the hill to the loading tracks. The loading shed is 42x800′, of steel frame, with 4 railroad tracks running beneath, cars being loaded from 2 conveying belts running lengthwise between the 4 tracks, ore being scraped off the belts by dumping carriages moving continually back and forth, the motion mixing the ore thoroughly. Every tenth skipload is weighed automatically, and loaded into a special car for sampling and checking purposes.

A precipitation plant, built 1906, at the Czar shaft, on the site of the old smelter, has a series of vats and launders, taking mine water, from the Holbrook and Czar shafts, which is heavily charged with copper sulphate in solution. The two monstrous slag-dumps near the Czar shaft, remaining from the old smelting plant, are being broken up and shipped to Douglas for re-smelting.

Formerly each shaft had its own independent power plant, but these were replaced, 1908, by a central power plant that effects large savings. The main power plant, between the Sacramento and Gardner shafts, has an engine-house and boiler-house, both of steel frame. Equipment includes four 400-h. p. Stirling boilers, 3 Curtis 500-kw. turbo-generators, 3 Ingersoll-Rand air-compressors, with aggregate piston capacity of 9,300 cubic feet of free air per minute, and various smaller machinery. Fuel is Texas and California petroleum, with large tanks for oil storage

The mine machine-shop, 66x150′, of steel frame, located on Sacramento Hill, near the power plant, includes a smithy and boiler-shop. Mine buildings include a considerable number of minor shops, warehouses, changing-houses and offices. All of the shafts and the principal mine buildings are reached by spurs of the El Paso & Southwestern railway, the railroad line at the mines having been rebuilt, 1907, with better grades.

The smelter, known as the Douglas reduction works, is at Douglas, Arizona, 28 miles from the mine and 1 mile from the Mexican border. This plant was designed as a central smelter for the mines of Phelps, Dodge & Co. in Arizona and Mexico, these including the Copper Queen at Bisbee, the Detroit at Morenci, the Old Dominion at Globe, the Moctezuma at Nacozari, and the Sierra de

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Cobre at La Cananea. These properties produce a great diversity of copper ores, including those of practically every grade and character found in the American southwest and in northern Mexico, and it is possible, by means of this central reduction plant, to take advantage of the varied nature of the ores, in mixing furnace charges. This plant also does a considerable custom business, on copper, gold and silver ores.

The works occupy a site of 320 acres, and are served by a very complete Y-track railroad system, of standard gauge, that reaches every building and department of the plant, there being about 15 miles of railroad track, including main line and sidings. Construction of the plant was begun May, 1901, and the first stack was blown in March, 1904, since which time there has been almost continuous enlargement, and the works, costing circa $4,000,000, are second in size only to the mammoth Washoe smelter, having a daily smelting capacity of about 4,000 tons.

Water for the works is secured from artesian wells of about 300′ average depth, water rising nearly to the surface, with one well, of circa 1,000′ depth, flowing 200 gallons per minute. A large reservoir and cooling tower have been built, in connection with the water supply.

The ore bedding system at the works consists of 5 pits, the fifth having been built 1908, each 40x800′ in size, and 11′ deep, having an aggregate storage capacity of circa 90,000 tons. Ore, received from the mine in side-dumping steel cars, is discharged into the pits, which are lined with white tufa. The pits are filled with the different grades of ore required to constitute a normal furnace mixture, and mixed by a mechanical plow, while ore is removed therefrom, as required at the furnaces, by steam-shovels running on permanent tracks laid upon the floors of the pits.

Adjoining the furnace building is a steel trestle, 48′ high and 1,343′ long, divided into sections, with storage bins for coke, fluxes and silica.

The sampling mill, 65x235′ in size, of steel and brick, has 3 crushers, 6 rolls and 2 Vezin automatic samplers.

The steel blast-furnace building, twice enlarged, is 160x775′ in size, including also the converter department and relining plant, and is equipped with three 60-ton 5-motor Morgan traveling cranes, of 60′ span, running the entire length of the building. There are ten 400-ton blast-furnaces, each 44x240″, with forty 4″ tuyeres, and a height of 16′ from the tuyeres to the charging floor. The 10 furnaces are set 15′ apart, in a single line, with one settler between each pair, settlers being 10′ wide and 20′ long, lower half lined with chrome brick and upper half with ordinary fire-brick. Slags skim through 2 spouts into 18-ton slag-cars, hauled by electric locomotives, the slag being used for grading by the El Paso & Southwestern railway. Ore is charged on either side, alternately, charging being done from trains of 20 cars, each car carrying 2,500-lb. charges, hauled by 13-ton electric locomotives.

The dust chamber is of steel frame, with brick walls, roofed with reinforced concrete supported by steel trusses, and has a bottom of tiled hoppers.

There is one large reverberatory furnace in the slag-yard south of No. 6 blast-furnace. This has been run experimentally, taking charges of flue dust and fines mixed with converter slags. The experiment has not proven entirely successful. The original plans called for 4 additional reverberatories, giving one for each pair of blast-furnaces.

Molten matte is taken from the blast-furnaces to the conveyors by two 60-ton Morgan electric traveling cranes, each having two 15-ton auxiliary hoists. The converter department has 8 stands, operated hydraulically, with 36 shells of the well-known Copper Queen barrel type, 96x126″ in size. Copper is poured in a Walker casting machine. The lining department has 3 grinding-pans, with pneumatic machinery for tamping.

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The steel stack of the furnace building, 30′ in diameter at the base and 25′ at the top, was 200′ high, but a 60′ extension was added, 1906, by the Wisconsin Bridge & Iron Co. The new section, weighing 40 tons, built upon a scaffolding at the top of the old stack, upon the windward side, was rolled into position and riveted on within a few hours after completion, without the suspension of smelting.

The power-house, of steel and brick, repeatedly enlarged, is now 120x379′ in size, and has about 20 engines of various sizes and types, aggregating more than 6,000 h. p., for different uses. The equipment includes 4 Nordberg cross-compound blowing engines, each direct-connected to a 400-kw. 250-volt direct current generator; Nos. 9 and 10 Connersville blowers, set staggering; a cross-compound 2-stage condensing air-compressor, with piston capacity of 2,000 cubic feet of free air per minute, at 100 lbs. pressure, for running pneumatic tamping machines, operating charging doors of the blast-furnaces and pumping water; 3 triplex motor-driven pumps, delivering water into compression tanks at 350 lbs. pressure per square inch, with automatic regulation; four 400-kw. 250-volt direct current generators, supplying power for cranes, slag locomotives and electric light, and a number of minor engines and dynamos.

The 85x205′ steel boiler-house has six 500-h. p. and four 1,000-h. p. Stirling water-tube boilers, with a Green fuel economizer and a Foster superheater with capacity of 90,000 lbs. of steam per hour. The stack of the boiler-house is of brick, 13′ in diameter at the base, and 177′ high. Boilers are arranged to burn either coal or petroleum, but latter is used exclusively, consumption of California and Texas petroleum, at the mine and works, amounting to about 500,000 gallons monthly. Oil for fuel is cheaper in first cost, easier and cleanlier to handle, and effects a great saving in the wages of 3 daily shifts of stokers formerly required at every boiler plant.

The machine-shop, 80x204′, of steel and brick, is fitted with a very complete line of shop tools, capable of handling the heaviest work.

The boiler-shop, 85x120′, of steel and brick, is exceptionally well equipped, and can repair locomotive boilers.

The smithy, 90x120′, of steel frame, is equipped as thoroughly as the other shops, and is capable of handling forgings of considerable size.

The foundry, 80x90′ in size, of steel frame, has both iron and brass cupolas, turning out iron castings up to many tons in weight. The shops at the Douglas works can do, not only any ordinary or extraordinary repair work, but, at a pinch, are capable of manufacturing heavy machinery.

Miscellaneous shops at the smelter include a combination sawmill and planing mill, 95x120′ in size, well equipped with wood-working tools.

Miscellaneous buildings at the Douglas works include an office and warehouse, various minor shops and a considerable number of neat dwellings for employes.

A limestone quarry, at Lee station, 7 miles east of Douglas, has a large crusher and storage bins, the requirements of the smelter being 400 to 500 tons of limestone daily, for flux.

The El Paso & Southwestern railway, owned by Phelps, Dodge & Co., which serves the Copper Queen mines and works, has some 300 miles of main line, and, though designed solely as an outlet for the Phelps-Dodge mines, has developed a previously inaccessible district, rich in natural resources. One result of the construction of this line has been the building of the new town of Douglas, named in deserved honor of the president of the Copper Queen, which is a bustling young metropolis of some 15,000 population, already a strong competitor of El Paso as a custom smelting point, taking ores from Arizona, New Mexico, Sonora and Chihuahua.

A sawmill is operated, in the Chiricahua Mountains, though the bulk of

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the timber and lumber requirements of the mine and works are met by the importation of timber from the Pacific coast.

The company maintains, at Bisbee, an enormous department store, that carries a stock larger than can be found in most cities of twice the size. This store has extensive branches, at Lowell, Douglas and Naco. There is, however, no compulsion of employes, who are at perfect liberty to buy goods of any of the numerous and flourishing independent mercantile establishments of Bisbee and Douglas.

The Copper Queen has a large and well equipped hospital at Bisbee. The company also owns, at Bisbee, a fine 4-story hotel, and maintains libraries and reading-rooms for employes at both Bisbee and Douglas. At Bisbee there is a handsome 3-story gymnasium, having baths, bowling alleys and a large auditorium, in which scientific and popular lectures are given frequently.

Relations of the Copper Queen with its employes have been notably cordial for many years, though some trouble was had, 1906-1907, through a strike called by the Western Federation of Labor. Efforts were made, at different times, to unionize the Bisbee camp, but, early in 1906, a referendum vote of the mine-workers was taken on this point, no bosses or other salaried employes being allowed to vote. The polling was conducted on the Australian system, with complete poll-lists, inspectors and guards, and was absolutely fair, resulting in a vote of more than 5 to 1 against forming a union of the Western Federation of Miners, notwithstanding which the Federation promptly organized, in violation of the spirit of the vote, and immediately thereafter called a strike. This was maintained for some months, backed by all the power of a strong labor union, but, though causing more or less trouble, resulted in a disastrous defeat for the Federation, and Bisbee is now an open camp. The mine workers have not suffered, however, as wages have been maintained at the high level set by the Copper Queen many years ago, and the 8-hour system continued. The attitude of the miners employed by the Copper Queen is that, inasmuch as they are obtaining all the benefits demanded by the miners' union, without any of the strikes and other troubles usually attendant upon the existence of the union, they are satisfied to leave matters as they have been for 20 years past.

Production was 64,570,847 lbs. fine copper in 1905; 71,711,813 lbs. fine copper, 332,311 oz. silver and 7,573 oz. gold in 1906, and 66,916,972 lbs. fine copper, 338,723 oz. silver and 4,197 oz. gold in 1907. The ultimate productive capacity of the Copper Queen cannot be rated at less than 100,000,000 lbs. yearly. The mine is one of the best in existence, and both mine and works have grown wonderfully within the past few years, the mining and reduction plants now being among the best in existence. The management is exceptionally farsighted and capable, and deserves the highest commendation for the friendly and helpful spirit shown in dealings with employes, and for the neighborliness that has impelled the Copper Queen to lend a helping hand to the newer mines at Bisbee.

COPPER QUEEN CONSOLIDATED MINING CO. **WYOMING.**

Dead. Formerly at Dillon, Carbon Co., Wyo.

COPPER QUEEN CONSOLIDATED MINING & MILLING CO.

Office: 500 Auerbach Bldg., Salt Lake City, Utah. Moribund.

COPPER QUEEN GOLD MINING CO. **ARIZONA.**

Office: Mayer, Yavapai Co., Ariz. J. S. Johnson, superintendent. Lands, across the Agua Fria river from the Binghamton mine, show argentiferous and auriferous copper ores. Was developing with a small force at last accounts.

COPPER QUEEN GROUP MINING CO. **COLORADO.**

Office: 723 Oddfellows Bldg., St. Louis, Mo. J. G. Bolmer, president;

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C. A. Weber, vice-president; M. M. Clemmons, secretary and treasurer. Organized 1901, under laws of Colorado. Lands, 6 claims, patented, in the Elk Mountain district of Gunnison county, Colo., having about 600′ of workings, said to have produced several thousand dollars' worth of ore under previous ownership. A tunnel to undercut this and adjoining properties, being driven by the Usona Mining Co., at last accounts, was planned to intersect the Copper Queen vein about one-half mile below surface. Idle since 1903, but selling stock at last accounts.

COPPER QUEEN, LTD. **BRITISH COLUMBIA.**

Dead. Dissolved, August, 1904. Formerly at Nelson, Kootenay district, B. C.

COPPER QUEEN MINE. **BRITISH COLUMBIA.**

Office: care of Edw. B. Cox, manager, Seattle, Wash. Mine office: Van Anda, Texada Island, B. C. Harry Wild, superintendent. Lands, crown-granted, near the Cornell and Marble Bay mines, carry bornite and chalcopyrite ranging in tenor up to 8% copper, 2.5 oz. silver and $1 gold per ton. Has a 500′ main shaft, with a 180′ winze. Presumably idle.

COPPER QUEEN MINE. **COLORADO.**

Office and mine: care of Miss Nettie Hornbeck, owner, Silverton, San Juan Co., Colo. Lands, 8 claims, area 160 acres, on Sultan Mountain, opened by a 70′ contact tunnel showing ore assaying 15% copper and $25 gold per ton, with small silver values.

COPPER QUEEN MINE. **NEW MEXICO.**

Mine office: Jarilla, Otero Co., N. M. Wm. Wade, manager, at last accounts. Lands, in the northern part of the Jarilla Mountains, show a 14′ vein of sulphide ore assaying circa 8% copper, with small gold and silver values. Presumably idle.

COPPER QUEEN MINING CO. **IDAHO.**

Office and mine: Mullan, Shoshone Co., Idaho. E. B. Crawford, president and general manager; Tennes Nelson, vice-president; C. B. Boyden, secretary; Dr. E. D. Keys, treasurer. Organized 1906, with capitalization $1,000,000. Lands, 7 claims, known as the Stevens Peak group, at the head of Willow Creek, having a 400′ tunnel cutting a vein, supposed to be the Reindeer, of 40′ estimated width, carrying a 12″ paystreak of massive chalcopyrite, assaying 20 to 30% copper, with fair silver values, balance of vein being spathic iron ore impregnated with low-grade chalcopyrite of concentrating tenor. Has an 86′ tunnel and plans running, jointly with the Reindeer, a tunnel of circa 2,800′, giving a back of circa 775′ on the Reindeer and circa 1,200′ on the Copper Queen.

COPPER QUEEN MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Lands, 6 claims, held under a $33,500 bond and lease.

COPPER QUEEN MINING CO.

Dead. Formerly had an office at 542 Rookery Bldg., Spokane, Wash.

COPPER QUEEN MINING CO., LTD. **ONTARIO.**

Dead. Succeeded, 1905, by Calumet & Algoma Mining Co. Formerly at Bruce Mines, Algoma, Ont.

COPPER QUEEN MINING & SMELTING CO. **IDAHO.**

Office: 409 Providence Bldg., Duluth, Minn. Mine office: Grant, Beaverhead Co., Mont. T. E. G. Lynch, president; B. F. White, vice-president; A. J. McLennan, secretary and treasurer; Geo. H. Crosby, general manager; Emerson Hill, superintendent; preceding officers, Dr. C. W. McFadden and J. C. McFadden, directors. Organized June 12, 1905, under laws of Arizona, with capitalization $500,000, shares $1 par. Absorbed, circa 1908, the Queen & Crescent Mining Co., giving one share for eight.

Lands. 23 claims, on Agency creek, in Lemhi Pass, in the Eureka district

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of Lemhi county, Idaho, 38 miles from the Oregon Short Line railway. Property includes the Queen & Crescent group of 17 claims, and the Copper Queen group of 6 claims, latter carrying 8 fissure veins, in schistose quartzite, of which 3, under development, range from 15″ to 15′ in average width, showing mainly bornite, with occasional chalcocite and chalcopyrite, said to give average assays of 15% copper, 5 to 10 oz. silver and $15 gold per ton. Development is by shafts of 100′ and 140′, and by 7 tunnels, longest 425′, with circa 2,000′ of workings.

Equipment includes a steam plant with 3 boilers, 2 hoists and a 3-drill Rand air-compressor. There are 10 buildings, including a log mill having 10 gravity stamps, 2 concentrators and Wilfley tables. In January, 1908, shipped 2 carloads of ore assaying circa 45% copper, 8 oz. silver and $20 gold per ton. Is developing with force of 16 men. Property considered promising and management good.

COPPER RANCH GOLD MINING & MILLING CO. **COLORADO.**

Office: 1711 Tremont St., Denver, Colo. W. E. Alexander, president; T. E. Fisher, vice-president; Thos. Fielding, secretary. Organized under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands, 170 acres, patented, in the Grand Island district of Boulder county, Colorado, opened by a 218′ shaft, with circa 350′ of drifts. In May, 1903, advertised that there was no risk in buying this stock, as dividends would be paid in a few months. Was still selling stock, 1906, advertising its property as a tungsten mine, with no dividends paid, and no prospects of dividends. Is not regarded favorably.

COPPER RANCH MINING CO. **UTAH.**

Office: 323 D. F. Walker Bldg., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Milford, Beaver Co., Utah. Moses Thatcher, president; C. L. Rood, vice-president; Benj. T. Lloyd, secretary and treasurer. Organized under laws of Utah with capitalization $500,000, shares 50 cents par.

Lands, 17 claims, area circa 340 acres, between the Old Hickory and O. K. mines of the Majestic company, carrying circa 2 miles of the strike of a vein of about 100′ width, opened at intervals for a mile, showing ores assaying up to 43% copper, 10 oz. silver and $8 gold per ton. Management estimates that entire vein will average 4 to 7% copper, with fair gold and silver values, which is a serious overestimate. Ore carries 5 to 25% iron, rendering it desirable for fluxing purposes. The mine has but slight development, with a shaft, poorly planned, 32′ deep on the incline and 43′ farther vertically, mainly in ore. Said to have been bonded, early 1907, for 18 months, to E. H. Wilson, R. N. Hertzig and John W. Compton, for $75,000. Property considered promising, but out of cash and idle several years.

COPPER RANGE CO. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Wm. A. Paine, president; Chas. H. Paine, vice-president; Frederic Stanwood, secretary and treasurer; preceding officers and Chas. A. Snow, directors; F. W. Denton, general manager.

Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Is controlled, through ownership of 99,674 shares out of the total issue of 100,000, by the Copper Range Consolidated Co. Owns 50,000 shares of Champion Copper Co., being one-half the total issue, and 26,051 shares of Copper Range Railroad Co. Income, 1907, was $502,913.97, of which $500,000 came from dividends on stock of Champion Copper Co., $2,749.97 from interest and $114 from rentals. Disbursements, 1907, were $545,532.75, including $450,000 paid in dividends. Ended 1907 with $69,146.55 cash on hand, and liabilities of only $427.06. Dividend record is as follows: $300,000 in 1905, $600,000 in 1906, $450,000 in 1907.

Lands, 9,360 acres, in a compact tract south of the Baltic mine, in Town

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54 North, Range 34 West, and Town 54 North, Range 35 West, upwards of 5,000 acres being on the mineral belt. Company also holds an option on 2,000 acres of mineral land owned by St. Mary's Canal Mineral Land Co., in the immediate neighborhood of its own holdings. Miscellaneous lands include 441 acres, with nearly 4 miles frontage on Lake Superior, near the mouth of the Graveraet river, 3 miles southwest of the Champion mill, at Freda, sufficient to give sites to three or four new stamp mills. The mineral tract was explored, 1907, by 1,535' of diamond drilling, without results.

COPPER RANGE CONSOLIDATED CO. MICHIGAN.

Office: 82 Devonshire St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Wm. A. Paine, president; Chas. H. Paine, vice-president; Frederic Stanwood, secretary and treasurer; preceding officers, J. Henry Brooks, Kenneth K. McLaren, R. Townsend McKeever, Frank McM. Stanton, F. W. Denton and Samuel L. Smith, directors; John M. Wagner, purchasing agent; C. E. Cleaves, mechanical engineer.

Organized November, 1901, under laws of New Jersey; capitalization increased, 1903, to $38,500,000, and increased, 1907, to $40,000,000, shares $100 par; issued, $38,418,500. Has about 6,000 shareholders. American Trust Co., Boston, transfer agent; Old Colony Trust Co., Boston, registrar. Dividends have been as follows: $1,536,086 in 1905, $2,300,064 in 1906, $2,304,810 in 1907, $1,536,740 in 1908.

The Copper Range Consolidated Co. is a securities holding corporation, its assets consisting principally of stock in subsidiary companies, these including the Copper Range Co., Copper Range Railroad Co., Baltic Mining Co. and Trimountain Co., all practically owned outright; a one-half interest in the Champion Copper Co., and control of the Globe mine, now under development, all separately described, under their respective titles.

Share assets of the Copper Range Consolidated Co. are as follows: 99,699 shares Copper Range Co.; 99,659 shares Baltic Mining Co.; 99,185 shares Trimountain Mining Co.; 13,986 shares Copper Range Railroad Co., and $615,000 bonds of Copper Range Railroad Co. In addition, the company holds, unissued, 791 shares of its own stock, in reserve, for exchange for outstanding shares of the Baltic Mining Co. and Copper Range Co.

Company's assets, Jan. 1, 1908, included bills receivable of Champion Copper Co., $579,808.99; bills receivable of Baltic Mining Co., $535,070.23; bills receivable of Copper Range Railroad Co., $35,082.97. Total assets, Jan. 1, 1908, were $41,106,790.73, with a balance of $344,154.24 to credit of profit and loss.

Receipts for 1907 were $4,384,315, and disbursements were $4,128,502.82, company beginning the year with a cash balance of $194,526.83, and ending with a cash balance of $450,339.01. Principal items of 1907 receipts were $996,590 dividends from Baltic Mining Co.; $448,645.50 dividends from Copper Range Co.; $114,906.57 from the Michigan Smelting Co., from advances previously made; $600,000 from United Metals Selling Co., advances on copper unsold; $1,150,000 bills payable, representing loans made, and $514,885.42 from A. C. Burrage, as balance in full under the Trimountain majority stockholders' agreement of Aug. 25, 1903, this completing payment of the full amount of $854,954.80, as per settlement effected 1907. Disbursements, 1907, included dividends of $2,304,810; $117,030.06 for miscellaneous expenditures, mainly legal expenses in the Burrage litigation, and various advances to the subsidiary companies, necessitated by the complete collapse of the metal market during the latter part of 1907, these advances being $363,045.72 to the Baltic Mining Co., $513,808.99 to the Champion Copper Co., $546,583.49 to the Trimountain Mining Co., and $42,251.57 to the Copper Range Railroad Co. Expenditures also included $41,716.40 for electric construction, and $191,580.92 on the Globe

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option and exploration, total expenditures on the latter, to end of 1907, having been $392,307.20.

While the Copper Range Consolidated Co. is merely a securities holding corporation, the option on the Globe mine is held direct, but probably will be transferred later, if the property is taken over. The Globe mine is described separately.

The company is said to plan a central electric power plant, for the operation of the mines and mills of its subsidiary companies, which plant probably will be located near the Michigan smelter, at Houghton.

Through its subsidiary corporations the Copper Range Consolidated Co. has become the second largest copper producer of the Lake Superior district, and one of the dozen largest producers of the world. Copper Range production includes total outputs of the Baltic and Trimountain mines, and one-half of the output of the Champion mine, other half going to the St. Mary's Mineral Land Co., a joint owner, with the Copper Range, in the shares of the Champion Copper Co. The production, 1907, of the Baltic, Trimountain and Champion mines was 41,385,015 lbs., leaving a net production, for the Copper Range Consolidated Co., of 33,140,297 lbs. fine copper, comparing with 32,382,983 lbs. in 1906, and 32,714,859 lbs. in 1905. Production, 1908, was practically unchanged. The mines and mills are in condition to increase production materially, in the near future. Average cost of copper produced, 1907, by the subsidiary companies, was about 9 cents per pound.

It is probable that the Baltic, Trimountain and Champion mines carry more copper, and eventually will produce more copper, than the Calumet & Hecla mine proper, and it should be produced at nearly as great a profit per pound. The management of the Copper Range Consolidated Co. is one of the most progressive and efficient in the industry, and its mines are among the very best in the Lake Superior district.

COPPER RANGE & ARIZONA MINING CO. **ARIZONA.**

Office: 44 Pine St., New York, N. Y. Mine office: Tucson, Pima Co., Ariz. Francis M. Hartman, president; Frank G. Wright, secretary; Geo. Saville, treasurer; Jos. W. Coffin, consulting engineer. Organized under laws of Arizona, with capitalization $1,000,000, shares $2 par. Lands, 15 claims, 5 patented, area 300 acres, also 100 acres of millsites and water rights, 40 miles from a railroad, opened to depth of 300′, with about 3,000′ of workings, showing auriferous and argentiferous chalcopyrite and galena.

COPPER RANGE MINING CO. **MEXICO.**

Office: Chicago, Ills. Mine office: Autlán, Jalisco, Mex. Is said to have ordered a 50-ton smelting-furnace.

COPPER RANGE RAILROAD CO. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Operating office: Houghton, Houghton Co., Mich. Wm. A. Paine, president; R. Townsend McKeever, vice-president, manager, assistant secretary and assistant treasurer; Frederic Stanwood, secretary and treasurer; preceding officers, John H. Rice, F. W. Denton, Frank McM. Stanton, Rufus R. Goodell and Samuel L. Smith, directors; C. T. Fales, general superintendent.

Organized 1899, under laws of Michigan, with capitalization $5,000,000, shares $100 par; issued, $4,033,700. Bonds, outstanding, $2,025,000, at 5%. Is authorized to issue bonds to the extent of $20,000 per mile of completed main line, and $15,000 per mile of completed branch lines and sidetracks.

Balance sheet, Dec. 31, 1907, gave cost of road as $5,678,676.83, and cost of equipment as $735,249.55. Earnings, 1907, were $860,434.84, comparing with $659,252.86 in 1905. Operating expenses, 1907, were $602,245.21, with $146,680.12 taxes and interest, leaving a surplus of $111,298.51, with total credit balance of income account, for all years, of $504,899.42.

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The railroad has upwards of 100 miles of trackage, the main line, of 60 miles, running from Calumet to Mass, connecting with the Keweenaw Central at Calumet, Duluth, South Shore & Atlantic, Hancock & Calumet and Mineral Range railways at Hancock and Houghton, and the Chicago, Milwaukee & St. Paul railway at Mass. The company's principal business is the transportation of copper rock and supplies for the subsidiary corporations of the Copper Range Consolidated Co., for which purpose the line was built, but, incidentally, a large general business has been built up, and what was a wilderness at the end of the Nineteenth Century has been developed and populated. The road is in fine physical condition, with well ballasted tracks laid with heavy steel rails, substantial bridges and good rolling stock.

The company owns a half interest in a railroad bridge crossing Portage Lake, between Houghton and Hancock. An extensive water frontage on Portage Lake, in the western part of Houghton, is improved by a two-story stone and brick general office building, shops, roundhouse, warehouses and wharves for merchandise and coal. The coal-wharf is equipped with modern unloading machinery, and has deep water alongside, capable of accommodating the largest freighters plying the great lakes.

COPPER RIDGE MINING & DEVELOPMENT CO. **NEW MEXICO.**

Mine office: Magdalena, Socorro Co., N. M. Capitalization, $500,000. Lands are said to show chalcopyrite and sphalerite.

COPPER RIDGE MINING & MILLING CO. **COLORADO.**

Mine office: Steamboat Springs, Routt Co., Colo. W. H. Dunfield, president; Clinton E. Bivens, vice-president; W. C. Shaw, secretary and treasurer; Burt Goldsworthy, general manager; preceding officers, Ben Goldsworthy, S. R. Mayberry and G. W. Bratton, directors. Organized 1907, under laws of Colorado, with capitalization $300,000, shares $1 par. Lands, 2 claims, known as the Democrat and Republican, 5 miles north of Steamboat Springs, carrying a fissure vein opened by a shaft of circa 100′, showing ore assaying up to 18% copper, 2.5 oz. silver and $10 gold per ton.

COPPER RIVER COPPER CO. **ALASKA.**

Letter returned unclaimed from former office, Boston, Mass. Robt. Linn, president; Dr. C. A. B. Peters, vice-president; Geo. Tomkins, second vice-president; Geo. A. Ackler, secretary; M. V. Little, treasurer. Organized, 1907, under laws of Arizona, with capitalization $10,000,000 shares $1 par. Is said to have 2 groups of claims in Alaska, and is presumed to have some connection with the Alaska Amalgamated Copper Co., or to have secured lands from same.

COPPER RIVER MINING CO. **ALASKA.**

Office: 1347-25 Broad St., New York, N. Y. F. M. Bradshaw, president; Frank Conrad Helm, secretary and treasurer; preceding officers, Hon. Robt. Gwynne, Jr., and John Q. Denny, directors. A. J. Stewart denies that his brother, Hon. W. F. Bay Stewart, ever was a director, though the name was given by the secretary, Helm, who is a consummate liar and finished rascal. Capitalization, $50,000,000. Lands claimed were 128 claims, area 2,360 acres, including the Bonanza group, which never was owned by the Copper River Mining Co. Lands, if any, are located about 185 miles inland, by trail, from Valdez, Alaska, having "plenty of wood and water, with coal in the vicinity," the timber being a sparse growth of spruce and cottonwood, and the coal being lignite of poor quality. The Copper River Mining Co. is a swindle, and its promoters should be in jail. Fully described Vol. IV.

COPPER ROCK GOLD MINING & MILLING CO. **COLORADO & WYOMING.**

Office: 105 North 7th St., St. Louis, Mo. Mine offices: Sunset, Boulder Co., Colo., and Encampment, Carbon Co., Wyo. H. Lee Servoss, president; Dan G. Kirshbaum, secretary and manager; John Wessels, superintendent.

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Capitalization $1,500,000, shares $1 par. The Colorado property, 60 acres, in the Sugar Loaf district, near Sunset, has a 300′ shaft, showing ores giving good assay values in copper, gold and silver. The Wyoming property, 6 claims, 120 acres, known as the Copper Link, has shafts of 50′, 100′ and 285′, showing a little leached copper ore, carrying up to $4 gold per ton. Wyoming lands possibly sold.

COPPER ROCK & GOLD QUARTZ MINING CO. **ARIZONA.**

Dead. Lands sold to Calumet & Boston Copper Co. Formerly at Bisbee, Cochise Co., Ariz.

COPPER SECURITIES CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. F. Augustus Heinze, general manager. Organized July, 1905, under laws of Arizona, with capitalization $10,000,000, shares $10 par. Apparently is a subsidiary corporation of the United Copper Co., property being $2,000,000 common stock of La France Copper Co., secured in exchange for same amount of common stock of Copper Securities Co. Reason for existence of company is not apparent.

COPPER SELECTION SYNDICATE, LTD. **AUSTRALIA.**

Office: Broad Street House, London, E. C., Eng. Organized Aug. 22, 1902, under laws of Great Britain, with capitalization £15,000, in 14,000 ordinary £1 shares and 20,000 deferred shares, 1s. par. Property was options on sundry mining and smelting properties, in New South Wales. Moribund.

COPPER SHARE SYNDICATE. **WYOMING.**

Office: 7 Union Court, Old Broad St., London, E. C., Eng. Walter Broomfield, secretary. Organized Jan. 9, 1906, under laws of Great Britain, with capitalization £5,000, shares £1 par, as Penn-Wyoming Copper Share Syndicate, Ltd., and name changed, March, 1906, to present title. Was promoted to place shares of the Penn-Wyoming Copper Co. in Great Britain.

COPPER SHIELD MINING CO. **NEVADA.**

Letter returned unclaimed from former office, Salt Lake City, Utah. Mine office: Contact, Elko Co., Nev. Dr. C. I. Douglas, president; U. U. Hiskey, vice-president; J. A. DeValley, secretary and treasurer; preceding officers, C. R Strock and H. M. Shields, directors. Organized, 1907, under laws of Nevada, with capitalization $1,000,000, shares $1 par. Lands, 11 claims, in the Salmon River district, showing ore assaying 3 to 56% copper, with gold and silver values.

COPPER-SILVER MONTANA MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Helena, Lewis & Clark Co., Mont. Lands, in the Scratch Gravel district, just north of Helena, adjoining the Sacajewea Gold & Copper Mining Co., have a 350′ shaft in oxidized copper ore. Idle.

COPPER STAR MINING CO. **COLORADO.**

Dead. Eugene B. Estes was president, and Edwin Wallace secretary. Was a swindle that paid "dividends" while peddling stock. Formerly at Salida, Chaffee Co., Colo.

COPPER STAR MINING CO. **UTAH.**

Mine office: Springville, Utah Co., Utah. T. Y. Shepherd, vice-president; T. L. Hatch, secretary and treasurer; T. T. Hatch, superintendent; preceding officers and Jas. H. Okey, directors. Organized 1908, under laws of Utah, with capitalization $25,000, shares 2½ cents par.

COPPER STATE MINING CO. **MONTANA.**

Mine office: White Sulphur Springs, Meagher Co., Mont. Geo. P. Wells, president. Lands, circa 15 miles northeast of White Sulphur Springs, have a 2-compartment 100′ shaft, with crosscuts said to show a 12′ vein of ore assaying 5% copper and 16% zinc, with small silver and gold values. Has a hoist and plans installing an air-compressor.

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COPPER STATE MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

COPPERTOWN MINING & SMELTING CO. **CALIFORNIA.**

Dead. Formerly at Hornitos, Mariposa Co., Cal. Fully described Vol. VI.

COPPER TRUST, LTD.

Office: 20 Laurence Lane, London, E. C., Eng. Geo. Thompson, secretary. Organized Dec. 9, 1905, under laws of Great Britain with capitalization £50,000, shares £1 par. Apparently moribund.

COPPER TRUST MINING CO.

Dead. In 1901 had an office in Plankinton Bank Bldg., Milwaukee, Wis.

COPPER & URANIUM MINING CO. **IDAHO.**

Office: Rexburg, Idaho. Henry Flamm, president; M. H. James, vice-president; Alfred James, secretary and treasurer; preceding officers and James Shail, directors. Lands, in the Hamilton district of Blaine county, Idaho, have a 125′ shaft on a 10′ contact vein between limestone and quartzite, said to show copper and uranium ores. Plans driving a 600′ tunnel.

COPPER VEIL MINING CO. **WASHINGTON.**

Dead. Formerly at Index, Snohomish Co., Wash.

COPPER VENTURE SYNDICATE, LTD.

Dead. Voluntarily liquidated, June, 1905. Formerly had an office at 10 St. Helen's Place, London, E. C., Eng.

COPPER WORLD EXTENSION MINING CO. **WASHINGTON.**

Office: 503 New Hayden Bldg., Columbus, Ohio. Mine office: Loomis, Okanogan Co., Wash. Walter A. Boyle, president; Edw. H. Caylor, vice-president; Alfred F. Carman, secretary and treasurer; R. J. Thomas, superintendent; preceding officers, Samuel Bachtell and Clarence E. Ferree, directors. Organized Jan. 11, 1904, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, 8 claims, area 160 acres, on Palmer Mountain, in the Wannicut Lake district, showing an ore body, estimated by company to be 100′ to 300′ in width, opened by a 300′ two-compartment shaft, with south crosscut on the 210′ level showing a 17′ vein of chalcopyrite assaying circa 8% copper, 4 oz. silver and $1.40 gold per ton. Has a steam plant with 2 hoists, good for 500′ each, and a 5-drill air-compressor. Plans diamond drilling.

COPPER WORLD GOLD MINING CO. **WASHINGTON.**

Office: care of Jerome L. Drumheller, Spokane, Wash. Mine office: Loomis, Okanogan Co., Wash. John Wentworth, superintendent. Lands, sundry claims on the apex of Palmer Mountain, lying between the Copper World Extension and Leadville mines, 4½ miles northeast of Loomis, showing a 100′ gossan, with pyrite near surface and chalcopyrite at little depth. Has several shallow shafts and short tunnels, showing ore giving assay values of $10 to $15 per ton, in copper, gold and silver.

COPPER WORLD MINING CO. **CALIFORNIA.**

Dead. Formerly at Manvel, San Bernardino Co., Cal. Described Vol. V.

COPPER WORLD MINING CO. **NORTH CAROLINA.**

Dead. Merged, 1903, in Carolina King Mining Co. Formerly at Holloway, Person Co., N. C.

COPPER WORLD MINING & SMELTING CO. **WASHINGTON.**

Dead. Succeeded by Copper World Gold Mining Co. Formerly at Loomis, Okanogan Co., Wash. Described Vol. IV.

COPPER ZONE MINING CO. **NEW MEXICO.**

Dead. Lost lands. Formerly at Watrous, Mora Co., N. M.

SOCIEDAD MINERA COQUIMBANA. **CHILE.**

Mine office: La Serena, Coquimbo, Chile. Property includes the Rosario, Socavon and other mines. Idle for some years.

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CORBIN CONSOLIDATED MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. J. L. Meixell, F. L. Case, D. M. Armstead, H. K. Welch and M. J. Jenkins, directors. Organized 1908, with capitalization $500,000, shares $5 par. Lands, 4 claims, 1 held under bond and lease on Alta Hill, adjoining the Boston & Corbin, having a 405′ tunnel cutting 3 veins, one showing auriferous and argentiferous copper ore of good average tenor.

CORBIN MINE. **ALASKA.**

Owned by United Metals Co.

CORBIN-MONTANA COPPER CO. **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Thos. R. Hinds, Fayette Harrington, M. W. Bacon, John Hoye and J. A. Zzezek, directors. Organized 1907, with capitalization $1,000,000, shares $1 par. Is a twin of the Jefferson-Montana Copper Mines Co.

CORBIN-MONTANA MINES CO. **MONTANA.**

Office: care of Clarence K. McCornick, vice-president and general manager, Salt Lake City, Utah. Mine office: Corbin, Jefferson Co., Mont. Arthur H. S. Bird, president; C. H. Post, secretary-treasurer; preceding officers, H. A. McCornick and B. T. King, directors. Organized 1904, under laws of Utah, with capitalization $600,000, shares $2 par. Lands, in the vicinity of Corbin, were diamond-drilled, 1904-5; since idle.

CORBIN-VALPARAISO COPPER MINING CO. **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. A. G. Grosso, H. J. Dewey, Thos. F. Casey, J. P. Daly, Frank W. Richards and G. P. Paul directors. Organized 1907, with capitalization $1,000,000, shares $1 par. Mine, on Big Valparaiso Mountain, has tunnels of 600′ and 800′, latter with back of about 780′, cutting 4 veins, showing ore assaying 3 to 8% copper, with average assays of 26 oz. silver and $3 to $9 gold per ton. Made small ore shipments, circa 1885, under former ownership.

CORBIN-WICKES COPPER MINING CO. **MONTANA.**

Office: 19 East Broadway, Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Chas. H. Lane, president; W. C. Dierks, vice-president; Edwin L. Mayo, treasurer; J. L. Meixell, secretary; preceding officers, I. A. Heilbronner, W. F. Davis, I. M. Symons and H. A. Sullivan, directors. Organized 1904, with capitalization $1,000,000, shares $1 par, apparently as successor of Colorado Mining & Development Co. Lands, 2 claims, known as the Hidden Treasure and Copper King, circa one-half mile from the Alta, and across Picnic gulch from the Bertha mine of the Boston & Corbin, supposed to carry the extension of the Bluebird vein. Has a 300′ tunnel and 105′ shaft, crosscut from latter said to show an 18′ vein carrying hanging-wall and footwall paystreaks, assaying 4% copper, 8 oz. silver and 40 cents gold per ton, with occasional assays up to 12% copper. 34 oz. silver and 60 cents gold per ton.

CORDILLERO MINING CO. **BRITISH COLUMBIA.**

Office: 332 Lumber Exchange, Seattle, Wash. Mine office: Van Anda, Texada Island, B. C. Alfred Raper, manager. Lands, 3 claims, adjoining the Cornell mine, having a 120′ tunnel. Operated, 1905-1906, the Cornell mine, since sold to Texada Consolidated Mining Co. Company's present holdings produced, 1905, circa 100 tons of ore.

CORDONERA MINING CO. **MEXICO.**

Mine office: Suaqui Grande, Hermosillo, Sonora, Mex. W. S. Morrow, manager. Has argentiferous copper ores, with steam power and a 5-stamp mill. Presumably idle.

CORINTH COPPER CO. **VERMONT.**

Office: 703-68 William St., New York, N. Y. Organized 1906, under laws of New York, with capitalization $3,000. Lands supposedly are in Vermont.

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GEWERKSCHAFT CORIOLAN. **GERMANY.**

Mine office: Wissen am Sieg, Rheinprovinz, Germany. Has lead, copper, cobalt and antimony ores, opened by one shaft. Was a very small producer at last accounts.

CORK MINERAL DEVELOPMENT SYNDICATE, LTD. **IRELAND.**

Office: Finsbury Pavement House, London, E. C., Eng. Mine office: Skibbereen, County Cork, Ireland. A. J. M. Brown, secretary. Organized June 22, 1903, under laws of Great Britain, with capitalization £15,000, shares £1 par. Property is a 31-year lease of 1,040 acres on Mount Gabriel, from which small quantities of copper ore and barytes have been produced.

CORNELIA COPPER CO. **ARIZONA.**

Office: 610 Wright Bldg., St. Louis, Mo. Mine office: Gila Bend, Maricopa Co., Ariz. Geo. H. Augustine, president; H. W. Mann, vice-president; John R. Boddie, secretary; C. W. Chamberlain, treasurer; preceding officers, E. W. Huie, C. E. Neeley, C. A. Bowman, T. G. Ratcliffe, Herman Diel, L. O. Branch, H. B. Salls, Buck Williams, J. W. Sanders, John Brod and M. E. Chamberlain, directors; C. L. Chamberlain, manager; L. T. Reynolds, foreman.

Organized May 14, 1900, under laws of Arizona, with capitalization $1,000,000, shares $10 par, increased, Feb. 19, 1907, to $3,000,000, shares $10 par, on which latter date the Rescue Copper Co., a formerly affiliated corporation, was absorbed.

Lands, 13 claims, partly patented, area 260 acres, showing a wide ore body with limestone foot and granite hanging, carrying silicious copper oxides and carbonates, mainly latter, estimated by company at 10% average copper tenor, with gold and silver values, which is excessive, as ores are low in grade, probably averaging 2.5 to 3% only in copper tenor. Company estimates 25,000,000 tons of ore in sight, which also is a serious overestimate, though the mine unquestionably has a large ore tonnage. Development is by tunnels of 30′ and 60′, and by shafts of 125′ and 225′, the 200′ level showing a 15′ to 20′ vein of sulphide ore assaying 3 to 15% copper, with small gold and silver values. Mine has a small steam plant. Company claims to be able to deliver ore to the crusher for 25 cents per ton, which cost cannot be attained.

In 1906 the company contracted with one "Prof." Fred L. McGahan for a so-called vacuum smelter, planned to operate on principles that will prove successful when water runs uphill, and not before. The description of this process, given in Vol. VI of the Copper Handbook, is perhaps the most remarkable piece of literature extant in the technical field. The smelter proving an inglorious failure, after costing $30,000, McGahan was arrested, and a nephew of McGahan's was shot three times, while trying to dismantle the plant. The Cornelia Copper Co. sued McGahan for damages, and had him indicted criminally, May, 1907, on 3 counts, for obtaining money under false pretenses.

Having lost considerable money through the McGahan fiasco, the company, nothing daunted, turned to another new and untried process, invented by an electrician named Anderson, which is claimed to have been in use more or less successfully for 4 or 5 years, though specific evidence on this point seems lacking.

An Anderson electrolytic reduction plant, built at the mine, is rated at 5 tons daily capacity, but the first day's run was 320 lbs. fine copper, and the largest run apparently was 600 lbs., or 6% of the estimated capacity. The plant is terraced, having three 5-ton leaching tanks, followed by 3 settling tanks and 52 square electrolytic tanks placed in four rows, terraced for circulation of electrolyte. Anodes are of carbon, and cathodes of the usual thin copper plates. Electrodes are spaced about 3″ apart, and connected in multiple, with tanks connected in series. Current density is 100 amperes at 110 volts and electrolyte is handled by pump. The ore is crushed to 20-mesh size before

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delivery to the leaching tanks, the charge per tank ranging from 2 to 5 tons, according to assay values in copper. The charges are covered with acid solution for 18 hours, at the end of which time the acid, in theory, is supposed to have dissolved the copper, forming a bluestone solution, which passes from the leaching tanks to settling tanks, where impurities are allowed to settle. The clarified solution flows from the settling tanks, by trough, to the electrolytic tanks. Cathodes are built up to about 80 lbs. weight.

The Anderson process, which is planned to treat silicious oxidized copper ores only, provides for dissolving the soluble copper compounds with hydrofluorsilic acid, filtering the electrolyte and depositing copper by electrolysis, using carbon anodes. According to the theory, the electrolyte, on depositing its copper, regains its hydrogen, thus being regenerated for further use. The inventor claims that the acid does not exhaust or deteriorate more than 10% in a year, which statement remains to be demonstrated, and it is claimed that the hydrofluorsilic acid does not destroy the carbon anodes, as does sulphuric acid. The inventor claims that a small experimental plant, at Webster Grove, near St. Louis, Mo., can produce pure electrolytic copper at a cost not to exceed 4 cents per pound, which is important, if true.

The acid, which the inventor terms hydrofluosilic, is made out of about one-third each sulphuric acid, quartz and fluorspar, with the addition of an ingredient kept secret by the inventor. Acid, as used, is said to be of about 15% strength. The inventor claims that the apparatus at the Cornelia can make a special acid for 8 cents per gallon, and that fluorspar can be obtained at a cost of $25 per ton. The inventor was advertising, October, 1907, for fluorspar to be delivered at Webster Grove, Mo. It was first claimed that the Anderson process could produce copper for less than 3 cents per pound, which figures were increased gradually to about 8 cents per pound, but in October, 1907, the mine was partly closed down, because losing money on 13-cent copper. The practicability of the Anderson electrolytic process remains to be demonstrated, but the inventor is of an entirely different stripe from "Prof." McGahan, and it is certain that his process actually will make copper, the crux of the matter lying in the question of costs.

The officers of the Cornelia are residents of St. Louis and vicinity, of excellent local standing, and perfectly sincere in their operations, but are totally lacking in practical knowledge of the copper business, and prone to overmuch experimentation with new processes.

CORNELL GOLD, SILVER & COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Silver City, Grant Co., N. M. Described Vol. VI.

CORNELL MINE. **BRITISH COLUMBIA.**

Held, at last accounts, by Texada Consolidated Mining Co.

CORNELL OPERATING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Van Anda, Texada Island, B. C.

MINA EL CORNETA. **MEXICO.**

Mine office: San Miguel Mezquital, Nieves, Zacatecas, Mex. Henry Winninghoff, owner and manager. Presumably idle.

CORNISH COPPER CO.

Office: care of Andrew B. Hardryx, New Haven, Conn. Organized December, 1903, under laws of Connecticut, with capitalization $300,000. Location of lands, if any, unknown. Presumably moribund.

CORNUCOPIA COPPER CO. **OREGON.**

Dead. Formerly at Cornucopia, Grant Co., Ore.

CORNUCOPIA GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Cherry, Yavapai Co., Ariz.

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CORNWALL COPPER CO.

Office: 1206-71 Broadway, New York, N. Y. Location of lands, if any, unknown.

CORNWALL MINES. **MISSOURI.**

Mine office: Cornwall, Madison Co., Mo. Were worked on a small scale circa 1860. Ores are greater in variety than in quantity, those found including cuprite, melaconite, malachite, azurite, chalcocite, covellite, bornite, chalcopyrite, chalcanthite and chrysocolla. Idle many years.

COMPAÑIA CORO CORO DE BOLIVIA. **BOLIVIA.**

Office: Santiago de Chile. Mine office: Coro Coro, La Paz, Bolivia. Organized Apr. 23, 1873, under laws of Bolivia, with capitalization 1,025,000 boliv-ianos. Property is the largest copper mine in Bolivia. Mine, 460 meters deep, is opened on conglomerate strata carrying native copper, with occasional cuprite and chalcocite, and silver, which occurs native with copper, as in the Lake Superior mines, is an important by-product. Has steam power, and has been said to have a small smelter, but probably latter is a mill, as product is exported as copper mineral, production ranging 600 to 800 quintals monthly, of barillas de cobre of about 80% average copper tenor, estimated, by the Bolivian government, to cost 7.8 bolivianos per quintal. Production, 1907, estimated at 1,750,000 lbs. fine copper. Employs circa 500 men.

CORONA CONSOLIDATED GOLD & COPPER CO. **ARIZONA.**

Office: Union Blk., Prescott, Ariz. Mine office: Turkey, Yavapai Co., Ariz. Geo. H. Schuerman, president and general manager; Jas. I. Gardner, vice-president; Eugene Newman, secretary; N. B. Hazeltine, treasurer; preceding officers, J. S. Acker and W. B. Brown, directors; Ambrose Stewart, superintendent. Organized Apr. 9, 1903, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 16 claims, area 320 acres, 8 miles from a railroad, first located 1880, showing 5 contact deposits between porphyry and schist, of 2′ to 6′ width, of which 3 are developed by 5 shallow shafts, deepest 80′, and by several tunnels, longest 520′, estimated to show 40,000 tons of carbonate and sulphide ores, with 6,000 tons blocked out for stoping, ranging in tenor from 3 to 16% copper, 2 to 12 oz. silver and $5.50 to $60 gold per ton. Mine shipped a little ore, under previous ownership, some years ago, and had a mill, circa 1890. Idle for several years.

CORONA COPPER CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

CORONA COPPER CO. **WISCONSIN.**

Dead. Lands sold by sheriff, September, 1906, for $1,137. Formerly at Superior, Douglas Co., Wis. Described Vol. VI.

CORONADO COPPER CO. **NEW MEXICO.**

Letter returned unclaimed from former office, Wichita, Kas. John W. Foster, manager; Henry W. Queen, secretary; H. E. Noah, treasurer. Organized circa 1905, under laws of Oklahoma, with capitalization $5,000,000, shares $1 par. Lands, 18 claims, in Union county, New Mexico, 45 miles from a railroad, having a 65′ shaft. Average of 41 assays is said to have given 16% copper.

CORONADO GOLD & COPPER MINING CO. **ARIZONA.**

Office and mine: Prescott, Ariz. Chas. P. Myers, president and general manager. Lands, 14 claims, area 285 acres, including the Black Warrior group, in the Black Hills district, said to show considerable ore. Idle for several years and apparently moribund.

CORONADO MINING CO. **ARIZONA.**

Office: 52 Broadway, New York, N. Y. Mine office: Metcalf, Graham Co., Ariz. Wm. B. Thompson, president; J. W. Belches, vice-president; Wm. J. Palmer, secretary; Henry L. Westlake, general manager; John L. Scofield,

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superintendent. Organized July 12, 1902, under laws of Maine, with capitalization $1,000,000, shares $10 par. Is controlled, through ownership of 51% of stock, by Shannon Copper Co. Lands, 23 claims, area circa 400 acres, adjoining the Coronado mine of the Arizona Copper Co., carrying what is supposed to be the extension of the Coronado vein. Development is by several short tunnels and shallow shafts, with a 2-compartment working shaft on the Garnet claim, showing a good body of auriferous and argentiferous chalcopyrite on the 200' level. The Emerald mine shows a considerable body of sulphide ore, giving average assays of about 9% copper. Property considered promising.

CORONA GOLD & COPPER CO. **NEW MEXICO.**

Dead. Formerly at Santa Rita, Grant Co., N. M.

CORONA QUEEN MINING CO. **NEW MEXICO.**

Office: care of Hon. M. A. Otero, president, Santa Fé, N. M. Mine office: Corona, Lincoln Co., N. M. Thos. M. Du Bois, superintendent. Is under English control. Lands, in the Red Cloud district, give a considerable surface showing of iron ore, apparently of commercial grade, and copper ore up to 67% in tenor has been found. Idle since 1906.

NUEVA COMPAÑIA MINERA DE CORPUS CHRISTI. **MEXICO.**

Mine office: Matehuala, Catoree, San Luis Potosí, Mex. W. B. A. Dingwall, president and manager. Has auriferous copper and argentiferous silver ores, developed by an 1,800' tunnel. Presumably idle.

CORRA MINE. **MONTANA.**

Owned by Butte Coalition Mining Co.

SOCIEDAD DE MINAS y FUNDICIONES DE CORRALES. **ARGENTINA.**

Mine and works office: Chilecito, Rioja, Argentina. Has auriferous and argentiferous copper ores, with a 12-ton smelter and small gas power plant. Was a small producer, circa 1903. Presumably idle.

CORRA-ROCK ISLAND MINING CO. **MONTANA.**

Dead. Property sold, 1906, to Butte Coalition Mining Co. Formerly at Butte, Silver Bow Co., Mont. Described Vol. V.

JOSÉ FRANCISCO CORREA. **CHILE.**

Office and mine: San Fernando, Colchagua, Chile. Has a small smelter, producing matte, and employed about 100 men circa 1902. Presumably idle.

CORRIGAN, McKINNEY & CO. **MEXICO.**

Office: Cleveland, Ohio. Mine office: Terrazas, Chihuahua, Mex. R. B. Hutchinson, superintendent. Lands include the San Rafael copper mines, bought for $50,000, and formerly included the Concheño gold-silver mines, sold to the Greene Gold-Silver Co. In August, 1907, planned sinking 2 new shafts on the San Rafael. Firm is strong and experienced, being one of the oldest and largest independent iron ore operators of the Lake Superior district.

CORTLAND GOLD & SILVER MINING CO. **COLORADO.**

Mine office: Ohio, Gunnison Co., Colo. Victor Reno, superintendent, at last accounts. Ores carry gold, silver, lead, copper and zinc. Has gasoline power. Presumably idle.

CORUÑA COPPER CO., LTD. **SPAIN.**

Dead. Liquidated June 27, 1906. Formerly at Pino Arca, Coruña, Spain. Described Vol. VI.

CORY BROS. MINING CO. **MONTANA.**

Office and mine: Helena, Deer Lodge Co., Mont. Lands, on Beaver creek, north of Helena, show gold-copper ores. Presumably idle.

COSTELLO COPPER CO. **ARIZONA.**

Office: care of Martin Costello, Tombstone, Ariz. Organized August, 1903. Location of lands unknown, but presumably in Cochise county, Arizona.

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COTTONWOOD COPPER CO. **ARIZONA.**

Dead. Was promoted by the Southwestern Securities Co., of Los Angeles. Was organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands were 6 claims, near Groom Creek, 6 miles south of Prescott, having a 100′ tunnel and shallow shafts, said to show 4′ of low-grade auriferous and argentiferous copper ore. Company was a strong believer in full-page advertisements, and was not hampered by regard for the truth in its promotion. Formerly at Prescott, Yavapai Co., Ariz.

COW CREEK COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

COXHEATH MINE. **NOVA SCOTIA.**

Owned by Cape Breton Copper Co., Ltd.

CRADOCK DISTRICT COPPER (BEKKERS KLOOF) SYNDICATE, LTD. **CAPE COLONY.**

Office and mine: 28 Market Square, Cradock, Cradock Co., Cape Colony. W. L. Williams, secretary. Organized Aug. 13, 1907, under laws of Cape Colony, with capitalization £3,500, shares £1 par. Lands, on the Farm Bekkers Kloof, have several shallow shafts and 4 tunnels, longest apparently 210′, showing ores assaying up to 36.08% copper, 52 oz. silver and 2 oz. 2 dwts. gold per long ton, with occasional cobalt. Has secured good assays from surface ores.

CRAWFORD COPPER CO. **WISCONSIN.**

Letter returned unclaimed from former office, 531-A Marquette Bldg., Chicago, Ills. Mine office: Prairie du Chien, Crawford Co., Wis. John Peacock, president and general manager; Chas. Greele, vice-president; W. H. Herrington, secretary and treasurer; preceding officers, W. T. Pinkerton, Edw. T. Martner, Francis A. Harper and G. R. Turley, directors. Organized circa 1907, under laws of Maine, with capitalization $1,000,000, shares $1 par. Property is an old mine, on which a little work was done, previous to 1862, and on which new shafts were started by present company, old workings having caved in. Has secured ores assaying up to 40% copper. Idle and apparently moribund.

CRAWFORD GOLD MINING CO. **ARIZONA.**

Office: Clifton, Graham Co., Ariz. Benj. M. Crawford, manager. Has auriferous copper ores and steam power.

CREEDE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Rawlins, Carbon Co., Wyo.

CRESCENT COPPER CO. **COLORADO.**

Office: Edinboro, Pa. Mine office: Boulder, Boulder Co., Colo. Organized under laws of Colorado, with capitalization $1,000,000, shares $1 par. Claims to have sundry rich copper claims somewhere on the line of the Moffat railroad. Not regarded favorably. Presumably idle.

CRESCENT COPPER CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. Idle for several years.

CRESCENT COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

CRESCENT COPPER MINING CO. **ARIZONA.**

Office and mine: Bisbee, Ariz. Carl Clausen, president and general manager; W. A. Eckerly, secretary. Organized 1903, under laws of Arizona, with capitalization $2,500,000, shares $2.50 par. Lands, 12 claims, in Tombstone Cañon, circa 2 miles northwest of Bisbee, showing oxide and carbonate ores, and small quantities of chalcocite and iron ore, with quartz gangue, claiming to give average assays of 19.1% copper and 41 oz. silver per ton, from a vein said to range 8′ to 30′ in width. Idle almost from birth and moribund.

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CRESCENT MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Phoenix, Boundary district, B. C. Edw. Ford Johnson, secretary. Has a 225′ shaft with one level opened, and asked a $50,000 bonus of the town council to aid in driving a 3-mile tunnel through the mountain between Phoenix and Greenwood. Has an air-compressor. Tunnel project is not considered feasible.

CRISTOBAL COPPER MINING CO. **NEW MEXICO.**

Mine office: Taos, Taos Co., N. M. Is said to have an 8′ ore body, opened by a 100′ tunnel, on lands in the South Fork district. Presumably idle.

CROESUS GOLD & COPPER MINING CO. **IDAHO.**

Office: Beatrice, Neb. Mine office: Hailey, Blaine Co., Idaho. Frank H. Plummer, secretary; W. G. Page, superintendent. Mine has a 3-compartment 800′ shaft, bottom workings showing auriferous and slightly argentiferous chalcopyrite of fair average tenor. Has steam power and a 10-stamp mill. Idle at last accounts.

CROFTON SMELTER. **BRITISH COLUMBIA.**

Owned by Britannia Smelting Co., Ltd.

CRONA COPPER CO. **COLORADO.**

Office: Clay Centre, Kan. Mine office: Lyons, Boulder Co., Colo. Chas. A. Southwick, president; C. W. Strong, secretary and treasurer. Organized, 1901, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Lands, 14 claims, 2 miles from Lyons. Idle several years.

CRONNEBANNE MINES. **IRELAND.**

Owned by Ovoca Copper Syndicate, Ltd.

CROWL CREEK COPPER MINING CO. **AUSTRALIA.**

Dead. Merged December, 1906, in the Crowl-Creek-Shuttleton Copper Mining Co. Formerly at Shuttleton, Mouramba Co., N. S. W., Australia. Described Vol. VI.

CROWL CREEK-SHUTTLETON MINING CO. **AUSTRALIA.**

Dead. Was organized, 1907, under laws of New South Wales, with capitalization £150,000, shares £1 par, as a merger of the Crowl Creek Copper Mining Co. and Shuttleton Copper Mining Co. Lands were 260 acres in the Nymagee district, carrying about one mile of the strike of the ore body. The Crowl Creek mine had a 680′ main shaft, on a 14′ vein with a 30″ paystreak said to average 12% copper on the 530′ level, with reserves of 15,000 tons of oxidized ores in the upper levels, claimed to average 10% copper. The Shuttleton mine, adjoining the Crowl Creek, was opened to depth of 330′, the bottom level showing a 40′ vein with a 4′ paystreak of chalcopyrite, claimed to average 22% copper, which probably was an overestimate. Equipment included steam power and air-compressors, with a concentrator and smelter. Production, 1906, is estimated at 1,000,000 lbs. fine copper. Property was sold, circa January, 1908, to a London syndicate, for £2,500. Formerly at Shuttleton, Mouramba Co., N. S. W., Australia.

CROWN COPPER CO. **ALASKA.**

Office: 234 Pioneer Bldg., Seattle, Wash. Mine office: Valdez, Alaska. T. D. Bradford, president and treasurer; Chas. C. Wheeler, secretary; preceding officers, C. D. Yendell, Hon. John Lyons, W. H. Yendell, J. R. Young and Fred S. Fogg, directors. Organized under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, 54 claims, area 1,100 acres, in 3 groups, 2 on Knights Island, Prince William Sound, Alaska, located with tidewater on either side. Has several tunnels of 25′ to 100′ length, 2 showing ore, and employed circa 25 men at last accounts.

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CROWN LYELL, LTD. **TASMANIA.**

Dead. Dissolved, December, 1902. Formerly at Mt. Lyell, Montagu Co., Tasmania. Described Vol. V.

CROWN LYELL COPPER CO., N. L. **TASMANIA.**

Office: 60 Queen St., Melbourne, Australia. Mine office: Mt. Lyell, Montagu Co., Tasmania. Wm. Madden, manager. Capitalization £250,000, shares 25s. par; issued, 160,000 shares, 20s. 11d. paid in. Lands, 30 acres, having a 514′ shaft showing a little medium grade ore, and a tunnel of circa 900′ length. Company planned increasing capitalization to deepen shaft, and, in 1908, was endeavoring to sell its property to the Mount Lyell Mining & Railway Co., Ltd., for £25,000 cash or 17,000 shares of Mount Lyell Mining & Railway Co., Ltd.

CROWN LYELL MINING CO., N. L. **TASMANIA.**

Dead. Succeeded by Crown Lyell Copper Co., N. L. Formerly at Mt. Lyell, Montagu Co., Tasmania.

CROWN POINT COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Organized circa 1907. Lands, known as the Grand Staff group, on Lower Pinto Creek, have a 400′ tunnel.

CROWN POINT MINING CO. **WASHINGTON.**

Office: 709 Grant Bldg., Los Angeles, Cal. Lands, in Chelan county, Washington, are asserted to show copper, silver and molybdenum ores. Apparently organized to sell stock.

CROWN PRINCESS MINING CO. **ARIZONA.**

Dead. Merged circa September, 1908, in Clara Consolidated Gold & Copper Mining Co. Formerly at Planet, Yuma Co., Ariz.

CROWN QUEEN MINES CO. **ARIZONA.**

Dead. Merged circa September, 1908, in Clara Consolidated Gold & Copper Mining Co. Formerly at Planet, Yuma Co., Ariz.

MINA LA CRUZ. **MEXICO.**

Office and mine: Indé, Durango, Mexico. Ernesto Avila, owner. Has a 40-ton matting furnace. Presumably idle.

COMPAÑIA MINERA DE LA CRUZ. **MEXICO.**

Dead. Formerly at La Cruz, Centro, Tamaulipas, Mex.

CRYSTALINA COPPER CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

CRYSTAL LAKE GOLD & COPPER MINING & SMELTING CO. **COLORADO.**

Office: 915 Barristers' Hall, Pemberton Sq., Boston, Mass. Letter returned unclaimed from former mine office, Lake City, Hinsdale Co., Colo. Philip G. Dawson, president; Kendric P. Crawford, treasurer and general manager; A. D. Wise, secretary. Capitalization $1,500,000, shares $1 par. Lands, 10 claims, 4 on Hotchkiss Mountain, and others in vicinity, showing ores of gold, silver, copper and lead. Idle and apparently moribund.

CRYSTAL MINING CO. **WASHINGTON.**

Office: 45 Jamison Blk., Spokane, Wash. Letter returned unclaimed from former mine office, Bolster, Okanogan Co., Wash. Ores carry gold, silver, lead and copper. Had steam power and a small smelter. Idle some years and apparently moribund.

CRYSTAL MOUNTAIN MINING & DRAINAGE CO. **COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. Mine has a tunnel showing auriferous and argentiferous copper ore. Had a steam plant. Idle.

C. S. A. BLOCK TEN MINING CO. **AUSTRALIA.**

Dead. Organized 1906, and merged, 1907, in C. S. A. Mines, Ltd. Formerly at Cobar, Robinson Co., N. S. W., Australia.

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C. S. A. MINES, LTD. **AUSTRALIA.**

Office: 16 O'Connell St., Sydney, Australia. Mine office: Cobar, Robinson Co., N. S. W., Australia. L. J. Winton, superintendent; F. N. Yarwood, secretary; Dr. Richard Head, chairman. Capitalization increased, 1907, to £60,000, shares £1 par. In 1907 absorbed the C. S. A. Block 10 Mining Co., N. L., an adjoining company. Lands, 7 miles from Cobar, known as the Cornish, Scottish and Australian mine, show a very prominent gossan, underlaid by low grade sulphide ores. Production is mainly silver-lead carbonates, with copper values increasing at depth. Main shaft, at 472', carried ore assaying 13% copper and 2,393 oz. silver per long ton. Production, 1907, was 3,800 long tons of ore averaging 24% lead, 1 oz. silver and 1 dwt. 6 grains gold per ton. Mine has shafts of 250' and 481', timbered with ironbark and Oregon pine, using square sets and filling depleted stopes with mullock. Has a good machinery plant, with new hoist and air-compressor, installed 1907, steam plant having condensers, district being arid. Production, first quarter 1907, was 2,641 long tons of ore netting £8,304. Employs 65 men.

C. S. A. NORTH SILVER & LEAD MINING CO. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Mine is opened to depth of about 300'. Idle at last accounts.

CUAUHTEMOC MINING CO. **MEXICO.**

Office: 508 Germania Bank Bldg., Pittsburg, Pa. Mine office: Ocotlán, Oaxaca, Mex. James McKay, president; Frank A. Vickery, vice-president; J. Albert McKay, treasurer; Oscar A. Rogers, secretary; Guillermo W. Thompson, general manager. Organized 1904, under laws of West Virginia, with capitalization $400,000. Lands, 21 hectares, including the Carpintero y Anexas group, in the camps of Taviche, San José and San Martín, showing auriferous and argentiferous lead and copper ores. Presumably idle.

CUARTAS MINING CO. **MEXICO.**

Office: care of Harry McIntosh, president, Railway Exchange Bldg., Chicago, Ills. Mine office: Ayutla, Autlán, Jalisco, Mex. Wm. H. Lees, vice-president and general manager; Wm. T. Sheffield, secretary and treasurer; Thos. M. Hughes, superintendent. Capitalization, £100,000. Property is the old Cuartas mine, in the Bautista district, area circa 250 acres, also sundry adjoining timber lands. Mine is an antigua, worked by the Spaniards, and abandoned, circa A. D. 1745, at depth of 275', on account of water and base ore. There is a legend that the mine caved in, burying 7 men. It is stated that ores left in old workings assayed 2,268 oz. silver and 1 oz. gold per ton, which is more than doubtful, as neither Spaniards nor Mexicans left any considerable quantity of such ore in any abandoned mine, except from dire necessity. The veta madre of the Cuartas is about 30' in average width, carrying mainly silver and gold values. Assays from old dumps are claimed to run circa 400 oz. silver and $30 gold per ton, which either is untrue, or samples were selected with unusual care.

CUATRO GRANDE MINING CO., S. A. **MEXICO**

Is the Mexican incorporation of the Pittsburg & Sonora Development Co

COMPAÑIA MINERA CUATRO SEÑORES, S. A. **MEXICO.**

Office: Chihuahua, Mex. Mine office: Coyame, Iturbide, Chihuahua, Mex. Lands, 74 hectares, leased from Las Vigas Mining Co., said to show 19 ore bodies, as fissures in sandstone and as contact deposits between sandstone and clay-slate, ore occurring mainly as impregnations and replacements in the sandstone. Four ore bodies under development are reported to average 7' to 12' width, and are claimed to give average returns of 7.5% copper and 3 oz. silver per ton, mainly from bornite and chalcopyrite, with occasional oxidized ores and native copper. Has shafts of 61', 98', 125' and 179', with

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3 short tunnels, estimated to develop 60,000 tons of ore. Has steam power, hoist and air-compressor, with an office building, store and 19 dwellings. Ore is hauled 43 miles, to Las Trancas station, by a Buffalo-Pitts traction engine.

CUBA COPPER CO. **CUBA.**

Office: 2401-60 Wall St., New York, N. Y. Mine office: El Cobre, Santiago de Cuba. Benj. B. Lawrence, president; Colgate Hoyt, vice-president; Jas. T. Nelson, secretary and treasurer; Morrison B. Yung, general manager; E. H. Emerson, mine superintendent. Organized Jan. 5, 1907, under laws of West Virginia, with capitalization $2,000,000, shares $100 par, divided into $1,500,000 non-cumulative 6% preferred and $500,000 common shares, as successor of El Cobre Mines. Annual meeting, first Tuesday in March.

El Cobre mines were opened by the Spanish, A. D. 1532, and probably produced the first copper made in America by Europeans, the first product of the Cuban mines having been used for casting Spanish cannon. The properties were taken over, circa 1832, by a Hispano-English company, ore mined being shipped to Swansea for reduction. The custom-house records of Santiago are said to show exports of 610,210 tons of ore, valued at $50,186,225, (probably in depreciated Spanish currency) from 1851 to 1869, inclusive, ores as shipped assaying from 12.69% upwards, and probably averaging about 16% in copper tenor. During the revolution of 1868, the big Cornish pump was burned, which flooded the mines, and they remained idle until taken over, 1902, by predecessor of present company.

Lands are extensive, lying 8 miles west of Santiago Bay on which the company has wharves. The property shows a mineralized zone of 200′ width, traceable circa 6,500′, carrying 3 parallel veins, intervening rock being much altered. Ore is primarily chalcopyrite, associated with pyrrhotite, in a quartz gangue, the grains of chalcopyrite frequently being coated with covellite. Ore bodies occur in lenticular chutes, along fracture planes, in serpentine, the largest lenses being about 30′ in extreme width, with length of 200′, lenses averaging about 7′ width with occasional widenings to 20′ and even 30′. The oxidized zone is of 50′ to 75′ depth only, succeeded by sulphide ores averaging 5 to 6% in copper tenor, without either gold or silver in important quantities.

The old workings were extensive, including some 40 shafts, of which the 4 deepest were about 1,200′ each, with 17 miles of underground openings, timbered mainly with mahogany. Some of the old stopes were 20′ to 30′ in width, but, when unwatered, 1903, many of the old workings caved in, and the mine was allowed to fill again. During the rainy season the mine makes 500 to 1,200 gallons per minute of strongly acid water, requiring pumps of composition metal, with lead or wood-lined pipes. The pumps have a combined capacity of 5,000 gallons per minute, and water, after forked from the mine, is leached over scrap-iron, producing considerable copper precipitate. The old waste dumps contain about 250,000 tons of rejected material, averaging circa 2% in copper tenor. Considerable ore has been blocked out in open-cuts, this averaging about 4% copper.

El Cobre railroad, 9 miles in length, owned by the company, connects the mine with Santiago Harbor at Punta Sal, equipment consisting of 2 locomotives and 40 cars.

The smelter, of 200 tons rated daily capacity, is at Punta Sal, but is idle, and apparently has not been in blast for several years. Company employs circa 450 men, and ore is shipped to Atlantic coast smelters, in the United States, ore being mined both from the old workings, and from a new vein, previously unworked. Ore produced, 1907-1908, is reported by company as of 6.5% average copper tenor. Production, 1907, was 6,483,000 lbs. fine copper.

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CUBA MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Has a tunnel, showing auriferous copper ores. Idle several years.

CUBAÑA CONSOLIDATED COPPER CO. **MEXICO.**

Office: care of R. M. Fitzgerald, 16-309 Montgomery St., San Francisco, Cal. Mine office: Arizpe, Sonora, Mex. Don Ray, president; A. H. Rose, vice-president; M. A. Nurse, secretary; Geo. H. McLean, superintendent. Organized Jan. 6, 1903, under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 244 hectares, bought for $20,000, showing 6 ore bodies, of 4' to 20' width, of which 3, carrying estimated values of 12% copper, 10 oz. silver and $2 gold per ton, are opened by 6 shafts, deepest 102', and by a number of tunnels, longest 250' and 575', with a total of 1,415' of underground openings. Mine is about 40 miles from La Cananea, the nearest railroad point, and is connected therewith by a good wagon road. Sample carload smelter shipments returned 23% copper, with fair gold and silver values. Property considered promising. Presumably idle.

COMPAÑIA MINERA CUBAÑA DEL BRILLADOR. **CHILE.**

Office: Valparaiso, Chile. Mine office: Compañía, Coquimbo, Chile. Organized Oct. 20, 1906, under laws of Chile, with capitalization 320,000 pesos, shares 20 pesos par.

CUBAN EXPLORATION CO. **CUBA.**

Office: 11 Nassau St., New York. Letter returned unclaimed from former mine office, El Caney, Santiago, Cuba. W. A. Dennis, vice-president and general manager. Did a little exploratory work, circa 1904. Apparently moribund.

CUBAN LAND & DEVELOPMENT CO., LTD. **CUBA.**

Office: Dashwood House, London, E. C., Eng. Cuban office: Bahia Honda, Pinar del Rio, Cuba. W. R. Beit, agent. Organized Oct. 26, 1905, as successor to Cuban Mining & Development Co., Ltd. Property is the Finca Nazareno, a plantation on which present company is centering its operations, also 2,766 acres of mineral territory in vicinity of Bahia Honda, and two gold claims in the province of Santa Clara. The copper mines have 5 old shafts, with workings of considerable extent, but in very bad condition. Company plans no mining operations in the near future.

CUBAN MINING & DEVELOPMENT CO., LTD. **CUBA.**

Dead. Reorganized Oct. 26, 1905, as Cuban Land & Development Co., Ltd. Formerly at Bahia Honda, Pinar del Rio, Cuba. Described Vol. IV.

COMPAÑIA MINERA CUCHARA. **MEXICO.**

Mine office: Culiacán, Sinaloa, Mex. Lands show argentiferous and auriferous copper and lead ores. Presumably idle.

CUCHARAS MINING CO. **MEXICO.**

Mine office: Acaponeta, Tepic, Mex. J. M. Winston, manager, at last accounts. Operates the San Juan copper mine, opened by shaft and tunnel. Has steam power and a 40-ton smelter. Production, 1903, was 200,618 lbs. fine copper. Presumably idle.

MINAS LA CUEVA y PEDRO ESTEBAN. **MEXICO.**

Mine office: Mazapil, Zacatecas, Mex. J. S. Morrison Estate, owner; Manuel R. Orozco, manager. Has highly argentiferous and auriferous copper ores, and when working makes a small amount of copper as a by-product. Has a 25-ton smelter. Presumably idle.

MINA CULEBRA. **MEXICO.**

Mine office: Etzatlán, Ahualulco, Jalisco, Mex. T. C. & H. K. Myers, owners. Mine is an antigua, developed by several hundred feet of shafts and tunnels, showing auriferous and argentiferous copper sulphides, in a vein of 1 to 3 metres width. Idle.

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CULGOA MINES. **AUSTRALIA.**

Mine office: Kilkivan, Queensland, Australia. G. Turner, manager. Lands on Thunder Creek, 15 miles north of Kilkivan, show several 8" to 15" veins, assaying 3 to 24% copper. Ore is shipped to the Waratah smelter. In 1906 employed 45 men and produced 114,388 lbs. fine copper.

CULLIGAN MINING CO. **WISCONSIN.**

Dead. Lost lands circa 1903. Formerly at West Superior, Douglas Co., Wis.

CULLOWHEE COPPER CO. **NORTH CAROLINA.**

Dead. Reorganized, 1905, as Cullowhee Mining & Reduction Co. Formerly at Cullowhee, Jackson Co., N. C.

CULLOWHEE COPPER CO. **NORTH CAROLINA.**

Office: Spartansburg, S. C. Mine office: Cullowhee, Jackson Co., N. C. J. R. Aiken, president. Lands are an extensive tract in the vicinity of Cullowhee. Presumably idle.

CULLOWHEE MINING & REDUCTION CO. **NORTH CAROLINA.**

Office and mine: Cullowhee, Jackson Co., N. C. S. B. Exell, president; D. D. Davies, vice-president; Thos. C. Cox, secretary. Organized, 1905, as successor of Cullowhee Copper Co. Lands, 1,300 acres, showing a large body of sulphide ore said to average about 5% copper and $4 gold per ton, though occasionally ranging up to 15% copper, with increased gold values. Has steam and water power, with hoists and Sullivan air-compressor, and was developing steadily at last accounts. Property considered promising, and management good.

CUMARAL MINES & DEVELOPMENT CO. **ARIZONA.**

Letter returned unclaimed from former office, Oakland, Cal. Mine office: Old Glory, Pima Co., Ariz. Mine shows auriferous and argentiferous copper ore. Had gasoline power. Idle several years.

CUMBERLAND COPPER CO., LTD. **NEVADA.**

Office: 1033-141 Milk St., Boston, Mass. Organized under laws of Maine, with capitalization $6,000,000. Is some relation to the Cumberland-Ely Copper Co., but whether an ancestor, offspring or a collateral relative, or some sort of connection on the distaff side, has not been learned.

CUMBERLAND COPPER CO. **NOVA SCOTIA.**

Dead. Lands sold under foreclosure, circa January, 1907, to Wentworth Copper Co., Ltd. Formerly at Wentworth, Cumberland Co., N. S.

CUMBERLAND-ELY COPPER CO. **NEVADA.**

Office: 165 Broadway, New York, N. Y. Mine office: Ely, White Pine Co., Nev. Silas W. Eccles, president; Wm. B. Thompson, vice-president; W. E. Bennett, secretary; Geo E. Gunn, general manager; preceding officers, F. W. Hills, J. K. MacGowan and J. G. Hopkins, directors; C. K. Lipman, treasurer; A. C. Cruikshank, superintendent; Llewellyn Humphrey, consulting engineer.

Organized Nov. 28, 1905, under laws of Maine, with capitalization $5,000,000, increased, December, 1906, to $6,500,000, shares $5 par, fully issued. Supposedly is controlled by the Guggenheim interests, through ownership of 51% of stock, held by American Smelters Securities Co. or the Coppermines Co. Is very closely affiliated, in ownership and operation, with the Nevada Consolidated Copper Co., owning joint interests, with that corporation, in the Steptoe smelter and the Nevada Northern railway, the half interest in the latter having been bought of the Nevada Consolidated for $1,000,000 in shares. Begun 1908 with cash on hand, $1,077,243. Annual meeting, second Monday in February.

Lands, 51 claims, area circa 1,000 acres, including the Veteran group of

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14 claims, the Jupiter group of 22 claims and a tract of 15 claims adjoining the Giroux Consolidated. Lands partly surround the holdings of the Nevada Consolidated, and carry a continuation of the ore bodies of that company. Property has been extensively tested by churn drills, showing much ore, and has a number of exploratory shafts. The ores, as developed, especially in the Veteran mine, are somewhat higher in grade than those of the Nevada Consolidated, and carry considerable gold and silver values, said to range about $10 per ton of blister copper.

The Wedge mine has a shaft showing ore of about 3.5% average copper tenor.

The Jupiter mine, having 4 shallow shafts, shows ore up to 9% in copper tenor, but the average is about one-third as high.

The Veteran mine, which is the principal property, both in development and promise, shows an ore body of about 500x1,000′ known length, and apparently circa 200′ deep, averaging about 3.5% in copper tenor, and there are indications that this ore body may be nearly or quite 2,000′ long. The Veteran, as developed, has at least 3,000,000 tons of ore in sight, with prospects of a considerably larger tonnage. The Veteran has a tunnel, but principal development is by a 4-compartment 400′ shaft, which was sunk 142′ in December, 1907, constituting a record. The Veteran mine has 2 levels opened, the bottom at 400′. The shaft is similar in plan and equipment to the Star Pointer shaft of the Nevada Consolidated, and has a 300-h. p. electric hoist raising 5-ton automatic skips, shaft being capable of producing 2,000 to 3,000 tons of ore daily, from a depth of 1,000′ or less. Mine is being worked by top-slicing and caving, the blanket formation being excellently adapted to this system.

Water supply for the mine is brought through an 8-mile pipe-line, owned jointly by the Cumberland-Ely and the Nevada Consolidated. The mine has necessary buildings and a number of dwellings for employes.

Ore is sent to the Steptoe reduction plant, which is operated in 2 sections, one for the Cumberland-Ely and one for the Nevada Consolidated. Production was begun on a small scale, May 15, 1908. The ore concentrates about 4 into 1, with about 70% extraction, giving returns of about 2.25 to 2.5% copper from the ore. Costs apparently are estimated by company at about 8 cents per pound, but are likely to prove somewhat higher. The property is one of great possibilities, and bids fair to develop into one of the big copper mines of the world.

CUMBERLAND MINING CO. **ARIZONA.**

Mine office: Turkey, Yavapai Co., Ariz. Lands are about one-half mile north of the Corona Consolidated Gold & Copper Co. Presumably idle.

CUNNINGHAM PASS COPPER MINING CO. **ARIZONA.**

Mine office: Wendendale, Yuma Co., Ariz. Lands include the Josephi group of 4 claims, held under a $50,000 bond and lease, having a 115′ shaft with surface ores giving fair assays in copper and gold. Has started a vertical shaft in the hanging wall of the Bullard group, planned to be sunk 400′, to develop a wide ledge traceable for entire length of property. Under former ownership the Bullard shipped considerable ore, to the Humboldt smelter, returning $50 to $100 per ton. Employed circa 50 men at last accounts.

CUPRIC MINES CO. **UTAH.**

Mine office: Frisco, Beaver Co., Utah. A. J. Harrison, president; M. C. Morris, manager. Organized under laws of New Jersey, with capitalization $1,000,000, shares $1 par. Property, formerly known as the Washington mine, near the Horn Silver and Imperial mines, was a considerable producer in early days. Mine has 2 old incline shafts, with a new shaft, started near the

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adit of the Cactus mine. Ores are chiefly silver-lead, and property is said to have good ore on the 300′ level.

CUPRITE COPPER CO. **ALASKA.**

Mine office: Sulzer, Prince of Wales Island, Alaska. Lands, lying northeast of the Jumbo group of the Alaska Industrial Co., show a contact vein between granite and limestone, carrying chalcopyrite, opened by a 100′ tunnel.

CUPRITE COPPER CO. **ARIZONA.**

Office: Columbus, Ohio. Mine Office: Clifton, Graham Co., Ariz. N. W. Lord, president; Isaac N. Stevens, vice-president; L. B. Kauffman, secretary; Geo. B. Kauffman, treasurer; F. C. Alsdorf, superintendent; Frank A. Ray, engineer; preceding officers and Frank B. Laine, directors. Organized March, 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 26 claims, area 490 acres, in the Copper Mountain district, opened by shafts of 30′ and 320′ and by tunnels of 150′ and 260′, showing ore bodies of 5′ to 100′ width. Work performed has been done in the leached zone, which carries isolated pockets of rich ore, from which sundry small shipments have given returns of 15 to 30% copper, and up to $5 gold per ton. Company also owns about 2,000 linear feet of strong hematitic outcrops, ranging 5′ to 100′ in width. It is likely that the copper veins, which are parallel with and similar to the Big Coronado vein of the Arizona Copper Co., are leached to very considerable depths, but prospects for developing large and profitable bodies of low and medium grade sulphides at depth seem good. Property considered promising. Presumably idle.

CUPRITE COPPER CO. **ARIZONA.**

Dead. Formerly at Vail, Pima Co., Ariz.

CUPRITE COPPER MINING CO. **NEVADA.**

Letter returned unclaimed from former office and mine, 42 Nixon Bldg., Goldfield, Esmeralda Co., Nev. G. S. Johnson, president; Oliver Mathews, vice-president; Herbert S. Cook, treasurer; Ellsworth Oldt, managing director; preceding officers and S. E. Vermilyea, directors. Organized Dec. 28, 1905, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, 3 fractional, area circa 85 acres, in the Cuprite district, about 17 miles south of Goldfield, showing argentiferous and auriferous copper ores, assaying 10 to 20% copper and 20 to 100 oz. silver per ton. Planned sinking a 100′ shaft. Idle and apparently moribund.

CUPRITE MINING CO. **WYOMING.**

Mine office: Holmes, Albany Co., Wyo. Idle since circa 1904.

CUPRITE MINING & SMELTING CO. **ARIZONA.**

Office: Tucson, Ariz. Letter returned unclaimed from former mine office, Vail, Pima Co., Ariz. E. N. Fish, president; F. W. Fish, treasurer. Capitalization $1,000,000, shares $1 par. Lands, 8 claims, opened by a 120′ shaft, with about 500′ of workings, showing sulphide ores between limestone and porphyry. Idle and apparently moribund.

CUPRUM MINE. **CALIFORNIA.**

Office: care of Omara & Co., owners, Tonopah, Nev. Mine office: Needles, San Bernardino Co., Cal. Early 1907 shipped 15 tons of ore.

CURLEW MINE. **MONTANA.**

Office: care of A. M. Holter, owner, Butte, Mont. Mine office: Victor, Ravalli Co., Mont. Thos. Cowan, superintendent. Mine, formerly a silver producer, also shows zinc ores and a vein claimed to be 12′ wide said to show ore carrying 10% copper, with lead, silver and gold ores, opened 1906.

CUSTER PEAK MINING CO. **SOUTH DAKOTA.**

Mine office: Deadwood, Lawrence Co., S. D. Property shows copper ores, slightly developed. Late in 1907 company planned resumption of work.

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COMPAÑIA MINERA DE CUTTER COVE. **CHILE.**

Dead. Succeeded May 20, 1906, by Sociedad de Minas de Cobre Cutter cove. Formerly at Cutter Cove, Magallanes, Chile.

SOCIEDAD DE MINAS DE COBRE DE CUTTER COVE. **CHILE.**

Mine office: Cutter Cove, Magallanes, Chile. Organized May 20, 1906, under laws of Chile, as a reconstruction of Compañía Minera de Cutter Cove, with capitalization £400,000, shares £1 par. Lands, 15 pertenencias, showing country rocks of diorite and syenite, with veins of 4 to 6 meters width, carrying chalcopyrite with quartz gangue said to average 6% copper. Has a concentrator with Krupp ball mills, and a small reverberatory furnace.

CUZCO COPPER & SILVER CO., LTD. **PERÚ.**

Office: 62 London Wall, London, E. C., Eng. Edgar Anderson, chairman; Sidney Fawns, consulting engineer; Lionel Perry, mine manager; H. Bacon, secretary. Organized Nov. 28, 1907, under laws of Great Britain, with capitalization £3,000, in 2,925 preferred ordinary shares of £1 par and 2,000 deferred shares of 6d. par. Lands, circa 2,000 acres, in the district of Chumbivilcas, Perú.

CYMRU COPPER CO. **ALASKA.**

Office: 117½ South Tenth St., Tacoma, Wash. Mine office: Baldwin, Prince of Wales Island, Alaska. J. M. Miller, Jr., president; F. P. Hicks, vice-president; Frank D. Nash, secretary and treasurer; J. Cuthbert Welch, manager; A. I. Jones, superintendent. Organized 1905, under laws of Washington, with capitalization $50,000, shares $1 par. Lands, 6 claims, area 190 acres, on Moira Sound, showing 3 lenticular ore bodies, reported by company as of 40′ aggregate width, assaying 6 to 10% copper, 4 to 6 oz. silver and $2 gold per ton, mainly from chalcopyrite, with occasional carbonate ores and native copper. Has a 100′ shaft and a 187′ tunnel, with hoist and 6-drill Laidlaw-Dunn-Gordon air-compressor. Has a 4,000′ ground tram, of 36″ gauge, laid with 20-lb. steel rails, leading to a 1,600-ton ore bunker on tidewater, with a gasoline locomotive. Fire destroyed old machinery plant, which was replaced circa June, 1908.

DACOTAH HEIGHTS LAND CO. **MICHIGAN.**

Office and mine: Houghton, Houghton Co., Mich. Lands are the fractional Southwest ¼ of Section 35, Town 55 North, Range 54 West, lying just west of the Isle Royale, in the western limits of Houghton. Was organized as a land company, to promote a townsite, but has mineral rights to the entire tract, and explored the property, 1908, with a diamond drill.

DACOTAH MINING CO. **MICHIGAN.**

Dead. Lands sold, 1905, to Dacotah Heights Land Co. Formerly at Houghton, Houghton Co., Mich.

DAILEY COPPER MINING & SMELTING CO. **MONTANA.**

Mine office: Wickes, Jefferson Co., Mont. Wm. Dailey, president and general manager. Has developed mainly medium grade ore, with some ore of higher tenor, and was shipping, to the Washoe works, circa May, 1908.

DAIRY FARM MINING CO. **CALIFORNIA.**

Office: 165 Broadway, New York, N. Y. Mine office: Van Trent, Placer Co., Cal. Daniel Guggenheim, president; Corey C. Brayton, manager. Organized circa 1903, under laws of California. Company is controlled, through stock ownership, by American Smelters Securities Co.

Lands, 160 acres, showing a mineralized fractured zone of circa 80′ width, in rhyolite and andesite, having a north and south strike, with dip of 60°, opened by a 500′ shaft. Ore is auriferous copper oxides, becoming lean at depth of circa 500′. Mine, opened 1903, was closed September, 1907, because of inability to complete the San Bruno smelter. Equipment includes a 600-

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h. p. electric plant, with a 120-h. p. hoist, good for 1,000′ depth, and a 20-drill air-compressor. Buildings, about 25 in number, include a 20x40′ wooden machine-shop, 30x50′ carpenter-shop, 30x20′ smithy, office, store and dwellings.

A small concentrator has Chilean mills, and a 100-ton leaching plant treats oxidized ores from the gossan.

Survey has been made for a railroad, from Lincoln to Van Trent. Property is reported to have proven somewhat disappointing, but apparently was closed down by reason of depression in the metal market, and inability to complete the projected San Bruno smelter, rather than because found worthless, as reported, as the mine is in shape to begin considerable production, and probably will be heard from in the future.

DAISY BELL COPPER-GOLD MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Whitehall, Jefferson Co., Mont. Malcolm Gillis, president. Capitalization $600,000, shares $1 par. Lands, 8 miles from Whitehall, have a 160′ shaft, showing ore assaying up to $350 gold per ton, with fair copper and silver values, and with indications of increasing copper values at depth.

DAISY BELL GOLD & COPPER DEVELOPMENT CO. **MONTANA.**

Dead. Organized circa June, 1906, under laws of Montana, with capitalization $600,000, as successor of Daisy Bell Gold & Copper Mining Co., and was succeeded by Daisy Bell Copper-Gold Mining Co. Formerly at Whitehall, Jefferson Co., Mont.

DAISY BELL GOLD & COPPER MINING CO. **MONTANA.**

Dead. Organized Nov. 22, 1905, under laws of Montana, with capitalization $120,000, shares 20 cents par, as a reorganization of a previous Daisy Bell, and succeeded, circa June, 1906, by Daisy Bell Gold & Copper Development Co. Formerly at Whitehall, Jefferson Co., Mont.

DAKOTA-CALUMET CO. **SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Hill City, Pennington Co., S. D. Geo. Edward Reed, vice-president; Henry G. Ellison, treasurer; W. J. Boothe, assistant secretary; A. C. Overpeck, superintendent. Organized 1902, under laws of South Dakota, with capitalization $3,000,000, shares $1 par. Is controlled, through ownership of circa two-thirds of stock issue, by Continental Copper Mining & Smelting Co., which, March, 1907, succeeded the Continental Copper Co.

Lands, 19 claims, patented, including the Lilian group, area 179 acres, and a 20-acre millsite, with total landed holdings of 319 acres. Mine has a 380′ tunnel and a 3-compartment 385′ shaft, also shafts of 40′ and 80′, with a 40-h. p. hoist and 10-drill Sullivan air-compressor. Has 15 buildings, including a 16x50′ wooden machine-shop and a 30x40′ wooden carpenter-shop.

The smelter, of wood on stone foundations, connected with the mine by a 300′ Bleichert aerial tram, has a 150-ton Colorado Iron Works blast-furnace and a 120-h. p. steam plant. Smelter, never in blast, is 4 miles from limestone and 6 miles from a railroad, and was built before the mine was developed. Company employs circa 30 men.

DALTON & LARK MINING & MILLING CO. **UTAH.**

Mine office: Lark, Salt Lake Co., Utah. Was controlled, through stock ownership, by Bingham Consolidated Mining & Smelting Co. Has shafts of 815′ and 1,150′, also 4 tunnels with electric haulage plant, bottom level being said to show ore averaging 7% copper and 60 oz. silver, which estimate is considered excessive.

DALY COPPER MINING CO. **AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. Sutherland, manager at last accounts. Has steam power. Presumably idle.

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DALY JUDGE MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Otto Hanke, president; Moylan C. Fox, vice-president; Geo. W. Lambourne, secretary and treasurer; Fredk. P. Burrell, general superintendent. Organized 1901, under laws of Utah. A $300,000 bond issue, at 7%, was retired, 1906.

Lands, 146 claims, area 715 acres, including the Anchor mine, with 3 ore bodies, known as the South, Contact and North veins, the middle or Contact vein, which is the more important, showing a strong outcrop for 3,000′. Property also includes the Bonanza group, slightly developed, but considered promising. Ore values are in lead, silver, zinc, copper and gold, approximately in the order given. The mine has nearly 10 miles of workings, making circa 400 gallons of water per minute, which is sufficient, not only for the use of the company's concentrator, but also to supply the Daly-West, under contract, and there is a lake 2 miles from the mine, affording an alternative water supply. The 3-compartment Anchor shaft, having a powerful hoist operating double-deck cages, is 1,650′ deep, connecting, on the 1,200′ level, with the 6,000′ Anchor tunnel, which has an electric haulage system. The Anchor workings have a large ore tonnage blocked out for stoping, and extraction was begun, 1907, on the 1,500′ level.

The concentrator, of 300 tons daily capacity, puts 6 into 1, using the Sherman slimes process.

Production, 1907, was 76,914 tons of ore, costs being $3.03 for mining, 95 cents concentrating, $1.08 marketing, 40 cents prospecting and dead work and 23 cents general expenses. Net earnings, 1906, were $500,015.05, or 51.2% of gross earnings, a remarkably good showing. Quarterly dividends were begun, 1907, but second quarterly dividend was passed on account of depression in the metal market. Property considered valuable and management good.

DALY MINING CO. **MONTANA.**

Office: care of Marcus Daly Estate, Butte, Mont. Letter returned unclaimed from former mine office, Copperopolis, Meagher Co., Mont. Organized 1903, under laws of Arizona, with capitalization $1,000,000, to take over sundry mining properties of the Marcus Daly estate, in Meagher, Silver Bow and Lewis & Clark counties, Montana. Properties in Meagher county are the Copperopolis, Daly, North Pacific, Darling Fraction and others. The Copperopolis mines have 3 shafts, deepest 500′, with a good surface equipment, and were small producers of high-grade ore for many years, but have been idle since 1903.

DALY WEST MINING CO. **UTAH.**

Office: 163 South Main St., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Employs circa 250 men. J. Ernest Bamberger, president; H. G. McMillan, vice-president; J. Barnett, secretary; W. S. McCornick, treasurer; preceding officers, W. H. Dickson and S. J. Hagenbarth, directors; Ernest Bamberger, general manager; P. L. Williams, Jr., superintendent; E. L. Talbot, mine superintendent; F. W. Sherman, mill superintendent; F. I. Williams, engineer.

Organized Feb. 14, 1902, under laws of Colorado, with capitalization $3,600,000, shares $20 par. Has paid dividends, to end of 1907, of $5,877,000, largest disbursement, 1903, having been $1,332,000; 1907 dividends were $378,000. Regular quarterly dividends were passed first half of 1908. Company ended 1907 with $305,067.31 cash on hand. Has circa 2,800 shareholders. Corporation Trust Co., New York; North American Trust Co., New York; McCornick & Co., Salt Lake City, registrars. American Loan & Trust Co., Boston; North American Trust Co., New York; McCornick & Co., Salt Lake City, transfer agents.

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Lands, 50 claims, patented, area 250 acres, in the Uintah district, showing extensive ore bodies carrying argentiferous and auriferous chalcopyrite, galena and sphalerite, with silicious gangue, values being mainly in silver and lead, with small copper values and still smaller gold values. Lead ores apparently are declining in value. Ore production is about equally divided between smelting and concentrating grades. The property has 3 principal veins, of 4′ to 6′ minimum, and up to 40′ maximum width, and additional ore bodies have been developed, to some extent.

The main shaft is 1,640′ deep, though no mining is in progress below the 1,400′ level, and the mine has about 12 miles of workings, 4,269′ having been opened in 1907. The Ontario drain tunnel, about 3 miles long, has been extended into the Daly West property, at the expense of this company, which pays therefor $750 monthly rental. The tunnel in October, 1908, was 155′ in Daly West ground, and was expected to connect, circa April, 1909, with the shaft, at a depth of about 2,000′.

The Quincy mine, operated in connection with the Daly West mine, and owned by the company, shows considerable ore reserves, and, in 1907, produced 3,199 tons of first class ore and 7,953 tons of second class ore.

The 350-ton concentrator has crushers, rolls, automatic sorting belt, two 5′ Huntington mills and Wilfley tables, putting about 6 tons into 1, with an average extraction of 98% lead and 70.5% silver, the practice being exceptionally advanced and successful.

The tailings mill, 56x82′ in size, 400′ northeast of the concentrator, has a 5′ Huntington regrinding mill, two 2-compartment jigs, 6 concentrating tables, 1 Wilfley table and 7 slime, settling and classifying tanks, treating tailings at a cost of circa 20 cents per ton, when in operation. Water supply for both mills is secured, under contract, from the Daly-Judge mine.

Operations were suspended, late 1907, and resumed circa June 1, 1908. Maximum production, 1903, was 3,160,824 lbs. fine copper, 35,744,000 lbs. lead, 4,382,222 oz. silver and 3,195 oz. gold. Production, 1906, was 830,307 lbs. fine copper, 12,150,000 lbs. lead, 1,200,857 oz. silver and 1,016 oz. gold, and 1907, was 673,890 lbs. fine copper, 8,086,000 lbs. lead, 1,042,062 oz. silver and 949 oz. gold, of the gross value of $771,679.44.

Former large reserves of high grade ore were greatly depleted by undue crowding for several years, culminating in 1903, and the principal reliance for the future is upon large bodies of low grade ore, and some newly opened high grade ore. The mine has about 3 years' supply of milling ore blocked out. Management, since 1904, has been improved, though shareholders remain dissatisfied, and the property is valuable.

DAMARALAND COPPER SYNDICATE, LTD. — **GERMAN SOUTHWEST AFRICA.**

Dead. Voluntarily liquidated, February, 1903. Formerly at Windhoek, German Southwest Africa.

DANA COPPER CO. — **MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. Mine office: Phoenix, Keweenaw Co., Mich. C. O. Burbank, secretary and treasurer; preceding officer, John C. Watson and Joseph H. Chandler, directors. Organized April, 1853, under laws of Michigan, with capitalization $500,000, and reorganized with capitalization $1,000,000, shares $25 par. Is controlled, through ownership of 35,450 shares, out of the capitalization of 40,000, by the Calumet & Hecla Mining Co. To Dec. 1, 1871, had levied assessments of circa $68,000.

Lands, 640 acres, being the East ½ of Section 25, Town 58 North, Range 31 West, bounded on the north by the Arnold and on the other three sides by

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the Central. Mine was opened 1851, and never was a producer, having been idle since 1857.

DANES LEA MINING CO. **CALIFORNIA.**

Office: San Diego, Cal. Mine office: Encinitas, San Diego Co., Cal. W. C. Harland, president; W. H. McKinnon, manager. Lands, 20 claims, 8 miles east of Encinitas, with shafts of 100′ and 280′, also a tunnel, showing a 3′ vein of medium-grade chalcopyrite, traversing porphyry. Has gasoline power. Idle for several years.

DANIA COPPER MINES. **NATAL.**

Mine office: Undweni, Ngutu, Zululand, Natal. Lands, 570 acres, in the Ngutu district, on government lands, circa 30 miles from Vryheid. Mine has a 215′ shaft, in a vein of ore of fair grade, of 16′ to 20′ width, traceable by outcrop circa 2 miles. Has a small mill and planned beginning production 1908. Is the first producing copper mine of Natal, and is a property of considerable promise.

DANNEMORA GOLD & COPPER MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Frank L. Foreman, manager; Henry Klackers, superintendent. Has a 900′ tunnel, showing spathic iron ore, said to change to copper assaying up to 14% in tenor, with 40 oz. silver and $2 gold per ton.

DANUBE COPPER MINING CO., LTD. **HUNGARY.**

Office: care of E. D. Tupper, 6 Holborn Viaduct, London, E. C., Eng. Organized December, 1907, under laws of Great Britain, with capitalization £1,000, shares £4 par. Lands supposedly are in Hungary.

DANVILLE & VIRGINIA COPPER MINING CO. **VIRGINIA.**

Dead. Merged, 1903, in Carolina King Mining Co. Formerly at Virgilina, Halifax Co., Va.

DARGIN & RICHARDSON. **MEXICO.**

Office and mine: Unión de Tula, Autlán, Jalisco, Mex. Lands, 60 pertenencias, 7 miles southwest of Ayutla, showing a fissure vein of 5′ to 10′ width, in diorite, carrying argentiferous oxides and carbonates, associated with hematite. Has a 130′ shaft and 325′ tunnel, with some ore blocked out for stoping.

DARNELL MINING & MILLING CO. **WASHINGTON.**

Dead. Formerly at Kalama, Cowlitz Co., Wash. Described Vol. VI.

DARRINGTON-INDIANA MINING CO. **WASHINGTON.**

Office: care of Geo. H. Crawford, secretary, Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. G. A. C. Rochester, president; Jas. G. Gibbons, vice-president. Organized 1906, under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 2 unpatented claims.

DAULTON COPPER CO. **CALIFORNIA.**

Dead. Formerly at Daulton, Madera Co., Cal.

DAVID HARUM COPPER CO. **TEXAS.**

Office: 30 Broad St., New York, N. Y. Mine office: Van Horn, El Paso Co., Texas. Organized 1901. Lands, in the Diablo Mountains, 12 miles east of Van Horn, showed a 12x40′ pothole, carrying good ore, which was exhausted quickly. Idle and apparently moribund.

DAVIDSON O'SHEA COPPERS, LTD. **TRANSVAAL.**

Office: P. O. Box 22, Johannesburg, Transvaal. Mine office: Zoutpansberg, Transvaal. Organized 1907, under laws of Transvaal, with capitalization £20,000, shares £1 par, with £12,500 issued to vendors, £5,000 issued for working capital and £2,500 unissued. Lands, 96 claims, on Government Farm Rotterdam No. 1,450, 96 claims on Government Farm Lilliput No. 1,445, and 96 claims on Scrutton's Concession, unserveyed government ground, all in the Zoutpansberg district, Transvaal. Property has been slightly prospected.

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DAVIS-DALY COPPER CO. **MONTANA.**

Office: 1611-42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. It is planned to organize this company, with a capitalization of $10,050,000, shares $10 par, as successor of the Davis-Daly Estates Copper Co., having a similar capitalization, to take over the wreck of the latter. A full description of the disreputable career of the Davis-Daly Estates Copper Co. will be found under the title of the latter-named corporation.

The plan of reorganization provides for turning over the assets, such as they are, of the Davis-Daly Estates Copper Co., to the new corporation, which plans devoting circa $500,000 to the liquidation of the debts of the old company, leaving about $300,000 for working capital. Capital of the new company is to be provided by a practically forced assessment of $2 per share on old stockholders, payable in 50-cent installments Oct. 1 and Dec. 15, 1908, and Feb. 15 and March 15, 1909, old stockholders turning in their shares, in addition to the assessment. Stockholders who refused to furnish more money are said to be entitled to a dividend of 50 cents in liquidation, and it is to be hoped that they get it before it disappears.

It is said that Messrs. Coram, Leonard and Heinze, promoters of the old company, intend, with rare generosity, to donate an additional undivided fourth interest in the Daly Estate, which never was owned originally by the Davis-Daly Estates Copper Co., the present landed "holdings" of that corporation consisting merely of a six-elevenths undivided interest in most of its properties. With the addition of the additional fourth interest this would give the new company an undivided interest of thirty-five forty-fourths in the Daly Estate lands. Just what the other proportions may be seems unknown to the public.

The plan of organization calling for a continuance of the management that foisted the former rotten company on the credulous public, discriminating investors can have no confidence in the new company or in any promises made in its behalf. Once bit, twice shy.

DAVIS-DALY ESTATES COPPER CO. **MONTANA.**

Office: 1611-42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. J. A. Coram, president; N. Willis Bumstead, vice-president; preceding officers, F. Augustus Heinze (chairman), H. M. Burton and S. S. Rosenstamm, executive committee; preceding officers, E. L. White, Geo. H. Flint, Geo. Baglin, John MacGinnis, Henry Mueller, M. S. Largey, C. F. W. Dillaway, Chester D. Coram and Chas. R. Leonard, directors; W. J. Freeman, secretary; R. A. Cornachan, treasurer; Albert Frank, general manager; Wm. A. Kidney, superintendent.

Organized May 29, 1906, under laws of Maine, with capitalization $10,050,000, shares $15 par. Has circa 3,500 shareholders. Supposedly is controlled, through stock ownership, by United Copper Co. Controls, through stock ownership, the Smokehouse Mining Co., which owns the Detroit, National and Copper Bottom claims. Empire Trust Co., New York, transfer agent; Colonial Trust Co., New York, registrar.

Lands, circa 400 acres, "bought" of the estates of A. J. Davis and Marcus Daly, or rather supposed to have been bought, though apparently the company secured only an undivided interest of six-elevenths in most of its properties, this not having been known to shareholders until after the smash. The Davis lands are said to have been bought for $1,393,196, part of which was paid, balance being owned, this also coming out in the wash. Lands include the Owsley ranch and water rights, the mineral lands lying to the south and west of the proven mineral zone of Butte, though very close thereto, stretching over an area of approximately ½ mile wide and 1½ miles long, including old prop-

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erties claimed to have yielded profits of $2,000,000, mainly from silver production, these figures apparently being estimates only. Mines were idle from circa 1890 until taken over by present company. Property, in addition to sundry old exploring shafts, has four 3-compartment working shafts, on the Colorado, Smokehouse, Mount Moriah and Silver King claims.

The Mount Moriah has a 640′ shaft, and a crosscut of circa 2,000′ length has been driven to the Mount Moriah claim from the 1,800′ level of the Original mine, this showing occasional stringers of ore and leached veins, apparently there being nothing of workable value developed by the long crosscut, notwithstanding many flourishes of trumpets in the press.

The Colorado mine has a shaft of circa 1,400′ depth, with short crosscuts north and south, showing several veins carrying bunchy values in copper, but heavy in zinc.

The Smokehouse mine consists of one city lot, circa 50x125′ in size, with a 500′ shaft, vein having been lost on the 500′ level. It is planned opening the Smokehouse at greater depth by a crosscut from the Colorado shaft. Equipment, which completely fills the lot, includes a gallows-frame, electric hoist and electric air-compressor.

The Silver King claim, worked, 1907, by lessees, shows considerable good silver ore, with lead and zinc, but is only slightly developed.

The Lizzie mine, about ¼ mile east of the Colorado, has a shaft of about 100′ depth, on the Holy lease, claimed to show a 30′ vein carrying up to 8% copper. This claim was worked, 1907, by lessees, under a 25% royalty, producing some good silver ore.

The Plymouth claim was worked, 1908, in a small way, by lessees.

The only production of the Davis-Daly Estates Copper Co. consisted of ore carrying a little copper and considerable silver, taken out, 1907, by lessees. Work was suspended November, 1907, and resumed, in the Colorado shaft, circa June, 1908. Property has been attached for debts.

Some extremely and apparently deliberately misleading statements have appeared in the press regarding the size and value of the ore bodies of this company. In fact, most of the information appearing in the press has ranged from half-truth to nearly or complete falsehood.

The shares of the company were floated at $12.50 each, and it was stated in the press, apparently in an inspired article, that the actual cost to the promoters was $12.48 per share, leaving to those philanthropic gentlemen the beggarly profit of 2 cents per share, or 16 cents on every $100. In view of the actual facts disclosed upon the company's failure this statement must be considered the prime joke of the season, though it may appear but a scurvy jest to the deluded shareholders who swallowed the bait.

The Davis-Daly Estates Copper Co. was promoted by Messrs. Coram, Leonard and Heinze, Leonard apparently acting as Heinze's agent, the latter remaining in the background. The company was supposed to have begun business with $2,000,000 working capital, but actually started with $500,000 cash, and an agreement that the vendors, J. A. Coram and Chas. R. Leonard, guaranteed by F. Augustus Heinze, would furnish $1,500,000 more when needed. This arrangement was kept sub rosa, but there was a sub-cellar and private trap-door under even this basement arrangement, in the form of an agreement between the company and the vendors of the company, about which the stockholders knew nothing, providing that the vendors were to furnish $2,000,000 cash capital, failing which they could return the stock of the company at $15 per share. The vendors actually provided only $516,401 under this agreement, and met the balance of their "contract" by turning over to the treasury of the company 95,000 shares of stock at $15, at a time when the stock was selling

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at about $5 per share, which arrangement effectually choked off what little wind remained to the company, and rendered the balance of the stock practically worthless. It is obvious that if the stock had been selling at a premium the cash would have been paid. Under this agreement the vendors played the old game, "Heads I win, tails you lose."

In December, 1907, the company was supposed to have had about 225,000 shares unissued, but a few months later had circa 600,000 shares issued out of the capitalization of 670,000 shares.

The company's financial statement of September, 1907, gave liabilities of only $46,866, which figures were brought out by a juggling of the books, now comprehensible, but at that time unguessable by any shareholder, hence the statement was nothing less than a lie, no matter on what grounds of casuistry it may be defended. The company's statement of June 30, 1908, showed a "surplus" of $1,999,000, with liabilities of only about $90,000, while as a matter of fact the company at that date was bankrupt, and instead of about $90,000 of liabilities, the company had a floating debt of that amount, and owed somewhere between $300,000 and $450,000 remaining unpaid on its lands. The defense of the company, or its promoters, is that this money was owed, not by the company, but by the vendors, but, inasmuch as the property was liable to forfeiture by reason of non-payment of these balances, and the vendors got out from under by turning back worthless stock to a depleted treasury, it is evident that the company's financial statements were willful and deliberate lies, and no juggling with words can change this ugly fact.

Payments of about $180,000 were due July 1, 1908, to the owners of lands, but the time was extended.

In the total collapse of this rotten corporation, other facts of prime importance, carefully concealed at the time of flotation, have come to light. Not only was the alleged $2,000,000 cash capital a myth, and the alleged landed holdings held upon part payments, but the company never had any title or claim, no matter how poor, to more than a fractional interest in the lands. It transpired that the Davis-Daly Estates Copper Co. owned, or was supposed to own, merely a six-elevenths undivided interest in most of its properties. It is claimed that the vendors, by an act of rare generosity, will convey to the reorganized company an undivided fourth interest in the Daly Estate, which the Davis-Daly Estates Copper Co. never owned. In view of the promises broken, and the crooked methods employed throughout in the flotation and management of this company, any shareholder who places any confidence in any statement now made by the vendors writes himself down an ass.

The Davis-Daly Estates Copper Co. being hopelessly bankrupt in both cash and reputation, efforts are being made to resuscitate the corpse as the Davis-Daly Copper Co., and the proposed plan of reorganization is set forth in the description of the Davis-Daly Copper Co. Shareholders who failed to pay the practically enforced assessment on their shares Oct. 1, 1908, are said to be entitled to a dividend of 50 cents, in liquidation, presumably supposing nobody steals the funeral baked meats.

The Davis-Daly Estates Copper Co. is a swindle, and were justice done the people responsible for the frauds would be jailed.

DAVIS MINING & SMELTING CO. **CALIFORNIA.**

Dead. Formerly at Halleck, San Bernardino Co., Cal.

DAWES RANGE COPPER & GOLD MINING CO. OF QUEENSLAND, N. L. **AUSTRALIA.**

Offices: 78 Queen St., Melbourne, Australia, and 76 Bishopsgate St., London, E. C., Eng. Mine office: Glassford Creek, Queensland, Australia. Hon. Henry Foster, J. P., chairman; John Brown, manager; Stobbs & Roscoe, British

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agents. Organized January, 1900, under laws of Victoria, with capitalization £300,000, shares £1 par; issued, £250,000. Lands, 240 acres, in the Gladstone district of Queensland. Idle several years, owing to lack of funds.

DAY DREAM & BRETONARTE COPPER MINING CO. **AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. M. Montague, manager, at last accounts. Has steam power. Idle and apparently moribund.

DEADWOOD GOLD & COPPER MINES CO. **SOUTH DAKOTA.**

Dead. Formerly at Deadwood, Lawrence Co., S. D.

DEATH VALLEY COPPER GLANCE MINING CO. **CALIFORNIA.**

Office: 407-346 Fourth Ave., Pittsburg, Pa. Mine office: Greenwater, Inyo Co., Cal. Capitalization $1,000,000, shares $1 par. Claimed, early 1907, to have nearly $15,000 in treasury for development purposes, but it cannot be found that any work has been done. Lands, 6 claims, known as the Poorman group. Idle.

DEATH VALLEY COPPER MINES & SMELTING CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Jerry Rourke, manager. Lands are said to comprise several hundred acres, prospected by numerous pits and shallow shafts. Employed about 50 men in spring of 1907.

DeBORGIA COPPER MINING CO. **MONTANA.**

Office: Ritzville, Wash. Mine office: DeBorgia, Missoula Co., Mont. Wm. Weiland, president; C. H. Clodius, treasurer; W. Greenough, superintendent. Lands, on Goat Mountain, just east of the Idaho line, have a 265′ tunnel, showing a 6′ fissure vein carrying cuprite, melaconite and bornite, with quartz gangue.

DECATUR COPPER MINING CO. **ARIZONA.**

Office: 503 North Main St., Decatur, Ills. Mine office: Jerome, Yavapai Co., Ariz. W. J. Wayne, president; Frank P. Wills, vice-president and treasurer; Geo. R. Bacon, secretary. Organized 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 10 claims, area 180 acres, also a 10-acre millsite and 10-acre smelter site, 2 miles south of Jerome, in the Verde district, claimed to show 10 fissure veins and lenses, of which 4, slightly developed, are claimed to have an average width of 4′, giving average assays of 5 to 8% copper, 20 oz. silver and $10 gold per ton, which is too high. Has 6 shafts, deepest 280′, and tunnels of 70′ and 150′. Idle since circa 1904, and out of cash, with poor prospects of ever obtaining any.

DEDHAM COPPER MINING CO. **WISCONSIN.**

Office and mine: West Superior, Douglas Co., Wis. Abram G. Ross, president; Wm. C. Burke, secretary. Organized November, 1902, under laws of Wisconsin, with capitalization $1,300,000, shares $25 par; debentures, $150,000 authorized at 6%. Lands, 320 acres, also a 12-acre millsite, with waterfall estimated at 2,400 h. p. available. Has 34 pits and a shallow shaft, showing 3 cupriferous amygdaloid beds, each claimed to average 90′ width and to be about one-third mineralized. Idle for several years and apparently moribund.

DEEMS MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. C. D. Rooklidge, president; Abram Hanauer, Jr., secretary and treasurer. Organized 1904, with capitalization $75,000, shares 25 cents par. Idle and apparently moribund.

DEEP RIVER GOLD MINING CO. **NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. W. G. Gaither, manager, at last accounts. Mine, opened many years ago, has auriferous and argentiferous copper ores. Idle for several years.

DEER CREEK DEVELOPMENT CO. **UTAH.**

Mine office: American Fork, Utah Co., Utah. John Cleghorn, president;

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Henry Johnson, secretary. Organized, 1903, with capitalization $125,000, shares 25 cents par. Lands, 7 claims, in the Deer Creek district, showing a fissure vein in granite of 3′ to 6′ width, carrying ores assaying up to 22% copper and 7 oz. silver per ton. Idle for several years.

DEER CREEK GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Silverton, Snohomish Co., Wash.

DEER LODGE CONSOLIDATED MINES, LTD. **MONTANA.**

Office: 16 St. Helen's Place, London, E. C., Eng. Organized July 2, 1907, under laws of Great Britain, with capitalization £250,000, shares £1 par, to acquire properties, in Deer Lodge county, Montana, said to carry gold, silver, lead, zinc, copper, iron, sulphur, tin and coal, some of which minerals, in Deer Lodge county, apparently are mere figments of the imagination.

SOCIEDAD MINERA DEFENSO y TODOS SANTOS. **CHILE.**

Mine office: Taltal, Antofagasta, Chile. Daniel Olivia, superintendent, at last accounts. Has auriferous copper ores, employing circa 40 men.

DEGILBO COPPER MINING SYNDICATE, LTD. **AUSTRALIA.**

Dead. Was organized Feb. 18, 1907, with capitalization £960, shares £10 par, and was liquidated August, 1907. Former office, Queen St., Brisbane, Australia.

DE KAAP COPPER MINES, LTD. **TRANSVAAL.**

Mine office: Barberton, Middelburg, Transvaal. Capitalization, £2,000. Lands, 158 claims, near Barberton, having a tunnel and a 64′ shaft showing small quantities of oxidized ores and copper sulphides.

DE LAMAR'S COPPER REFINING CO. **NEW JERSEY.**

Dead. Succeeded, Oct. 15, 1906, by United States Metals Refining Co. Formerly at Chrome, Middlesex Co., N. J. Very fully described Vol. VI.

DE LAMAR-WALL MINING & MILLING CO. **UTAH.**

Dead. Sold lands, 1903, to Utah Copper Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

DELAWARE MINE. **MICHIGAN.**

Owned by Manitou Mining Co. Very fully described Vol. II.

DELAWARE MINING CO. **MICHIGAN.**

Dead. Formerly at Delaware Mine, Keweenaw Co., Mich. Exhaustively described, under title Oneida, Vol. II.

DEL COBRE CONSOLIDATED MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Red Rock, Pinal Co., Ariz. W. Humphrey Read, secretary and treasurer. Organized, 1903, under laws of Delaware. Lands, 15 claims, held under bond and lease, 12 miles east of Florence, having a 200′ shaft, showing auriferous and argentiferous copper ore. Idle several years and moribund.

DELFINA MINING CO. **MEXICO.**

Office: Centro Mercantil 3er, Piso, Mexico, D. F. Mine office: Chilpancingo, Bravos, Guerrero, Mex. Paul Merienne, superintendent. Lands include the Delfina, Argentina and Esperanza mines, carrying argentiferous and auriferous copper ores. Has steam power and a 5-stamp mill. Employed circa 100 men at last accounts.

DELMAS COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Lee, Elko Co., Nev. J. D. Wood, president; P. D. Delmas, vice-president and general manager; W. Earls, secretary and treasurer. Lands, in Lee Cañon, 6 miles from a railroad, show contact deposits in wollastonite near granite, also a 30″ fissure vein carrying high grade argentiferous ore. Development is by a 170′ tunnel, planned to give a back of 800′ at length of 1,400′. Mine is said to show 6′ of ore assay-

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ing up to 14% copper, 211 oz. silver and $9.60 gold per ton. Property considered promising.

DEL NORTE COPPER CO. **ARIZONA.**

Dead. Formerly at Kirtland, Yavapai Co., Ariz.

DEL NORTE COPPER CO. **CALIFORNIA.**

Dead. Formerly at Smith River, Del Norte Co., Cal.

DEL ROY COPPER MINING & SMELTING CO. **NEW MEXICO.**

Dead. Formerly at Alamagordo, Socorro Co., N. M. Was a fraud, promoted from El Paso by Wm. Moeller, W. J. Harris, H. F. Kettler, M. D. Gaylord and others. Sold stock on strength of options to purchase sundry lands. Fully described Vol. VI.

DEL VERDE TUNNEL CO. **UTAH.**

Office and mine: Ogden, Weber Co., Utah. Albert Scowcroft, president; F. L. Woods and Moroni Poulter, vice-presidents; C. H. Hussey, secretary and treasurer; B. F. Critchlow, Willard Scowcroft, F. M. Driggs, W. L. Porter and J. C. Platt, directors. Organized circa January, 1908, with capitalization $200,000, shares 10 cents par, as a merger of Utah Buckhorn Mining Co. and Weber County Mining & Milling Co. Lands, 19 claims, east of Ogden, including the Weber group of 8 claims, and the Buckhorn group of 11 claims in Coldwater Cañon. Company is said to plan a one-mile tunnel.

P. P. DEMIDOFF ESTATE. **RUSSIA.**

Mine and works office: Nijni Tagilsk, Perm, Russia. Smelter is known as the Vijski Works. Mine was flooded in 1905, reducing production in that year to 2,962,250 lbs. fine copper, as compared with 4,917,896 lbs. in 1902.

DEMOCRATA CANANEA SONORA COPPER CO. **MEXICO.**

Office: 815 Fourth National Bank Bldg., Cincinnati, Ohio. Mine office: La Cananea, Arizpe, Sonora, Mex. H. H. Hoffman, president, secretary and treasurer; C. E. Hoffman, vice-president and general manager; Adolph Ehlert, mine superintendent; Wm. Harris, smelter superintendent; H. S. McKay, engineer. Organized May 8, 1905, under laws of Arizona, with capitalization $3,000,000, shares $10 par; issued, $2,800,000. Central Trust Co., registrar. Annual meeting, last Tuesday in May.

Lands, 18 hectares, lying in the heart of the Greene Cananea mines, between the Veta Grande and Capote. Development is by an 800′ tunnel, in ore, a 3,000′ crosscut tunnel and a 500′ shaft, latter with collar at bottom of gulch, giving an advantage of circa 800′ in depth, as compared with the neighboring Capote shafts. Property has 2 miles of workings, estimated to show circa 350,000 tons of ore, averaging 6% copper, with combined gold and silver values of about $3 per ton, which estimate probably is too high.

Equipment includes three 80-h. p. hoists, two 120-h. p. hoists and a 15-drill Sullivan air-compressor.

Company owns 15 buildings, including a 20x35′ machine-shop, 15x25′ carpenter-shop, assay office, warehouse, general store and several other buildings.

The reduction works include a 125-ton concentrator and a smelter with blast furnaces of 125 tons and 250 tons rated daily capacity, making matte, which is sent to the Greene Cananea works for conversion, when mine is in operation.

Production, 1907, was 3,067,039 lbs. fine copper, 94,434 oz. silver and 271 oz. gold, and company plans increasing capacity to an annual production of circa 10,000,000 lbs. fine copper. Mine considered valuable, though small.

DEMOCRATA MINING CO. **MEXICO.**

Dead. Succeeded, 1905, by Democrata Cananea Sonora Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

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DENN-ARIZONA COPPER CO. **ARIZONA.**

Office: 600 First National Bank Bldg., Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Martin Pattison, president; A. Guthrie, vice-president; Lemuel C. Shattuck, treasurer; Byron M. Pattison, superintendent; preceding officers, Thos. Bardon, Archibald M. Chisholm and Maurice Denn, directors; John G. Williams, secretary. Organized Jan. 14, 1907, under laws of Minnesota, with capitalization $3,500,000, shares $10 par, fully issued, as successor of Denn-Arizona Development Co.

Lands, 13 claims, patented, area circa 200 acres, partly owned in fee and partly held under bond and lease, final bond payment, $15,000, to Maurice Denn, falling due Apr. 4, 1910. Lands are well located, immediately north of the Junction shaft of the Superior & Pittsburg. The Dividend fault traverses the company's ground for about 1,000′, and big ore bodies have been found near this fault on other properties. Development is by a 3-compartment 1,225′ shaft, sunk in the conglomerate capping, but penetrating limestone at depth of 840′. Mine has circa 5,000′ of workings, on the 1,000′ and 1,100′ levels, showing considerable leached ore, but little ore of commercial grade, deposits being very irregular, as in the other Bisbee mines. A 55′ body of leached ore is said to be shown on the 1,100′ level. Company estimates average tenor of ore, exclusively oxides and carbonates, at 8% copper. The mine has a 1,000-gallon triple-expansion Prescott pump on the 1,000′ level, and three 800-gallon sinking pumps. Diamond drilling, 1908, on the 1,100′ level, apparently has given no important results.

A second shaft was started May, 1906, on the Lee claim. This has a temporary hoist and a 6-drill Sullivan air-compressor.

Equipment includes a 1,600-h. p. steam plant, with two 6-drill Sullivan air-compressors and an 18x36″ Ottumwa Corliss first-motion hoist, raising double deck cages. Buildings include an 18x24′ carpenter-shop, an 18x24′ smithy and several minor structures. There is a railroad spur to the mine.

A little ore was shipped, 1907, but mine was closed, November, 1907, because of too much water and too little cash. Company plans resuming work, early 1909, on the 1,200′ level. While little ore has been found so far, there are excellent indications of good ore bodies at slightly greater depth than yet reached. Management considered good.

DENN-ARIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Reorganized Jan. 14, 1907, as Denn-Arizona Copper Co. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. VI.

DENORO MINES, LTD. **BRITISH COLUMBIA.**

Dead. Lands sold June, 1906, to British Columbia Copper Co., Ltd. Formerly at Eholt, Trail district, B. C. Fully described Vol. VI.

DENVER COPPER MINING & LEASING CO. **COLORADO.**

Mine office: Morrison, Jefferson Co., Colo. Everett B. Curtis, secretary and treasurer. Capitalization, $1,000,000, shares $1 par. Lands, 2 claims, in the Cup Creek district, also sundry coal lands. Idle for some years.

DENVER & GLOBE MINING & SMELTING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Organized Sept. 4, 1906, under laws of Arizona, with capitalization $750,000, shares $1 par, by W. J. Mallory, Silas H. Coplen and H. G. Stephenson. Lands, known as the Darby group, carrying circa 4,500′ of the strike of a vein with a prominent outcrop, are near the Inspiration and Live Oak mines, in the western part of the Globe district.

DENVER GROUP GOLD & COPPER CO. **ARIZONA.**

Office: 319 Douglas Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Wickenburg, Maricopa Co., Ariz. Thos. S. Wadsworth, president. Capitalization $2,000,000, shares $1 par. Lands, 10 claims,

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patented, area 194 acres, 12 miles northeast of Wickenburg, showing a mineralized zone of 80′ to 300′ width, traceable 6,000′, showing scattered parallel veins and stringers, opened by 5 prospecting shafts, and tunnels of 225′ and 600′, showing occasional native copper and sulphide ore assaying up to 15% copper and $10 gold per ton. Idle since circa 1904, and presumably moribund.

DENVER & ROCK ISLAND MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Has a shaft of circa 100′ showing ore assaying up to 16% copper, with a $6,000 wagon road from the mine to nearest railroad. Has a saw-mill of about 35,000′ board measure daily capacity.

DERBY COPPER SYNDICATE. **AUSTRALIA.**

Office: Adelaide, South Australia. Mine office: Derby, Western Australia. Lands, fairly timbered and watered, show outcrops of high grade copper ores in a formation of schist and slate. Shipped, 1906, circa 20 tons of 20% copper ore, to Wallaroo & Moonta smelter. Presumably idle.

DERBY SYNDICATE, LTD. **AUSTRALIA.**

Dead. Voluntarily liquidated, July, 1902. Formerly at Derby, Western Australia.

DEROFFSKI MINE. **SIBERIA.**

Mine office: Semipalatinsk, Siberia. Was a small producer at last accounts.

DERWENT PROSPECTING ASSOCIATION. **TASMANIA.**

Mine office: Liena, Tasmania. Lands, 24 miles from Liena, in the Cradle Mountains, include the Derwent, Cradle Mountain and Lake Windermere mines, showing large quantities of low grade ore occurring as stockwerks in Archæan schist. Property is estimated, by Dr. Fritz Noetling, to show 2,000,000 tons of ore on surface, which possibly is the case.

COMPAÑIA MINERA y FUNDIDORA DESCUBRIDORA. **MEXICO.**

Is the Mexican incorporation of the Descubridora Mining & Smelting Co.

DESCUBRIDORA MINING & SMELTING CO. **MEXICO.**

Office: 17 Battery Place, New York, N. Y. Mine office: Conejos, Mapimí, Durango, Mex. R. Brendel, general manager; D. Gough, superintendent. Lands include the Descubridora, an antigua, opened by a 500′ shaft, showing very large quantities of very low grade basic silver-copper carbonates, requiring silicious ores for flux, latter being bought in the market, as not produced by the company's mines. Has steam and electric power and built, 1902, a 600-ton smelter, but part of equipment was sold later to Continental Copper Co. Property was leased for several years to Guggenheim Exploration Co., but supposedly was turned back to company, early 1908. Production, 1903, was 4,964,272 lbs. fine copper.

SOCIEDAD DESENGAÑO DE PABELLON DE PICA. **CHILE.**

Office: Iquique, Chile. Mine office: Pica, Tarapacá, Chile. Organized May 29, 1906, under laws of Chile, with capitalization £25,000, shares £1 par.

DESERET MINING & REDUCTION CO. **CALIFORNIA.**

Office: 930 South Second West St., Salt Lake City, Utah. Mine office: Leastalk, San Bernardino Co., Cal. Lands, 9 claims, 3 miles from Leastalk, having circa 500′ of workings, said to show auriferous and argentiferous copper ore.

DESERET MOUNTAIN COPPER KING MINING CO. **UTAH.**

Office: care of E. B. McCabe, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Eureka, Juab Co., Utah. Organized circa 1907.

DESERT QUEEN COPPER MINING CO. **ARIZONA.**

Mine office: Quartzite, Yuma Co., Ariz. Organized circa May, 1907, under

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laws of Arizona, with capitalization $1,000,000. Lands, 11 claims, in 2 groups, opened by crosscut tunnels, intersecting veins at 300′ to 500′ depth, with 600′ of drifting on the ore bodies. Has a 40-h. p. gasoline engine, air-compressor and power drills. Has been under development since circa 1902. Ores have given smelter returns of 10% copper, 25 oz. silver and $12 gold per ton.

DE SOTO MINING CO. **ARIZONA.**

Office: 1206-71 Broadway, New York, N. Y. Mine office: Middelton, Yavapai Co., Ariz. John L. Elliott, president; Cyrus Robinson, vice-president; Benj. Prince, secretary; preceding officers, Francis Risk, LeRoy T. Harkness and Albert Kerr, directors. Organized January, 1905, under laws of New Jersey, with capitalization $100,000, shares $100 par. Bonds, $1,000,000 authorized, at 6%; issued, $500,000. Is controlled, through ownership of practically entire stock issue, by Consolidated Arizona Smelting Co.

Lands, 82 claims, area 1,400 acres, about 40 miles southeast of Prescott and circa midway between Crown King and Mayer, in the Peck district, Bradshaw Mountains, carrying 6½ miles of the strike of a very persistent copper formation. Country rocks, of porphyry and quartzite, show 5 parallel veins, of 10′ to 60′ width, carrying cuprite, melaconite, malachite, azurite, bornite and chalcopyrite, with schistose gangue, all having fair values in copper, gold and silver.

Development is by 2 tunnels, the Copper Link of 800′, and the Hot Number of 2,400′ length, latter 400′ vertically lower than the former, giving a back of 1,374′, with a double tram track laid with 20-lb. steel rails. Mine has nearly 2 miles of workings, showing a large amount of medium grade ore. A 4,000′ Bleichert aërial tram, of 2,000 tons rated capacity, connects the mouth of the Hot Number tunnel with 2,000-ton ore bins on the railway.

Mining equipment includes two 80-h. p. boilers and a 24-drill Ingersoll-Sergeant air-compressor. There are 9 miles of air and water pipes.

A 160x200′ steel concentrator has 2 Blake crushers, 2 centrifugal crushers, 2 sets of rolls, 2 Hancock jigs, 16 vanners, 16 Overstrom tables and 8 sizers.

Production, 1906, was 1,128,327 lbs. fine copper, 19,259 oz. silver and 903 oz. gold; production, 1907, was 1,016,170 lbs. fine copper, 22,216 oz. silver and 933 oz. gold. Property, though low in average grade, has large ore bodies, and is considered valuable.

DESPATCH COPPER-GOLD MINING CO. **COLORADO.**

Office: care of R. A. Gurley, secretary and treasurer, Denver, Colo. Mine office: Morrison, Jefferson Co., Colo. Henry Appel, president; O. M. Deemer, managing director; Geo. Q. Adams, vice-president and superintendent. Organized Apr. 12, 1903, with capitalization $150,000, shares 10 cents par. Lands, 8 patented claims, adjoining the F. M. & D. Copper Mining Co., circa 10 miles west of Morrison, opened by shafts, showing stringers of ore assaying 9 to 14% copper. District apparently has not developed continuous ore bodies of fair size. Has steam power. Idle.

DESSIE BOYER COPPER-GOLD MINE, LTD. **CALIFORNIA.**

Dead. Succeeded, circa 1908, by Copper Mines & Smelters Corporation of America. W. C. Fellows, president and general manager; E. H. Kramer, vice-president; H. M. Bowen, secretary and treasurer. Organized July, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Formerly at Vontrigger, San Bernardino Co., Cal.

DETROIT & COLORADO MINING CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. L. L. Haines, superintendent, at last accounts. Has auriferous and argentiferous copper ores, with a small steam plant.

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DETROIT COPPER MINING CO. OF ARIZONA. **ARIZONA.**

Office: 99 John St., New York, N. Y. Mine and works office: Morenci, Graham Co., Ariz. Employs about 1,000 men. Jas. Douglas, president; Jas. McLean, vice-president; Geo. Notman, secretary and treasurer; Chas. E. Mills, general superintendent; H. H. McLean, mine superintendent; G. E. Hunt, mill superintendent; H. S. Van Gorder, supply and mercantile superintendent; J. B. Fleming, mechanical engineer. Organized under laws of Michigan, with capitalization $1,000,000, shares $25 par. Is operated as a close corporation, by Phelps, Dodge & Co.

Lands are extensive, including the Ryerson, Arizona Central, Copper Mountain, Yankee, West Yankee, Montezuma and Santa Rosa mines, at and near Morenci. Mine, opened circa 1880, originally was worked open-cast, but has been developed latterly by tunnels and shafts, deepest workings being only about 400′. Ores are mainly sulphide, with but trivial gold and silver values, and are highly silicious, with gangue carrying up to 40% alumina, hence very careful handling is required. About 95% of the production is ore of concentrating grade that gives an average extraction of 35 to 40 lbs. fine copper per ton, ore treated being about half oxidized and half sulphide. A 240′ ore-bin at the Ryerson mine is connected with the mill by belt conveyor.

Gas power is used extensively throughout the mines and works, being employed for practically all machinery except hoists and locomotives. A Loomis generator, with capacity to supply gas for developing 1,000 h. p., consumes New Mexico bituminous coal, giving an efficiency of about one horse-power-hour from 1.5 to 1.75 lbs. coal. The power-house, 64x200′, of steel frame on concrete foundations, has Crossley gas-engines aggregating 1,920 h. p. This plant includes three 100-h. p. engines driving blowers that are connected with the furnaces by a 300′ blast-main; a 500-h. p. air-compressor furnishing converter blast, at 8 lbs. pressure only, and two 200-h. p. 250-volt electric generators furnishing current that is stepped up to 2,500 volts at the power-house, and carried by 4 feed-wires to a second set of transformers at the West Yankee mine, there stepped down to 250 volts, and distributed to the various mines. There also is a complete electric lighting plant.

The 1,200-ton concentrator, having two 600-ton units, is 166x240′ in size, and cost about $1,000,000. Equipment includes Chilean mills, 6 sets of 16x42″ rolls, 28 revolving screens, 80 Frue vanners and 40 Wilfley tables, the mill putting about 7 tons into 1. A pumping station 6 miles distant raises water from wells on the San Francisco river to a height of 600′, whence it is fed by gravity to the mill, which uses about 4,400 gallons per minute, with a consumption of new water of only about 80 gallons per minute, new water being supplemented by clarified water from an ingenious and highly efficient settling system designed by Mr. Hunt that includes tanks and settlers, with a steel dam, and a pond for tailings. Only about 400 gallons of water are used in the concentration of a ton of ore.

The 100-ton sampling mill is connected with the concentrator by a 400′ belt-conveyor. Experiments, 1904, with oil concentration, did not lead to the adoption of that process.

The smelter has four 54x144″ blast-furnaces, and one 42x264″ furnace, and a converter plant was added, 1906. Flue dust is briquetted for resmelting. The smelter has 2,000-ton ore bins, surmounted by steel railroad trestle.

A 36″ gauge railway connects the mines and smelters with the Arizona & New Mexico railroad, at Guthrie, this line having a maximum grade of 3.5%, with 4 complete loops within an air-line distance of 1½ miles near Morenci.

The company operates a large department store and an excellent hotel, and maintains a library, gymnasium and clubroom for employes.

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Production, 1907, was 17,346,411 lbs. fine copper, 4,814 oz. silver and 176 oz. gold, comparing with an output of 16,906,348 lbs. fine copper in 1906 The property is managed with great skill, and is an exceptionally fine example of a successful low grade mine.

DETROIT & LAKE SUPERIOR COPPER CO. **CONNECTICUT.**

Office and works: Waterbury, New Haven Co., Conn. Is a half owner of the stock of the Lake Superior Smelting Co., which bought the plants of the Detroit & Lake Superior Copper Co. at Hancock and Dollar Bay, Houghton Co., Mich. Built a smelter at Detroit, 1850, and shortly after built another at Hancock, being the pioneer in Michigan smelting.

DETROIT-OROVILLE EXPLORATION CO. **WASHINGTON.**

Office: 406 Gladwin Bldg., Detroit, Mich. Mine office: Oroville, Okanogan Co., Wash. F. A. Kelsey, president; Chas. E. Kanter, vice-president; Milton T. Watson, secretary and treasurer. Organized June 1, 1908, under laws of Michigan, with capitalization $3,000, shares $10 par. Lands, 15 claims, area 300 acres, with a smelter site, showing Carboniferous limestone resting on graywacke slates, carrying chalcopyrite giving assays up to 15% copper. Property has been partially explored by diamond drilling.

DETROIT & PARRY SOUND MINING CO., LTD. **ONTARIO.**

Office: 311 Wetherbee Bldg., Detroit, Mich. Mine office: Parry Sound, Parry Sound district, Ont. W. A. Phillips, president; H. C. Morris, vice-president; E. A. Covell, secretary. Organized June 3, 1903, under laws of South Dakota, with capitalization $3,000,000, shares $1 par; issued, at last accounts, $490,750. Lands have given specimens of ore assaying well in copper. Idle for several years.

DETROIT QUO VADIS COPPER CO. **MEXICO.**

Office: 1001 Majestic Bldg., Detroit, Mich. Mine office. Moctezuma, Bravos, Chihuahua, Mex. Frank C. Houston, secretary; A. C. Simkins, superintendent. Organized 1906, and bought property Aug. 16, 1906. Presumably idle.

DETROIT SONORA MINING CO. **MEXICO.**

Office: care of R. G. Lambrecht, secretary, Detroit, Mich. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. M. H. Gilbert, president; F. O. Bostwick, vice-president and general manager. Organized, circa 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 3 groups, area 214 acres, circa 25 miles from La Cananea, having a 300′ tunnel on the Abigail claim, said to show 200′ of ore of medium grade.

DEVELOPMENT COMPANY OF AMERICA. **ARIZONA.**

Office: 11 Pine St., New York, N. Y. Mine office: Tombstone, Cochise Co., Ariz. E. B. Gage, president; Frank M. Murphy, vice-president; A. N. Gage, secretary and treasurer; W. Dietz, assistant treasurer; W. F. Staunton, general manager; preceding officers, E. C. Gage, W. F. Staunton, Wallace Fairbank and H. M. Robinson, directors. Organized Nov. 23, 1901, under laws of Delaware, and capitalization increased, 1906, to $5,000,000. Is a holding company only, controlling, through stock ownership, the Imperial Copper Co., Tombstone Consolidated Mines Co., Ltd., Congress Consolidated Mines Co., Ltd., Poland Mining Co. and Mexican-American Lumber Co.

DEVINE MINING CO. **WASHINGTON.**

Office: 703 New York Blk., Seattle, Wash. Mine office: Cle Elum, Kittitas Co., Wash. C. P. Devine, president and general manager; F. A. Pontius, vice-president; Henry S. Noon, secretary; Wm. T. Kipp, treasurer; Clancy M. Lewis, engineer. Organized, 1904, under laws of Washington, with cap-

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italization $1,000,000, shares $1 par. Annual meeting, second Monday in April.

Lands, 2 claims, area 40 acres, also two 5-acre millsites and a water right, in the Gold Creek district, circa 12 miles north of the Northern Pacific railroad, showing andesite and rhyolite with lenticular chutes, of 45′ estimated average width, carrying sulphide ores, reported to average 5% copper, 25 oz. silver and $4 gold per ton, with traces of lead and zinc. Apparently values are mainly in a 40″ footwall paystreak, balance of vein carrying concentrating ore of 2.5 to 5% copper tenor, with small gold and silver values. Development is by tunnels of 800′, 75′, 300′, 220′ and 125′, with 1,520′ of workings, estimated by company to show 100,000 tons of ore, with 50,000 tons blocked out for stoping.

DEVLIN ARIZONA COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Bouse, Yuma Co., Ariz. Lands, 9 claims, known as the Bullion group, 9 miles west of Bouse, said to have been bought for circa $250,000. Property has a number of shallow shafts, one of which is said to show, in a crosscut, at depth of 70′, circa 35′ of sulphide ore, claimed to assay 10% copper and $3 gold per ton.

DEVON UNITED MINES SYNDICATE, LTD. **ENGLAND.**

Office: 6 Pall Mall, London, S. W., Eng. Mine office: Peter Tavy, Devonshire, Eng. Edward B. Haynes, chairman; F. N. B. Hill, secretary; Robert Sach, consulting engineer. Organized June 19, 1901, under laws of Great Britain, with capitalization £10,000, shares £1 par; issued, £7,797. Debentures, £5,000, at 6%. Lands, 100 acres, on the river Tavy, carrying tin, copper and arsenic ores, including the South mine, a tin property, and the Central mine, latter being considered the most promising copper prospect opened in Cornwall for some years. Has a tin-mill with 28 stamps. Presumably idle.

DEWEY CONSOLIDATED COPPER & GOLD MINING & MILLING CO. **IDAHO.**

Dead. Formerly at Grangeville, Idaho Co., Idaho.

DEWEY MINING CO. **IDAHO.**

Dead. Formerly at Bear, Washington Co., Idaho.

DIAMOND MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

FERNANDO DÍAZ. **MEXICO.**

Office and mine: Túxpam, Santiago Ixcuintla, Tepic, Mex. A. C. González, superintendent. Property is the Cardenillo mine, carrying argentiferous copper ores. Has steam power and employed circa 50 men at last accounts.

DICKERSON MINING CO. **MONTANA.**

Mine office: care of J. W. Dickerson, manager, Basin, Jefferson Co., Mont. Mine is slightly developed by tunnel, with steam and water power. Idle several years.

DILL GOLD & COPPER MINING CO. **WYOMING.**

Office: Prescott, Wis. Mine office: Rambler, Carbon Co., Wyo. M. T. Dill, president; Geo. S. Hollister, vice-president and treasurer; Edw. H. Wallace, secretary. Organized July, 1903, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. Lands, 4 claims, area 80 acres, next north of the Doane, in the Battle Lake district, opened by 100′ tunnel and shafts of 42′ and 100′, with circa 1,000′ of openings, showing several quartz veins carrying more or less copper. Has a 40-h. p. boiler, 6x8″ hoist and Cameron sinking pump. Idle for several years.

DILLON-ARGENTA MINING CO. **MONTANA.**

Office: Dillon, Mont. Mine office: Argenta, Beaverhead Co., Mont. E.

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R. Hall, president. Property has an air-compressor, and was working, 1907. Presumably idle.

DILLON CONSOLIDATED MINING & TUNNEL CO. **WYOMING.**

Mine office: Dillon, Carbon Co., Wyo. Organized 1904, to drive a 3,500' tunnel across the formation at Dillon, to cut 6 copper veins, located on surface. Idle and tunnel remains an iridescent dream.

DILUVIO GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Bouse, Yuma Co., Ariz. W. D. Tremain, manager. Property is said to be 5 groups of claims. Presumably idle.

DINGO COPPER MINING CO. **AUSTRALIA.**

Mine office: Essington, N. S. W., Australia. Produced circa 200 tons of high-grade hand-picked ore in 1901. Idle some years.

DIRIGO-LA SAL GOLD & COPPER MINING CO. **UTAH.**

Office: care of C. S. Richardson, secretary, Salt Lake City, Utah. Mine office: Castleton, Grand Co., Utah. Geo. E. McCann, manager. Lands, 31 claims, circa 600 acres, in the Deep Creek district. Presumably idle.

SOCIÉTÉ FRANÇAISE D'ELECTRO-METALLURGIE DE DIVES. **FRANCE.**

Office: 11 bis, Rue Roquèpine, Paris, France. Works office: Dives, France. Plant is an electrolytic refinery, treating Chile bars, having four 170-kw. generators, with 216 tanks, electrodes being arranged on the Elmore plan. Capacity is 10 to 12 tons of copper daily.

DIVIDEND MINING & MILLING CO. **NEW MEXICO.**

Office: 65 Journal Bldg., Boston, Mass. Mine office: Estey, Socorro Co., N. M. J. M. Bryson, president and general manager; J. E. Simpson, vice-president; B. F. Coburn, secretary and treasurer; preceding officers, F. B. Street, J. Wm. Rice, Samuel Porter, A. B. Spear, Jas. B. Putnam and Halbert E. Parkhurst, directors; W. E. Morong, superintendent. Organized September, 1902, with capitalization $3,000,000. Has authorized a 5-year bond issue of $150,000, at 7%.

Lands, circa 2,000 acres, also sundry coal lands about 16 miles distant. It is claimed that about $250,000 has been expended on the mine, which shows a fair body of sulphide ore, carrying good values in copper, with a little lead and with small values in gold and silver.

A 100-ton concentrator, apparently since enlarged to 250 tons rated daily capacity, and a small smelter, were inherited from the Estey Mining & Milling Co., previous owners, and company is supposed to have begun milling, circa July, 1907.

The company has been very prolific of "estimates" and promises, demonstrating—on paper—how, by merely producing 14,400,000 lbs. of copper yearly, profits of millions of dollars could be earned. Company's advertising is indefensible, and the statement that "there has been no such opportunity for investment since the Calumet & Hecla and United Verde were first put on the market" leads to the conclusion that the promoters of the company are sadly lacking either in sense or truth. Property is considered one of fair promise, but the management is not well regarded.

DIVIDEND MINING & SMELTING CO. **MEXICO.**

Office: 25 East Ninth St., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. Louis Fournie, president; W. E. Flanery, vice-president and mine manager; R. E. Kirtley, secretary; John W. Opie, treasurer; preceding officers and James Muir, directors. Organized October, 1904, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 195 acres, opened by a 75' shaft and 230' tunnel, showing ores carrying copper, lead and silver values, with occasional gold.

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D'JELELE COPPER SYNDICATE. **TRANSVAAL.**

Office and mine: Pietersburg, Zoutpansberg, Transvaal. Organized circa July, 1907, but apparently not incorporated, with capitalization £4,000, shares £10 par. Lands, 96 claims, near the D'Jelele river, in the northeastern part of the Zoutpansberg district, having a 44' shaft showing ore assaying up to 15% copper.

DOANE-VERDE MINING CO. **WYOMING.**

Office: 1301 Monadnock Bldg., Chicago, Ills. Letter returned unclaimed from former mine office, Rambler, Carbon Co., Wyo. John C. Clarke, president; Oliver S. Brown, vice-president; Robert H. Young, general manager. Organized June, 1902, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. Lands, 7 claims, on which a little development work was done, in the hope of striking the extension of the Doane-Rambler ore body, but without results. Idle some years.

DOGAMARU MINE. **JAPAN.**

Mine office: Ago-mura, Ochi-gori, Iwami, Japan. B. Hori, owner; J. Stajaki, general manager. Opened circa 1845, reopened 1873. Ore is chalcopyrite, associated with argentiferous galena, sphalerite and iron pyrites, with quartz gangue. Principal vein, of 10' to 25' width, traverses granite-porphyry, with frequent faults. Has steam and electric power and a small smelter, employing circa 600 hands. Production, 1906, was 445,105 lbs. fine copper and 1,141,482 grams fine silver, and 1907 was 403,505 lbs. fine copper and 258,393 momme fine silver. Owner does not pay his debts.

DOLCOATH MINE, LTD. **ENGLAND.**

Office: 28 St. Swithin's Lane, London, E. C. Eng. Mine office: Camborne, Cornwall, Eng. Frank Harvey, J. P., chairman; Oliver Wethered, vice-chairman; R. Arthur Thomas, mine manager. Organized July 15, 1895, under laws of Great Britain, with capitalization £350,000, shares £1 par; issued, £285,114. Lands include the Dolcoath mine, held on lease expiring June, 1955, under royalty, and the West Dolcoath mine, freehold. The Dolcoath is the principal mine of Cornwall, and is a large producer of tin, securing a little copper as a by-product. Main shaft is nearly ½ mile in depth. Ore in the upper levels is a complex mixture of chalcopyrite, pyrite and other sulphides, all more or less arsenical, carrying 2 to 3% copper and 1 to 2% tin. Complexity of the ore has caused considerable trouble heretofore in the extraction of full values, but a new Elmore vacuum flotation process plant saves the copper in the first milling, this formerly having been largely lost, the tin passing over in the tailings and being retreated. Property has a strong and capable management.

DOLGELLY COPPER MINES, LTD. **WALES.**

Office: 11 Coleman St., London, E. C., Eng. Mine office: Dolgelly, Merionethshire, Wales. R. Gillman Brown, technical director; R. Arthur Thomas, consulting engineer. Organized March 7, 1907, under laws of Great Britain, with capitalization £60,000, shares £1 par. Has a large body of ore of low average tenor, ore being complex and difficult of reduction, having yielded, under former milling process, only about 15% of assay values, but a new 120-ton mill, planned as the first unit of a 360-ton mill, using the Elmore vacuum flotation process, similar to that of the Dolcoath, has given test extractions averaging 80.9% of assay values, from complex sulphide ores, very difficult of reduction by any ordinary process.

DOLLY VARDEN COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Geo. Nix, manager. Organized circa 1907, with capitalization $1,000,000, shares $1 par. Lands are near Curry station, adjoining the Dolly Varden United Copper Co.

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DOLLY VARDEN UNITED COPPER CO. **NEVADA.**

Office and mine: care of Frank A. Herrell, president, Ely, White Pine Co., Nev. Organized 1907, with capitalization $1,000,000, shares $1 par. Lands, 9 claims, adjoining the Dolly Varden Copper Co.

MINAS DOLORES y ANEXAS. **MEXICO.**

Owned by Guggenheim Exploration Co.

DOLORES COPPER MINING CO. **MEXICO.**

Dead. Property sold to Guggenheim Exploration Co. Formerly at Matehuala, Catorce, San Luis Potosí, Mex.

DOMINGUEZ COPPER MINING CO. **COLORADO.**

Mine office: Delta, Delta Co., Colo. Lands, sundry claims, known as the Flossie B. group, near Dominguez Cañon. Idle for some years.

DOMINGO MINING, MILLING & SMELTING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Republic, Ferry Co., Wash. Development is by a 200′ tunnel, on the Little Giant claim, showing ore giving good assays in copper, silver and gold.

DOMINION COPPER CO., LTD. **BRITISH COLUMBIA.**

Office: 37 Wall St., New York, N. Y. Mine office: Phoenix, Boundary district, B. C. Works office: Boundary Falls, Boundary district, B. C. C. J. Cull, vice-president; Samuel Newhouse, general manager; Maurice M. Johnson, consulting engineer; P. F. Roosa, mine manager and receiver; John H. Sampson, mine superintendent; John Kawyle, smelter superintendent.

Organized Apr. 26, 1899, under laws of British Columbia, and reorganized, 1906, with capitalization $5,000,000, shares $10 par. Bonds, $1,000,000 authorized, at 6%, for 10 years, retirable 10% annually; outstanding, $800,000. Acquired, July 28, 1905, upwards of 75% of the capital stock of the Montreal & Boston Consolidated Mining & Smelting Co., Ltd., giving one share of stock for two shares of Montreal & Boston, and is supposed to have absorbed practically the entire stock issue of the latter named corporation.

Lands, 15 claims, area 500 acres, also fractional interests in 94 claims additional, and a smelter site. Mining lands are in 4 groups, in the Phoenix, Deadwood, Wellington and Summit camps. Country rocks are limestone and greenstone, ore bodies occurring as contact deposits, and largely as replacements in greenstone. Properties show 8 different veins, all more or less developed, of about 25′ average width, having a generally north and south strike, with average dip of about 40°. The ores are low in average grade, but, though showing large ore bodies, the amount of ground blocked out is comparatively small. For fiscal year ending July 31, 1907, the mines made 8,519′ of new openings.

The Phoenix group, area 366 acres, includes the Brooklyn, Idaho, Rawhide, Stemwinder, Montezuma and Standard mines. The Brooklyn and Idaho are adjoining properties, that produced 55,548 tons of ore in 1907, and the Rawhide is about ½ mile distant.

The Brooklyn mine, which is the principal property, has a 430′ main shaft, with about 8,000′ of workings, showing a 40′ vein, estimated to average 1.43% copper, 25 cents silver and $1.32 gold per ton.

The Idaho mine, connected with the Brooklyn on the 250′ level, is opened by tunnel and shaft, latter having an electric hoist, but is worked mainly open-cast.

The Stemwinder mine, opened on a vein parallel with and about 1,000′ east of the Brooklyn, has a 400′ shaft, with about ½ mile of workings, ore giving average assays of 1.4% copper, 25 cents silver and $1 gold per ton.

The Rawhide mine, adjoining the Gold Drop mine of the Granby, has a 180′ shaft, 6 tunnels, and various open-cuts, exposing circa 250,000 tons of

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ore averaging about 1.4% copper, 25 cents silver and 90 cents gold per ton. Equipment includes a 500′ Ingersoll-Sergeant electric air-compressor, and production, 1907, was 64,873 tons of ore.

The Montezuma and Standard claims are but slightly developed, showing ores similar to those of the other mines in the Phoenix camp.

The Deadwood group, area 110 acres, includes the Sunset, Morrison, Crown Silver and C. O. D. mines. The Sunset has shafts of 200′ and 412′, with large open-cast workings, and shows a large body of ore valuable chiefly for fluxing, carrying excess of iron, silica and lime, with only small copper, silver and gold values. Production, 1907, was 31,258 tons. A trestle from the Sunset mine runs to a 2-000-ton ore-bin on the railroad siding, whence ore is shipped to the smelter. Equipment includes a 14x20″ Jenckes duplex link-motion hoist, 14x20″ Lidgerwood double-cylinder hoist and a 10-drill Ingersoll-Sergeant duplex air-compressor.

The Crown Silver mine adjoins the Sunset, and is practically a part thereof. Development is by a 265′ shaft and an 880′ tunnel.

The Morrison mine has a 364′ shaft, with 4,300′ of tunnels, showing ore averaging circa 0.6% copper, 0.5 oz. silver and up to $4 gold per ton. Equipment includes a 110-h. p. steam plant, with 7x9″ hoist and a 5-drill Rand air-compressor.

The Wellington group includes the Athelstan and Jack Pot mines, with combined area of 34 acres. These show a large outcrop of oxidized ore carrying very low values in copper, about 1 oz. silver and up to $7.50 gold per ton, expected to carry somewhat better copper values below the oxidized zone.

Property in the Summit camp includes a half interest in the Lancashire mine and a three-fourths interest in the Mountain Rose mine, with combined area of 74 acres, carrying fluxing ores. Apparently the Lancashire, which has a silver vein, is idle, but the Mountain Rose, owned one-fourth by the Hall Mining & Smelting Co., has 2 tunnels, opening a vein of about 15′ width, which produced 3,999 tons of fluxing ore in 1907.

Power for the mine and works is mainly electric, current being furnished by the South Kootenay Power Co. from Bonnington Falls, circa 25 miles distant. The Phoenix group has electric hoists and a 25-drill Canadian Rand air-compressor, driven by a 450-h. p. Canadian Westinghouse electric motor. The largest crusher is a Jenckes-Farrel-Bacon, with 42x30″ jaw openings, weighing circa 125,000 lbs., with an hourly capacity of 150 tons of ore crushed to 6″ size, being one of the largest ever built.

Ore is transported 4 to 25 miles from the various mines to the smelter, by rail. The matter of building a 5-mile aërial tram to cost circa $100,000 has been given tentative consideration. Rail freights are 17 cents per ton on Deadwood ore, and 30 cents per ton on ore from the Phoenix and Summit camps.

The smelter, 4 miles from Greenwood, of 1,500 tons rated daily capacity, was built by the Standard Pyritic Co., passing later to the Montreal & Boston, and eventually to the Dominion. The old smelter was not well located, and was poorly equipped, but has been overhauled and modernized by the present owners. Extra land has been secured for slag room.

The works include a small sampling mill, equipped with crushers, rolls, belt-conveyors and Vezin and Bridgeman automatic samplers.

The blast furnace building is 120x182′, having in the building sixteen 10x24′ ore bins, with 3 large ore and coke bins outside, with railroad tracks running above. There are two 325-ton water-jacket blast furnaces, 40x176″ at the tuyeres, and one 600-ton 44x255″ furnace, all having automatic feed. The

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dust-flue, 200′ long, has a 30x50′ brick dust-chamber, and leads to a stack 112′ high and 9′ 6″ in diameter, and a self-supporting stack 100′ high and 8′ in diameter. Slag is handled by a 7x12″ locomotive, on railroad track of 40″ gauge.

The power plant at the works includes No. 7 Connersville blowers and a 250-light dynamo. The old machinery plant was burned 1908, but was rebuilt. The works include a machine-shop.

The smelter works three 8-hour shifts when operated, and product is a matte carrying about 45% copper, 13 oz. silver and 3 oz. gold per ton, shipped to the British Columbia smelter at Greenwood, for refining. The smelter also does custom work.

Production for year ending July 31, 1907, was 187,981 tons of ore, yielding 2,910,695 lbs. fine copper, 42,606 oz. silver and 10,321 oz. gold, realizing $820,184.84, with total operating expenses of $740,002.72, giving a net mining profit of $80,942.91. Company claimed, late 1906, to be making circa 750,000 lbs. of copper monthly, at a cost of 8 cents per pound. Company's financial statement showed a profit, on operations for 18 months ending July 31, 1906, of $139,144. Production for year ending July 31, 1907, averaged 15.5 lbs. fine copper, 0.5 oz. silver and $1.10 gold per ton. New management is said to show costs of $1.34 per ton for mining, including freight, and $1.32 for smelting, or total mining and smelting costs of $2.66 per ton. Allowing 34 cents miscellaneous expenses, the cost would be $3 per ton on ore reduced to matte, to which should be added 40 to 50 cents per ton for conversion, refining, smelting and miscellaneous expenses, giving total costs of about $3.50 per ton on ore, exclusive of interest on bonded indebtedness. Deducting therefrom $1.40 per ton for including gold and silver values, cost of copper contained in a ton of ore, amounting to 15.5 lbs., would be $2.10, or 13.5 cents per pound, instead of the alleged cost of 8 cents per pound.

The company begun 1907 with a treasury surplus of circa $400,000, which was expended, mainly on improvements at the mine and smelter, the company suffering also, in common with others, by reason of the slump in the metal market. There was some talk of dividends, early 1907, which was entirely unwarranted. Mine and works were closed down, circa November, 1907, and resumed, circa July 1, 1908.

The company was unable to meet a bond interest payment of $24,000, due June, 1908, but this payment was made by some of the larger shareholders. On October 2, 1908, a receiver was appointed, on application of the mortgage trustee, by reason of the company's default in not setting aside 10% of the amount of its outstanding bond issue, for the sinking fund, as required to be done annually. The company is in such shape that reorganization seems obligatory. The property is dangerously low in grade, but has enormous ore bodies, and, with adequate capital and prudent management, should become a large and profitable producer, in time.

DOMINION FAIRVIEW COPPER CO., LTD. **BRITISH COLUMBIA.**

Office: Terminus Chambers, Holborn Viaduct, London, E. C., Eng. Mine office: Fairview, Boundary district, B. C. Wm. J. Spratling, secretary. Organized Sept. 22, 1901, as Dominion Fairview Klondike Syndicate, Ltd., and name changed to present title March, 1907, with capitalization £130,000, shares £1 par; issued, £42,637. Lands, 4 claims, area 200 acres, circa 4 miles north of the international boundary line, carrying a 6″ vein, opened by shafts of 50′ and 55′ and the beginning of a tunnel, showing a little copper ore of fair assay tenor.

DOMINION MINING & SMELTING CO. **CANADA.**

Works office: Pictou, Pictou Co., N. S. Property is a 70-ton furnace, blown in circa May, 1907, making matte of about 35% copper tenor.

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DOMINION SMELTING CO., LTD. **ONTARIO.**

Works office: Parry Sound, Parry Sound district, Ont. Was said, September, 1907, to plan building a $1,500,000 custom smelter, at Parry Sound. Presumably abortive.

MINA DON CARLOS. **MEXICO.**

Office: care of Avery T. Holmes, owner, Laramie, Wyo. Mine office: Nacozari, Sonora, Mex. Main shaft, 120′, shows ore running up to 43% copper, and from 60 to 7,000 oz. silver per ton. Shipped several carloads of high-grade ore to the El Paso smelter circa 1905. Presumably idle.

DON CARLOS & EUREKA CONSOLIDATED COPPER MINING CO. **MEXICO.**

Letter returned unclaimed from former office, Detroit, Mich. Mine office: Nombre de Dios, Durango, Mex. Property includes the Don Carlos y Anexa, Eureka and other mines, showing a vein about 150′ wide, carrying small stringers and pockets of high-grade auriferous and argentiferous bornite, assaying up to 18% copper, 3 kgs. silver and 7 grams gold per ton. Production, about 75 tons of ore in three years. Idle and apparently moribund.

DON FULANO COPPER MINES, LTD. **SPAIN.**

Office: Dashwood House, London, E. C., Eng. Col. C. E. Macdonald, chairman; C. E. Lawson, mining engineer; A. S. Hammond, secretary. Organized July 7, 1905, under laws of Great Britain, with capitalization £130,000, shares £1 par, fully issued. Property is 60 full paid shares, of 500 pesetas par, in the Compañía Minera Bilbaino Asturiano.

DONA LOUISA CONSOLIDATED COPPER CO. **MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: Coapa, Morelia, Michoacán, Mex. Organized circa 1907, to merge the Dona Louisa Copper & Gold Mining Co. and La Natividad Mining Co., latter a rank swindle that paid dividends from stock sales, and former a dubious proposition that also paid dividends from stock sales.

DONA LOUISA COPPER & GOLD MINING CO. **MEXICO.**

Letter returned unclaimed from former office, 69 Wall St., New York, N. Y. Mine office: Coapa, Morelia, Michoacán, Mex. Wm. A. Buckman, president; Chas. M. Heath, vice-president; Manuel L. Ward, secretary, treasurer and general manager; Joseph J. Collinson, superintendent. Organized April, 1903, under laws of Delaware, with capitalization $500,000, shares $5 par. Paid dividends of $4,200 on treasury stock, presumably from stock sales.

Lands, 45 hectares, 24 miles from the Mexican National railway, showing 4 fissure veins, of 3′ average width, 2 under development, giving assays of 9 to 63% copper, up to 120 oz. silver and $32 gold per ton, from oxidized ores, slightly developed by shafts and tunnels.

Equipment includes a 60-h. p. boiler, Lidgerwood hoist good for 1,000′ depth, and Cameron pump. A 5-ton test shipment, 1906, netted $59.62 per ton. Development and equipment seem along sensible lines, but the company paid 10% dividends while selling stock, hence is viewed with suspicion. Probably succeeded by Dona Louisa Consolidated Copper Co.

DONNA DORA MINING CO. **NEW MEXICO.**

Office: 220 Broadway, New York. Mine office: Kent, Donna Ana Co., N. M. Jos. Willetts, president; Edwin L. Scott, secretary and treasurer; Gerald W. Kent, general manager. Lands, sundry claims on the eastern slope of the Organ Mountains, developed by a 400′ tunnel and a shallow shaft, on a 5′ vein carrying copper, lead, silver and gold values. Equipment includes a 150-ton concentrator, 100-h. p. hoist, 10-drill Rand air-compressor and a small electric light plant. Employs about 20 men.

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DORA COPPER MINES, LTD. **TRANSVAAL.**

Office: 34 Coleman St., London, E. C., Eng. Mine office: Pretoria, Transvaal, South Africa. W. Vaughan-Williams, chairman; J. H. Bailey, secretary. Organized May 10, 1905, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £100,010. Property is mining rights to the northwestern half of the Farm Kamelpoort No. 278, area 4,027 morgen, near Pretoria.

DORAN & GALLAGHER. **ARIZONA.**

Office and mine: Paradise, Cochise Co., Ariz. Is a co-partnership composed of D. J. Doran and Chas. J. Gallagher. Lands, 10 claims, opened by a 110′ shaft, mainly in ore, and a 250′ tunnel, showing melaconite giving assays of 10% and upwards in copper.

DOROTEA MINING CO. **MEXICO.**

Dead. Lands sold, circa 1905, to Fay-Cananea Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

GEWERKSCHAFT DES BLEI- UND KUPFER-ERZBERGWERKE DOROTHEA. **GERMANY.**

Mine office: Jannowitz, Schlesien, Germany. Herman Schönfelder, agent. Has one shaft. Idle several years.

DOS CABEZOS CONSOLIDATED MINES CO. **ARIZONA.**

Mine office: Dos Cabezos, Cochise Co., Ariz. Has auriferous and argentiferous copper ores, with steam power and a small smelter. Idle several years.

DOS DE ABRIL MINING CO. **MEXICO.**

Mine office: El Dorado, Jiménez, Chihuahua, Mex. Heffron & Piper, lessees. Has auriferous and argentiferous lead and copper ores, with 7-stamp mill, employing circa 50 men at last accounts.

DOS ESTRELLAS MINES & DEVELOPMENT CO. **MEXICO.**

Office: care of Mutual Trust Co., Mexico, D. F. Hon. Alberto Pro, president; Hon. José Marie Gamboa, vice-president; Hon. Lic. Liscendro Maldonado, secretary; Geo. W. Emanuel & Co., fiscal agents. Organized under laws of Arizona, with capitalization, $2,500,000, shares $1 par. Lands are the Jennie mine, a gold-silver property, and the Mina Conquestadora, a copper property, area circa 130 acres, in El Oro district, Guerrero, Mexico, said to be held under lease. Company claims to have a mill and cyanide plant, and claims to have $2,500,000 worth of ore blocked out. Company claims that these mines produced $4,000,000 in ore values, in 4 years preceding 1907, and that 1906 production was sufficient to pay a dividend of 50% on the capital. Company claims to be paying 2-cent monthly dividends, guaranteed, and is peddling stock industriously, which leads to the unavoidable conclusion that it is a highly dubious enterprise, notwithstanding the good standing of some of its officers. No honest mining company pays 24% annually and peddles stock. Verbum sapienti.

DOS NACIONES MINING CO. **MEXICO.**

Dead. Lands sold to Cananea-Duluth Mining Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

DOUBLE SUNSET MINING & MILLING CO. **ARIZONA.**

Office: care of A. Stamps, manager, Farrisville, Kas. Mine office: Paradise, Cochise Co., Ariz.

DOUGLAS COPPER CO. **MEXICO.**

Office: 1547-42 Broadway, New York, N. Y. Mine office: Cocorit, Alamos, Sonora, Mex. Theo. Douglas, president; Victor M. Tyler, vice-president; John C. Rowe, second vice-president; C. R. Templeton, secretary and assistant treasurer; Wm. S. Higgins, treasurer; Melbert B. Cary, chairman; Gustave M. Gouyard, consulting engineer; preceding officers, Max Muller, E. C. Frisbie, Robt.

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B. Armstrong, A. Heaton Robertson, Ronald E. Curtis and W. Stockton Higgins, directors; Edwin H. Davidson, superintendent.

Organized July 23, 1903, under laws of Maine, with capitalization $3,000,000, shares $5 par. Bonds, $900,000 authorized, at 6%; $572,800 outstanding, of which $400,000 are convertible into stock, part at par and part at 110. Is said to be controlled, through ownership of 51% of stock, by the Mexican Exploration & Milling Co. Is a securities holding company only, owning the entire capital stock of the Anita Copper Mines Co., Ltd., and Pacific Smelting & Refining Co., Ltd., and controlling, through ownership of majority of stock, the Sonora Consolidated Gold Mines Co., Ltd. Company began 1908, according to statement, with cash and accounts receivable of $58,793, only liabilities being $572,800 on bonds outstanding. Empire Trust Co., New York, registrar. Annual meeting, third Tuesday in January.

Lands, held through subsidiary companies, are 494 acres, a 115-acre millsite and 19,716 acres of ranch, timber and coal lands, in the Baroyeca division of the Alamos district, including the Anita, Baroyeca, Consolidada, London, Juanita and Maria mines. Ore bodies occur in a crush-zone of 115' claimed average width, in series of bedded eruptives consisting of diorite, andesite and trachyte, as contact deposits and replacements in diorite, carrying cuprite, melaconite, malachite, azurite, chalcocite, covellite, bornite, chalcopyrite, brochantite and chrysocolla, from which average assays are said to have returned 8.5% copper, 5.5 oz. silver and $5 gold per ton, which figures probably are considerably above the average extraction that can be secured on regular mining operations upon a commercial basis.

Development is by 5 shafts, No. 1, the deepest, being circa 700', with 7,415' of workings in the Anita mine, Jan. 1, 1907, since increased. Company claims to have sufficient ore blocked out for 5 years production, which is considered doubtful, and ore reserves are estimated, by Messrs. Gouyard and Pritchett, to be of the value of $5,817,681.94, with copper at 14 cents per pound. This sort of estimate is not in favor with the best engineers, who prefer to estimate in tons and percentages, not in dollars, and, especially, not in cents. Such estimates, giving the odd pennies, may attract the credulous, but are considered a danger signal by the experienced.

The mine has steam and electric hoists, with one 250-h. p. Risdon hoist, a Rand cross-compound two-stage air-compressor with piston capacity of 3,700' of free air per minute, and an electric light plant. Mine has 21 buildings, including necessary shops and offices.

Mine being some distance from a railroad, ore is shipped to the smelter by five 110-h. p. traction engines and 24 ore-trucks, one engine hauling 5 trucks carrying three 4-ton ore buckets each.

The smelter is described separately, under title of Pacific Smelting & Refining Co., Ltd., the owner.

Production was begun May 19, 1908, previous statements in the press that the mine was treating 500 tons of ore daily having been absolutely unfounded. The first lot of matte, two carloads, was said to assay 40% copper, 5 oz. silver and 2.5 oz. gold per ton. Costs are said by company to be $3.99 per ton for mining, $2.21 for transportation, and $2.48 per ton for smelting, with indirect costs of $2.88, a total of $9.65 per ton, while miscellaneous charges, including refining, marketing and taxes, bring total costs to $15.73 per ton. On 6% ore this would make a copper cost of 13 cents per lb., from which should be deducted gold and silver values, these being, according to figures of first matte shipped, about 6.6 cents per lb. Company figures on an extraction of $5.65 copper and $9.63 per ton gold and silver, and, deducting the latter, estimates that it can obtain copper at a net cost of 5.64 cents per

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pound, but these figures are not apt to be borne out by actual production on a large scale, and, instead of gold and silver values amounting to 170% of the copper values, as estimated by the company, the actual gold and silver values, in the first lot of matte, were only a trifle more than 50% of the copper values, showing a very marked discrepancy, the shortage in gold and silver values being more than three-fourths. On May 1, 1905, President Douglas stated that the company could make its copper at 2.8 cents per pound, but revised figures, 1908, from the same authority, showed much higher estimated costs. Mr. Douglas calculated that the net profits of the first operating year would be $700,000, or 23.8% of the company's capitalization, and it will be interesting to see how close this estimate comes to the actual facts. The company figured on a production of 9,000,000 lbs. fine copper, from 6% ore, at 10 cents per lb., with gold and silver values nearly paying for the copper, giving copper at a net cost of only 1⅝ cents per pound, which figures must have been prompted by sheer ignorance, or intent to deceive. Company has given out estimates of net earnings as high as $1,500,000 yearly, which is ridiculous. The property is considered promising, though poorly located as to transportation facilities, but such wild and utterly indefensible "estimates" have been made by its officers and promoters, regarding percentage of ore, production, costs and profits, that the company is not regarded favorably.

DOUGLAS COPPER MINING CO. **NEVADA.**

Dead. Succeeded, circa 1906, by Nevada-Douglas Copper Co. Formerly at Yerington, Lyon Co., Nev. Described Vol. VI.

DOUGLAS-ELY MINES CO. **NEVADA.**

Office: 63 Wall St., New York, N. Y. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. John W. Keller, president; Sidney S. Darling, vice-president; Cornelius A. Haggerty, treasurer; J. E. Simons, secretary; preceding officers, Max Oberfelder, Samuel Joseph, Hon. Jas. J. Towners, Max G. Nickelsburg and Sidney Nickelsburg, directors. Organized under laws of Arizona, with capitalization $3,000,000, shares $1 par.

Lands, circa 600 acres, of which about 180 acres show copper indications, and 420 acres carry indications of gold, silver and lead. Lands are on Cave Creek, near the Success mine, in the Duck Creek district, circa 14 miles southeast of Ely. In May, 1908, property had a 60′ tunnel, three 10′ test-pits and a 70′ incline shaft, said to show ore giving good assays, and was said to employ 12 men. Is not regarded favorably.

DOUGLAS, LACEY & CO. **U. S. A.**

Office: 66 Broadway, New York, N. Y. This firm of swindlers has defrauded upwards of 20,000 individuals out of several millions of dollars. Firm formerly had about 40 branch offices, in the United States and Canada, from which utterly worthless mining stocks were peddled. In earlier years considerable bluffing was done, in the way of crude mining operations, but these evidently were merely for the purpose of keeping up appearances. Dividends were paid on shares that had earned no profits, for which Douglas, Lacey & Co. should have been jailed, for the common swindlers that they are, and doubtless would have been jailed, were the laws of the United States better administered.

Efforts, begun November, 1903, to have the methods of this firm investigated by the United States Postal Department, have come to naught, although the matter was pushed persistently, and finally was taken to the president of the United States, and by him referred back to one George Bruce Cortelyou, then Postmaster-General, and later Secretary of the Treasury of the United States, who "investigated" the firm by advising them privately of the charges made against them, and accepted their answer, which was that the

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Copper Handbook is a blackmailing publication, this answer being perfectly satisfactory to the Hon. Mr. Cortelyou, best known as the gentleman who "fried the fat" out of sundry insurance companies and other corporations, for the presidential campaign of 1904.

There is reason to hope that with the new administration, Mr. Cortelyou will be permitted to apply otherwise the talents and energy that he has been devoting, for some years past, to the public affairs of the United States, and it is possible that Messrs. Douglas, Lacey & Co. will be overtaken, eventually, by the punishment that they deserve.

DOUGLAS MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo. Described Vol. VI.

DOUGLAS MINING & SMELTING CO. **NEVADA.**

Dead. Succeeded by Douglas Copper Mining Co., latter bankrupt, 1905. Formerly at Yerington, Lyon Co., Nev. Described Vol. IV.

DOUGLAS MOUNTAIN GOLD MINING & TUNNEL CO. **WASHINGTON.**

Office: 38 West Gay St., Columbus, Ohio. Mine office: Loomis, Okanogan county, Wash. G. E. Bazler, general manager; J. J. Bennett, superintendent. Lands, 20 claims, showing several veins of 7" to 8' width. A 50' tunnel, on the Little Falls claim, shows a 2' vein carrying auriferous chalcopyrite, galena and iron pyrites. Idle.

DOUGLAS SMELTER. **ARIZONA.**

Owned by Copper Queen Consolidated Mining Co.

DOVER MINING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. David Ellis, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power. Presumably idle.

DRAGOON COPPER CO.

Office: 924 Columbus Ave., Boston, Mass. Moribund.

DRAGOON COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 310 Frost Bldg., Los Angeles, Cal. Mine office: Tombstone, Cochise Co., Ariz. C. M. Renaud, president; Maj. W. Arthur Phipps, vice-president; G. H. Mosher, secretary and treasurer; Geo. M. Henry, general manager. Organized May, 1902, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 20 claims, area 400 acres, near the Middlemarch and opposite the Black Diamond, showing 3 contact veins between limestone and porphyry, giving assays of 16% copper, 11% lead and 14 oz. silver per ton, from azurite, malachite, bornite and chalcopyrite. Has 4 short tunnels and a 465' shaft, bottomed in good ore. Has steam power and a 34-h. p. hoist, good for depth of 1,000'. Property considered promising. Practically idle since 1904, owing to lack of funds.

DRAGOON MINING CO. **ARIZONA.**

Dead. Lands sold circa 1907, to Bonanza Belt Copper Co. Formerly at Johnson, Cochise Co., Ariz.

DRAGOON MINING & DEVELOPMENT CO. **MEXICO.**

Mine office: Terrazas, Chihuahua, Mex. P. W. Robertson, manager. Has argentiferous and auriferous copper ore. Employs circa 35 men.

DRAGOON MOUNTAIN MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, 533 Kearney St., San Francisco, Cal. Mine office: Pearce, Cochise Co., Ariz. Lee Wee, president; Chu C. Mow, vice-president; Louis Fon, secretary; Leung Ting Mai, treasurer; S. E. Lake, superintendent, at last accounts. Organized under laws of Arizona, with capitalization $300,000. Lands, sundry claims near Middle Pass, in the Dragoon Mountains, opened by shaft and tunnel, giving a promising showing or ores carrying copper, silver and gold. Company was organized by Chinese

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residents of San Francisco and Tombstone, Arizona. A little ore was shipped in 1905-06. Idle.

DRIPPING SPRINGS MINES & SMELTERS. **ARIZONA.**

Dead. Was succeeded, 1907, by London-Arizona Copper Co. Chas. E. Finney was president and general manager; F. L. Wright, vice-president; E. W. Brooks, treasurer; Robt. K. Porter, secretary and assistant treasurer; preceding officers, Hon. R. E. Sloan and Paul Burk, directors. Was organized, 1907, with capitalization $5,000,000, shares $10 par. Formerly at Kelvin, Pinal Co., Ariz.

DROGSET KOBBERVAERK. **NORWAY.**

Mine office: Röros, Trondhjem, Norway. Ore is slightly cupriferous pyrite. Latest recorded production was 2,718 long tons ore in 1900. Idle for some years.

DRUMMERS DEVELOPMENT CO. **WASHINGTON.**

Office: 15 Jamison Bldg., Spokane, Wash. Letter returned unclaimed from former mine office, Chelan, Chelan Co., Wash. R. D. Johnson, president; Thomas Maloney, secretary. Capitalization $100,000, shares 10 cents par. Property, slightly prospected, shows ore of fair grade. Idle for several years.

DUBUQUE MINING & TUNNEL CO. **COLORADO.**

Office: Colburn Bldg., Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. E. A. Colburn, president; W. W. Kirby, vice-president; J. A. Wright, secretary and treasurer; preceding officers, B. L. Gorich and D. C. Waugh, directors. Organized Dec. 4, 1905, under laws of Colorado, with capitalization $2,000,000, shares $1 par. Lands, 2 claims, known as the Dubuque mine, opened by a 460′ tunnel, said to show a 6′ vein carrying a 3′ paystreak showing copper carbonates and melaconite, with good gold values.

DUCHESS MINING, MILLING & SMELTING CO. **WYOMING.**

Letters returned unclaimed from former office, Cheyenne, Wyo., and former mine office, Holmes, Albany Co., Wyo. Lands, west of the Blanche, are developed by a 100′ shaft, with steam plant. Did a little work in 1906.

DUCKTOWN SULPHUR, COPPER & IRON CO., LTD. **TENNESSEE.**

Office: 1 Gresham House, Old Broad St., London, E. C., Eng. Mine office: Isabella, Polk Co., Tenn. Col. Jas. LeGeyt Daniell, chairman; Jos. Gordon Gordon, managing director; preceding officers, F. Brown, L. G. Mortimer and H. G. Palmer, directors; Henry Godber, secretary; W. H. Freeland, general manager; Chas. W. Kennrick, assistant manager.

Organized Feb. 16, 1891, under laws of Great Britain, with capitalization £75,000, shares £1 par, in £74,800 ordinary and £200 founder's shares; issued, £66,000 ordinary and £200 founder's shares. Profits are divisible on the basis of 7%, plus one-half of the net remaining profits, to ordinary shares, balance of profits going to founder's shares. Debentures, £28,500, first-mortgage bonds, at 7%. Profits, 1905, were £65,741 net, and for 1906 were £104,388 net. Dividends, 1905, were 53⅓% on ordinary shares, and £152 18s. on founder's shares, and 1906 were 82½% on ordinary shares and £249 3s. on founder's shares, giving a dividend record, to Dec. 31, 1906, of 1,069% on ordinary shares and 51,785% on founder's shares.

Lands include the Mary, Callowell and other mines, bought for £68,057. Main shaft is circa 600′ deep, and ores are exclusively sulphide, averaging slightly under 3% in copper tenor, without either gold or silver values. Mine equipment includes steam and electric power.

The smelter has a Herreshoff furnace, with daily capacity of circa 500 tons of crude ore, and a No. 6 Connersville blower, driven by a direct-connected engine. The process of smelting was changed, 1905, and instead of heap-roasting the ore, as formerly, semi-pyritic smelting is employed, producing

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a 20% first-fusion matte and a 50% second-fusion matte. The change in smelting system at first reduced the capacity of the furnace by 48%, but eventually was brought to 16.5% net tonnage loss only, but effected a great saving in fuel charges, resulting in a saving of nearly 3 cents per pound on the cost of finished copper. The semi-pyritic smelting process first introduced by the Ducktown has been adopted by a number of other progressive smelters, and is highly commended by metallurgists. There is a small acid plant in connection with the smelter.

Production of fine copper has been as follows: 5,287,321 lbs. in 1904; 6,547,212 lbs. in 1905; 6,659,726 lbs. in 1906; 6,238,952 lbs. in 1907. The property is managed with great ability, both technically and financially, and ranks second only to the Tennessee among the copper mines of the Appalachian field.

DUGWAY COPPER MINING CO. **UTAH.**

Mine office: Callao, Juab Co., Utah. O. F. Peterson, general manager. Lands, in the Deep Creek district, have a 200′ shaft on a 15′ contact vein between limestone and porphyry, showing sulphide ore assaying up to 7.32% copper, 45% lead, 17 oz. silver and $1.60 gold per ton. Idle.

DUKE MINE. **NORTH CAROLINA.**

Office: care of Brodie L. Duke, owner, Durham, N. C. Mine office: Roxboro, Person Co., N. C. Thos. Morcom, superintendent. Lands, 470 acres, formerly known as the Tingen mine, showing fissure veins carrying copper ores, with gangue of epidote, calcite and quartz. Has 4 shafts, deepest circa 200′. Mine has produced some high grade ore, the last carload shipped averaging circa 17% copper and netting $1,100. Has steam power. Mine probably will be reopened.

DULUTH & ARIZONA COPPER MINING CO. **ARIZONA.**

Office: 219 West Superior St., Duluth, Minn. Letters returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. Chas. W. Ericson, president; Gideon Schelin, secretary. Organized circa 1902, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, south of Prescott, showing ores said to give average assay values of 11% copper and $6 gold per ton. Idle for several years.

DULUTH & CHIRICAHUA DEVELOPMENT CO. **ARIZONA.**

Office: Duluth, Minn. Mine office: Paradise, Cochise Co., Ariz. Martin Pattison, president; Edward F. Sweeney, vice-president and general manager; Geo. H. Crosby, secretary and treasurer; preceding officers, Byron M. Pattison and Thomas Bardon, directors. Lands, 37 claims, including the Sullivan, Copperopolis and Horace Mountain groups. The Sullivan group, 7 claims, circa 4 miles west of the San Simon, has open-cuts, showing leached copper ore and a little very rich ore, and has a 60′ tunnel showing lead ore. The Copperopolis group, 8 claims, near the Sullivan, is slightly developed. Litigation over the Sullivan group was settled in company's favor, 1908. Management considered good and property promising. Idle except for annual assessment work.

DULUTH CONSOLIDATED COPPER CO. **IDAHO.**

Office: care of W. J. Holman, secretary and treasurer, Calumet, Mich. Mine office: Baker, Lemhi Co., Idaho. W. A. Eaton, president; Lucien Merritt, vice-president; Thos. W. Hamilton, general manager; preceding officers, John H. Holman, H. S. Palmer, Geo. W. Logan, John E. Merritt, John Lefevre and Sam P. Dingee, directors. Organized circa 1906, under laws of Arizona, with capitalization $5,000,000, shares $10 par. Lands are near the Calumet & Montana, in the Salmon River valley. Presumably idle.

DULUTH & UTAH DEVELOPMENT CO. **UTAH.**

Office: 26 Mesaba Blk., Duluth, Minn. Operating office: 208 Atlas Bldg., Salt Lake City, Utah. Letter returned unclaimed from former mine office,

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Stockton, Toocle Co., Utah. H. F. Smith, president; Peter Porter, vice-president; Harvey J. Jones, secretary; E. J. Raddatz, treasurer and general manager. Organized under laws of Utah, apparently as successor of No-U-Dont Mining & Milling Co. Lands, 4 fractional claims, area 50 acres, near the Honerine tunnel, adjoining the Honerine mine on the north, which carries copper at considerable depth, and copper is expected in the Duluth & Utah at depth. Mine has circa 3,000′ of workings, deepest 500′, and ships ore carrying, 35 to 60% lead and 20 to 30 oz. silver per ton. Has produced circa $250,000 worth of silver-lead ores above the 500′ level.

DUNCAN MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Mine office: Duncans, Vancouver Island, B. C. Lands, 4 claims, in the Cowichan Lake district, showing ore giving assays up to 4% copper, 50% lead, 5 to 10 oz. silver and $2.50 to $5 gold per ton. Idle since circa 1901.

DUNKIRK GOLD & SILVER MINING CO. **ARIZONA.**

Office and mine: Prescott, Yavapai Co., Ariz. E. N. Mitchell, superintendent. Lands, in the Slate Creek district, show auriferous and argentiferous copper and lead sulphides. Has gasoline power and a small mill.

DUPLEX GOLD & COPPER MINING CO.

Office: 57-209 Washington St., Boston, Mass. Location of lands, if any, unknown.

DUQUESNE MINING & REDUCTION CO. **ARIZONA.**

Office: 820 Pennsylvania Ave., Pittsburg, Pa. Mine office: Duquesne, Santa Cruz Co., Ariz. H. T. Herr, vice-president and general manager; H. S. Stewart, superintendent. Lands, circa 800 acres, near the Pride of the West and several miles south of the Mowry mines, in the Patagonia Mountains, showing a contact vein between limestone and granite porphyry, carrying chalcopyrite, associated with sphalerite, galena and pyrite, opened by a shaft of circa 1,000′ depth. Plans building an electric railway from mine to the smelter at Calabasas, which has reverberatory furnaces, and begun production, 1907, on a small scale, employing circa 100 men. Property considered promising and management good. Idle at last accounts.

COMPAÑIA MINERA DE COBRE DE DURANGO. **MEXICO.**

Dead. Formerly at Otaez, Santiago Papasquiaro, Durango, Mex.

DURANGO COPPER SYNDICATE, LTD. **MEXICO.**

Dead. Lands sold, 1900, to Avino Mines of Mexico. Ltd. Formerly at Avino, San Juan del Rio, Durango. Mex.

FUNDICIÓN EL DURAZNO. **CHILE.**

Office and works· Combarbalá, Coquimbo, Chile. Francisco Greve G., owner. Property is a smelter with one reverberatory furnace, which, in 1903, employed 16 men at average wages of 1 peso daily, treated 810 metric tons of 15% ore from mines in Los Vilos district, producing therefrom 119 metric tons of bars averaging 97% copper, the slags averaging about 1% copper tenor.

DUTCH MILLER MINING & SMELTING CO. **WASHINGTON.**

Letter returned unclaimed from former office, 202 Denny Way, Seattle, Wash. Mine office: Skykomish, King Co., Wash. H. P. Fogh, general manager. Capitalization $2,000,000. Property was leased, for 3 years, with privilege of one-year extension, to Seattle-Boston Copper Co. Creditors of the Dutch Miller asked, 1907, for a receiver, alleging mismanagement on the part of the lessee.

Lands, 2 claims, in the Burns district, 12 miles south of Skykomish, carrying a vein of about 15′ average width, exposed for circa 400′, and opened by tunnels, shaft and trenches showing auriferous chalcopyrite. Property considered promising.

DUTTON MINE. **MONTANA.**

Owned by East Butte Mining Co.

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DWIGHT FURNESS CO. **MEXICO.**

Office: Guanajuato, Gto., Mex. Mine office: Etzatlán, Ahualulco, Jalisco, Mex. Dwight Furness, president; W. M. Cummings, manager. Property includes various groups of mines, in the Etzatlán, Ameca and Ahualulco districts. The Mina Grande group, 31 hectares, 21 miles west of Hostotipaquillo, shows veins of 6′ to 50′ width, carrying native silver and gold and silver sulphide ore, fairly developed by shafts and tunnels, with considerable ore exposed. The Casadas group, 21 hectares, 25 miles west of Hostotipaquillo, shows veins of 3′ to 10′ width, carrying native gold and silver and silver sulphides. The Magistral y Anexas group, 24 hectares, 12 miles southwest of Ameca, shows a wide vein, carrying paystreaks and chutes with workable values, of oxidized and sulphide copper ores, both carrying gold and silver, extensively developed by shafts and tunnels. Ores of the oxidized zone are largely worked out, from extensive operations in the past, mainly for the production of bluestone and sulphuric acid. The Calabaza group, 24 hectares, 4 miles south of Etzatlán, shows 4 fissure veins, of 4′ to 12′ width, carrying mainly auriferous and argentiferous sphalerite and galena, with 650′ of workings, estimated to show 20,000 tons of ore.

EAGLE BIRD MINING & MILLING CO. **UTAH.**

Office: care of Geo. A. Whittaker, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Geo. Yeadon, general manager; J. E. Meyer, secretary; E. G. Mahon, treasurer. Organized 1907, under laws of Utah, with capitalization, $400,000. Lands, 14 claims, area circa 280 acres, near the Highland Boy mine, having a 260′ tunnel and a 42′ shaft, showing a 14′ vein of ore assaying up to 37% lead.

EAGLE & BLUE BELL MINING CO. **UTAH.**

Office: 60 State St., Boston, Mass. Operating office: 700 McCornick Bldg., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. E. L. White, president; Willard F. Snider, vice-president; H. H. Green secretary; Walter S. McCornick, treasurer; preceding officers and Jos. A. Coram, directors; Wm. Clarke, superintendent. Capitalization $250,000, shares $1 par. Was controlled, through ownership of circa $190,000 stock, by Bingham Consolidated Mining & Smelting Co., which failed, and was under bond, March, 1908, to Bingham Mines Co., successor of the Bingham Consolidated.

Lands, 6 claims, between the Centennial-Eureka and Grand Central mines, on the Mammoth limestone, show considerable bodies of silicious copper ore and lead sulphides, former carrying only small copper percentages, but circa $10 per ton in combined gold and silver values. Development is by tunnel and a 1,100′ blind shaft, planned to be sunk to 1,400′, showing an ore body up to 66′ in width on the bottom level, said to carry values of $10 to $20 per ton in copper, silver and gold. The mine has considerable reserves, and normal ore output is about 75 tons daily. Production, 1907, was 227 carloads of ore. Mine was closed, late 1907, and reopened circa July, 1908. The property has a good machinery plant, including a powerful hoist.

EAGLE CONSOLIDATED GOLD MINING & MILLING CO. **WASHINGTON.**

Dead. Lands sold, 1908, for $13,000, to Blue Star Mining Co. Formerly at Chewelah, Stevens Co., Wash.

EAGLE CONSOLIDATED MINES CO. **ARIZONA.**

Office: care of T. J. Morrison, secretary, Prescott, Ariz. Letter returned unclaimed from former mine office, Wendendale, Yuma Co., Ariz. A. J. Harndon, president; Dr. R. N. Looney, vice-president; C. A. Peter, Jr., treasurer; T. J. Morrison, secretary; preceding officers, A. J. Dolan, Michael McHale and James Macklin, directors. Organized circa September, 1907. Lands, 5 claims, 6 miles north of Wendendale, having a 112′ shaft showing a 10′ vein giving fair assay values in copper and gold.

EAGLE COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

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EAGLE COPPER-GOLD MINING CO. **ARIZONA.**

Office: 2072 East Fortieth St. S. E., Cleveland, Ohio. Letter returned unclaimed from former mine office, Wickenburg, Maricopa Co., Ariz. Wm. F. Kuder, president; E. L. Motts, vice-president; A. L. Motts, secretary; J. L. Zesiger, treasurer; preceding officers, Alex. M. Fulford and Henry Ebner, directors; Nicholas McCarver, superintendent. Organized Sept. 8, 1902, under laws of South Dakota, with capitalization $1,000,000, shares $1 par.

Lands, 7 claims, 1 fractional, area 130 acres, known as the Profusion group, in the Blue Tank and Black Rock districts, in the foothills of the Bradshaw Mountains, 12 miles east of Wickenburg, with connection by 10 miles of good and 2 miles of bad wagon roads. Lands are reported to show 5 ore bodies, of which 2 are partially developed, one of 12′ average reported width, traceable 3,000′, carrying native copper, cuprite, malachite and chalcopyrite, giving average assays of 4% copper, 2 oz. silver and $3.10 gold per ton. Development is by tunnels of 35′ and 193′, and by shafts of 50′, 60′, 100′ and 150′. Has a 16-h. p. hoist and 4-drill air-compressor, with 7 mine buildings. Company plans deepening shaft to 300′ and building a 50-ton concentrator.

EAGLE COPPER & GOLD MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Organized 1902, under laws of Idaho, by J. H. Nordquist, et al., with capitalization $1,000,000, shares $1 par. Lands, sundry claims near the Leslie, opened by a 150′ tunnel, showing copper ore, associated with hematite. Idle.

EAGLE COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Lands, 3 claims, lying south of the Wonderful group, on Stevens Peak, slightly developed by shaft and tunnel, showing auriferous and argentiferous lead and copper ores. Idle.

EAGLE METALLIC COPPER CO. **PENNSYLVANIA.**

Office and mine: Belvidere, Warren Co., N. J. Henry D. Deshler, president; Samuel J. Koehler, treasurer; preceding officers, Frank C. H. Schweyer, Thos. Zellner, J. N. Boone, Owen H. Nagle and Thos. S. Downing, directors; Miss Millie Deshler, secretary. Organized 1903, under laws of New Jersey, with capitalization $500,000, shares $1 par.

Lands, 500 acres in Adams county, Pennsylvania, including an old copper mine, never worked successfully, on the western Maryland railroad. Property shows a mineralized zone of 400′ average width, carrying native copper, chalcocite, bornite, chalcopyrite and tetrahedrite, averaging about 2 oz. silver per ton, with traces of gold. Development is by a 300′ shaft at 40° incline, in ore from surface, giving assays up to 6% copper, and it is planned deepening the shaft 200′.

Equipment includes a steam plant and a 2⅝″ core-drill. Has a 24x30′ office and laboratory, and plans a 200-ton mill. Has circa 5,000 tons of ore on the dump, ready for treatment.

EAGLE MINING CO. **ALASKA.**

Letter returned unclaimed from mine office, Ketchikan, Alaska. E. M. Aldrich, consulting engineer. Lands, in the Martin's Arm district, on the coast, circa 40 miles from Ketchikan and 3 miles from tidewater, have a 5′ to 6′ vein traceable for 1,100′, said to give average assays of 19% copper. Plans a tram-line and bunkers, for ore shipment.

EAGLE MINING CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. Idle.

EAGLE MINING CO. **MONTANA.**

Office and mine: care of Hon. Patrick Mullins, director, Butte, Silver Bow Co., Mont. Organized March 10, 1906, under laws of Montana, with capitalization $150,000, shares $1 par, and is supposed to have increased capitalization,

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Apr. 29, 1907, to $250,000, shares 50 cents par. Lands, north of La France, have a 250′ shaft, showing a 5′ vein. Formerly was a silver mine, shipping ore running up to 1.7% copper and 186 oz. silver per ton.

EAGLE MINING & SMELTING CO. **MONTANA.**

Dead. Title changed, 1907, to Copper Eagle Mining & Smelting Co. Formerly at Butte, Silver Bow Co., Mont.

EAGLE MOUNTAIN COPPER MINING CO. **OREGON.**

Office: 912-131 LaSalle St., Chicago, Ills. Mine office: Harrisburg, Linn Co., Ore. Wm. Henry Harris, president; W. K. West, vice-president; D. J. McAllister, secretary and treasurer; preceding officers, Peter Basche, Geo. H. Foster and Hon. W. G. Drowley, directors; Geo. E. Alexander, superintendent; D. W. C. Nelson, consulting engineer. Organized under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, 8 claims, including the Cox and Van groups, near the Indiana mine, in the Goose Creek camp, 28 miles east of Baker City, showing a prominent gossan on a contact vein between porphyry and limestone. Company claims primary sulphide ores at depth of 10′ to 20′. Has a 10′ pit and several tunnels, of 30′ to 237′ length, latter said to be in a 14′ ore body showing sulphide ore assaying 3 to 20% copper, with short tunnel showing a 4′ vein carrying chalcocite and bornite assaying 10 to 40% copper. Nelson estimates long tunnel to show a 14′ vein averaging 3 to 4% copper, which has given ore assaying 3 to 20% in tenor. Company claims to have $1,750,000 worth of ore in sight, by actual measurement, and claims that it might claim $324,000,000 worth of ore in sight, this being one of the most monumental prevarications in the history of mining literature, so richly dowered with wild flights of the imagination. Has several substantial mine buildings, with 80-h. p. boiler and small Leyner air-compressor. Has a good water power on Rice creek, which it is planned to harness for a 350-ton mill. Property is reached by a good wagon road, and company hopes to obtain a railroad. Employed circa 20 men at last accounts. Property considered promising, but company's promises of dividends certainly were not warranted by the present showing and status of developments, and the so-called stock guarantee merely is that anyone who visits the property and finds same misrepresented may have his money back with interest.

EAGLE RIVER COPPER CO. **MICHIGAN.**

Dead. Lands sold, circa 1905, to a subsidiary company of the Calumet & Hecla. Formerly at Eagle River, Keweenaw Co., Mich.

EANKOPS COPPER MINING & SMELTING CO.

Office: Spokane, Wash. Organized 1906, under laws of Washington, with capitalization $1,500,000, by A. M. Baldwin, H. M. Allen, John H. Shaw and W. S. McCrea. Location of lands, if any, unknown.

EAST BUFFALO MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Has a tunnel and shallow shaft, showing ore assaying 5% copper, 15% lead and 8 to 10 oz. silver per ton.

EAST BUTTE COPPER MINING CO. **MONTANA.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. Robt. H. Gross, president and general manager; Frank M. Sullivan, secretary; preceding officers, Frank P. Son, Wm. H. Everts and Chas. R. Leonard, directors. Organized Oct. 14, 1905, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Is said to have begun business with $150,000 cash.

Lands, 134 acres, freehold, including the Dutton mine and 9 other fractional claims, with total area of 19 acres, in the southeastern part of the Butte camp, near the Pennsylvania mine. The various properties are said to carry nearly 20 veins, of more or less value, and have 11 shafts, of 50′ to 1,000′ depth.

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The principal shafts are No. 1, at the extreme north, and No. 11, at the extreme south of the Dutton group, connecetd by tunnel. Shafts are 16x4' 6" in the clear, being the largest in Butte. No. 1 shaft, 1,000' deep, is planned to be sunk to 2,000', and No. 11 is 500' in depth. Good ore has been opened on the 200', 400', 600' and 800' levels, and the mine was claimed, September, 1907, to have blocked out, on the 400' level and above, 597,404 tons of ore, the 400' level having a 6' vein of 5% ore, with estimates of 1,000,000 tons of ore of 3 to 4% copper tenor blocked out in the entire property. The Dutton mine carries the extension of the Glengarry vein, about 20' in width, but of low grade. The Oneida mine, having shaft No. 11, has yielded considerable rich ore, up to 16% in tenor. The Lassen mine has produced a little ore carrying up to 16% copper and 10 oz. silver per ton. The Yankee Boy mine is said to show a 9' vein of ore averaging 14% copper, which is an exaggeration.

Equipment includes a 150-h. p. Lidgerwood hoist, good for 1,500' depth. The mine has an office building and several other structures.

The precipitation plant, one of the largest in Butte, doubled in size, 1908, leaches water from the East Butte mines, and also secures the leachings from the old Parrot waste-dumps. This plant apparently was sublet, for reasons of dubious validity, and difficult of comprehension, to other interests that paid a royalty of 25% on gross values extracted, which royalty is inadequate.

The property has 2 small old concentrators, operated by leasers, including the 100-ton Yankee Boy mill, and the management was said to plan a 500-ton concentrator, to cost about $135,000.

The South Butte Mining Co. has been sued for damages caused by the blowing up of the mine, and removal of ore. There also is litigation with the Red Metal Company, started by the latter, intended merely to restrain the pernicious activity of East Butte leasers in going beyond the boundary lines.

Production, 1907, is estimated at 1,250,000 lbs. fine copper, secured exclusively by lessees, about one-half of the output being smelting ore and balance of concentrating grade, operations of lessees being entirely above the 400' level. From Jan. 1, 1906, to Sept. 1, 1907, the royalties of the company, being one-fourth of the gross values extracted, amounted to $149,728.84. Property is considered good, and management, changed 1908, also is good.

EAST BUTTE EXTENSION COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Chas. J. Schatzlein, president; A. C. McCallum, vice-president; Frank H. Cooney, secretary and general manager; J. K. Heslet, treasurer; preceding officers, John H. McQueeney, Jas. Maher and Dr. P. A. Green, directors; A. F. Monroe, engineer; Chas. Wyburg, superintendent. Organized Apr. 10, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $560,000. Paid, Oct. 1, 1906, a 1% dividend, amounting to $2,486.

Lands, sundry fractional claims, freehold, area circa 30 acres, lying west of the East Butte and between the Dutton, Belmont and Pennsylvania mines.

The Westlake and Wall mines are said to have produced, under former ownership, circa $300,000 worth of ore. No. 1 shaft on the Great Northern claim, 120' deep, has 2 compartments. No. 2 shaft, circa 200' deep, shows ore giving assays up to 13% copper and 1 oz. silver per ton. No. 3 shaft, formerly known as the Westlake, is 1,040' deep. A little ore was produced, 1906, shipments reaching 40 tons daily, and there is a small precipitation plant at No. 3 shaft.

EAST COBAR MINING CO., N. L. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. H. R. Treatt, manager. Organized 1907, under laws of New South Wales, with capitalization £1,200, shares 10s. par.

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EAST COLUSA MINE. **MONTANA.**

Owned by Boston & Montana Consolidated Copper & Silver Mining Co.

EAST CUMBERLAND ELY CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized Nov. 1, 1906, under laws of Maine, with capitalization $500,000, shares $1 par. Lands, 2 claims, south of the Chainman mine, known as the Rabbit mine, which formerly shipped some ore carrying up to 25% lead, 12 oz. silver and $12 gold per ton. Has a 600′ tunnel with a 100′ winze.

EASTERN NATIONAL COPPER CO., LTD. **NOVA SCOTIA.**

Dead. Succeeded, 1904, by Cheticamp Copper Co., Ltd. Formerly at Cheticamp, Inverness Co., N. S.

EASTER SUNDAY MINING CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Has gold and copper ores. Idle since circa 1905.

EAST GREENWATER COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Geo. Badget, superintendent. Lands, circa 6 miles east of Greenwater, adjoining the Greenwater Vindicator, have a 100′ shaft. Idle.

EAST GREY ROCK MINE. **MONTANA.**

Owned by Butte & Boston Consolidated Mining Co.

EAST GWANDA MINES, LTD. **RHODESIA.**

Office: 32 Old Jewry, London, E. C., Eng. Mine office: P. O. Box 414, Bulawayo, Rhodesia. T. B. Reynolds, chairman; Maj. Maurice Heany, managing director; A. H. Lawrence, consulting engineer; F. Mackenzie Greene, mine manager; Tom Prest, secretary; Geo. Young, local secretary. Organized Jan. 18, 1905, under laws of Great Britain, with capitalization £600,000, shares £1 par; issued, £460,607. Has a bond issue of £125,000 debentures, at 6%, convertible into stock at par, on 3 months' notice. Lands, 284 claims and a 10-acre millsite, in the Gwanda district of Matabeleland, south of Bulawayo, including the West Nicholson, Jessie and Valley mines. Latter has a fissure vein in granite, carrying auriferous chalcopyrite and pyrrhotite, with reserves estimated at 25,000 tons, assaying circa 1.5% copper and 12 dwts. gold per ton. Has a 110-stamp mill, cyanide plant and concentrator. Has a smelter, the first in Rhodesia, blown in 1906, having a 24″ water-jacket blast-furnace and a reverberatory furnace. To end of May, 1907, smelter had shipped 560 tons of matte, of presumably about 45% copper tenor. Production, 1906, from 61,875 tons of ore milled, was gold and silver values of £77,480, and 2,255 long tons of concentrates, yielding £31,017, and 323 long tons of copper matte, of £14,406 estimated value, carrying circa 725,000 lbs. fine copper. Forces are 60 white men and 400 natives. Company made some serious mistakes at first, but these have been rectified, and present development and future prospects are much improved.

EAST HECLA MINING CO. **IDAHO.**

Office and mine: Wallace, Shoshone Co., Idaho. C. F. O. Merriam, president; A. H. Featherstone, vice-president; P. L. Everhardt, secretary; preceding officers, Jas. F. McCarthy, W. H. North and Dr. Geo. Gray, directors. Lands, 25 claims, between the National and Hecla mines. Is driving a 2,500′ crosscut tunnel from Deadman Gulch, in connection with the Copper King, to develop the vein circa 1,000′ below present workings. Property considered promising.

EAST PACIFIC MINING CO. **MONTANA.**

Mine office: Winston, Broadwater Co., Mont. Robt. A. Bell, president and general manager; C. N. Kessler, vice-president; A. L. Smith, treasurer; W. H. Dickinson, cashier; preceding officers and C. C. Newman, directors. Capitalization $1,000,000, shares $1 par. Lands, 14 claims, area 220 acres. Mine has

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about 4 miles of workings, carrying mainly silver-lead ores, with some auriferous copper ore. Has a 60-ton mill, and, to end of 1906, had produced ore worth $1,366,527.

EAST-SIDE GOLD MINING CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. VII.

EAST SNOWSTORM-COEUR D'ALENE MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Capitalization $1,500,000, shares $1 par. Apparently was promoted, circa 1906, by the late Rev. Col. W. P. Fife, whose promotions proved more profitable to Rev. Col. Fife than to the purchasers of shares.

EAST SNOWSTORM MINING CO. **IDAHO.**

Office: 300 Columbia Bldg., Spokane, Wash. Mine office: Mullan, Shoshone Co., Idaho. A. Herman, president; J. F. Pasold, vice-president; R. H. Dunn, treasurer; John M. Scrafford, manager. Organized 1906, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, 4 claims, area 75 acres, in the Hunter district, east of the Snowstorm, and supposed to carry circa 3,000′ of the Snowstorm vein. Mine has 2 tunnels, longest circa 900′, planned to cut the Snowstorm vein by a 600′ crosscut; also a shallow shaft on a 6′ vein carrying an 8″ paystreak of chalcocite, bornite, chalcopyrite and tetrahedrite, all auriferous. Ores, as developed, carry mainly gold values.

EAST YERINGTON COPPER CO. **NEVADA.**

Office: care of Matthew Domm, treasurer, Salt Lake City, Utah. Mine office: Yerington, Lyar Co., Nev. Lands, adjoining the Contact group, were slightly prospected, 1907, showing a little high-grade copper ore.

J. M. ECHEVARRIA. **CHILE.**

Office and mine: Illapel, Coquimbo, Chile. Property is the Quilomenco mine, opened 1892, which formerly made about 100 long tons fine copper yearly. Presumably idle.

ECHO COPPER MINING & MILLING CO. **WYOMING.**

Office: 413-95 Dearborn St., Chicago, Ills. Mine office: Rudefeha, Carbon Co., Wyo. Dr. Geo. Illingsworth, president; W. D. Meeker, vice-president; W. R. Stiles, secretary; W. T. Peryam, managing director. Organized Dec. 21, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, area 80 acres, adjoining the Ferris-Haggarty mine on the northeast, opened by a 114′ shaft, showing copper stains. Did a little work in 1906. Idle.

ECHO MINING CO. **IDAHO.**

Dead. Formerly at Sandpoint, Kootenai Co., Idaho. Described Vol. VII.

ECLIPSE-ARGO MINING CO. **MONTANA.**

Office: New Britain, Conn. Operating office: Helena, Mont. Mine office: Argo, Broadwater Co., Mont. W. F. Quade, president; Frank L. Sizer, vice-president and general manager; E. J. Hoffman, secretary and treasurer; preceding officers, John Boyle, F. R. Bill, I. F. Pulcifer and E. G. Warner, directors; E. J. Clemo, superintendent.

Organized March 6, 1904, under laws of Montana, with capitalization $300,000, increased, circa November, 1906, to $400,000, shares $1 par, as a merger of the Eclipse Gold & Copper Mining Co. and Argo Gold & Copper Mining Co. Receipts for fiscal year ending June 1, 1908, were $119,093.30, including $88,041.85 from ore sales, and cash on hand was $1,371.59, with $5,943.89 in accounts receivable; accounts and bills payable aggregating $17,107.57.

Lands, 5 claims, 2 patented, area 100 acres, and a 10-acre millsite, north of Helena. Property shows a 10′ fissure vein, in slate, traced circa one-half mile, carrying bornite and chalcopyrite assaying circa 7% copper, opened by tunnels of about 700′ and 1,300′, with about 3,000′ of workings.

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Equipment includes a 40-h. p. steam plant with a 15-h. p. hoist and 3-drill air-compressor. There are 12 buildings, including a 20x25′ wooden carpenter-shop and a 14x18′ smithy.

The 50-ton mill, 60x140′, of logs and lumber, has a Blake crusher, 2 sets of rolls, 3 Hartz jigs, 2 Wilfley tables and a slime table.

Management was changed, June, 1906, and circa 50 men were employed until November, 1907, when work was suspended. Production, 1903, was 204,570 lbs. fine copper, and in the fiscal year ending June 1, 1907, was 1,124,000 lbs. fine copper.

ECLIPSE (BARBERTON) COPPER, LTD. **TRANSVAAL.**

Office: Johannesburg, Transvaal. Mine office: Barberton, Middelburg district, Transvaal. Percy B. Byass, manager. Organized under laws of Transvaal, with capitalization £600,000, shares £1 par. Lands, 72 base metal claims, in the DeKaap Valley, near Barberton, opened by 3 shallow shafts, Nos. 1 and 2 showing good ore. Shipped, early 1908, a little ore of about 20% copper tenor. Property considered promising.

ECLIPSE GOLD & COPPER MINING CO. **MONTANA.**

Dead. Was merged, 1904, in Eclipse-Argo Mining Co. Formerly at Argo, Broadwater Co., Mont.

EDDY GOLD, SILVER & COPPER MINING CO. **ARIZONA.**

Office: P. O. Box 596, Phoenix, Ariz. Mine office: Glendale, Maricopa Co., Ariz. F. L. Eddy, president and general manager; J. R. Aich, vice-president; S. P. Donnell, secretary and treasurer. Organized Aug. 22, 1902, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, area 200 acres, also a 5-acre millsite, in the Frog Tank Mountains, Old Baldy district. A 3′ fissure vein in porphyry, opened by six 10′ pits, a shaft of 65′ and tunnels of 55′ and 105′, carries oxide and carbonate ores, assaying 4 to 6% copper, 12 to 60% lead, 10 to 62 oz. silver and $5 to $32 gold per ton. Idle several years.

EDDY MINING CO. **MONTANA.**

Office: Missoula, Mont. Mine office: Saltese, Missoula Co., Mont. A. M. Stevens, secretary. Lands, on Clark's Fork, near Copper Mountain, show a vein up to 34′ in width, proven for about 6,000′ length by numerous pits and crosscuts, with a tunnel of 355′.

EDISON MINING CO. **BRITISH COLUMBIA.**

Mine office: Yreka, Vancouver Island, B. C. Property is the Superior group, adjoining the Yreka, said to show good ore. Idle for several years.

EDMUNDIAN (MANICALAND) COPPER CO., LTD. **PORTUGUESE EAST AFRICA.**

Dead. Voluntarily liquidated, July, 1902. Formerly at Umtali, Manicaland, Portuguese East Africa.

EDMUNDIAN COPPER MINING CO. **PORTUGUESE EAST AFRICA.**

Office: 8 Old Jewry, London, E. C., Eng. Mine office: Umtali, Mozambique, Portuguese East Africa. H. D. Boyle, chairman; preceding officer, J. Secar and E. R. Tymms, directors; N. S. Sidgreaves, secretary; Consolidated Goldfields of South Africa, Ltd., consulting engineers. Organized Aug. 7, 1907, under laws of Great Britain, with capitalization £135,000, shares £1 par; issued, £85,000. Was promoted by the Consolidated African Copper Trust, Ltd., which controls through stock ownership, and which advanced working capital, repayable Aug. 15, 1910, in cash or shares.

Lands, 202½ copper claims, including the Edmundian mine, which, circa 1906, shipped 2,377 long tons of 20% copper ore to England for test smelting. Mine is opened to the 7th level, with estimated ore reserves of 22,799 long tons of 5% copper tenor. A small smelter, with a reverberatory furnace, was built,

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circa 1906, and company planned beginning smelting October, 1908. Property considered promising.

EIGHTY-FIVE MINING & MILLING CO. **NEW MEXICO.**

Office: care of Jas. Barclay, Moline, Ills. Mine office: Lordsburg, Grant Co., N. M. Organized late in 1907, with capitalization $1,000,000, apparently succeeding the Eighty-Five Mining Co. Lands, in the Virginia district, show ore carrying good values in gold, silver and copper.

EINASLEIGH AMALGAMATED COPPER MINES, LTD. **AUSTRALIA.**

Office: Adelaide, South Australia. Mine office: Einasleigh, Queensland, Australia. Organized circa May, 1908, with capitalization £52,500, shares £1 par, as a merger of the Einasleigh Proprietary, Ltd., and an exploring syndicate that held Block 55, adjoining.

EINASLEIGH EXPLORATION SYNDICATE, LTD. **AUSTRALIA.**

Offices: 20 Copthall Ave., London, E. C., Eng. Mine office: Einasleigh, Gilbert Co., Queensland, Australia. W. H. Woodhead, managing director; Thos. Mullett, secretary. Organized Aug. 16, 1899, with capitalization £4,000, shares £50 par; issued, £3,850. Lands, 100 acres, on the Einasleigh river, Gilbert county, Queensland, Australia. Idle practically since birth.

EINASLEIGH FREEHOLD COPPER MINES, LTD. **AUSTRALIA.**

Dead. Reorganized, Jan. 17, 1907, as New Einasleigh Copper Mines, Ltd. Formerly at Einasleigh, Gilbert Co., Queensland, Australia. Fully described Vol. VI.

EINASLEIGH PROPRIETARY, LTD. **AUSTRALIA.**

Office: Rockhampton, Queensland, Australia. Mine office: Einasleigh, Queensland, Australia. R. S. Sarcher, chairman. At last accounts, May, 1908, planned amalgamating with an Adelaide syndicate owning lease No. 55, under title of Einasleigh Amalgamated Copper Mines, Ltd.

EINASLEIGH SOUTH BLOCKS. **AUSTRALIA.**

Mine office: Einasleigh, Gilbert Co., Queensland, Australia. Lands, sundry claims lying south of the Einasleigh Freehold. Idle some years.

EISFELDER KUPFERGEWERKSCHAFT. **GERMANY.**

Mine office: Glücksbrunn, Saxe-Meiningen, Germany. Capitalization, 600,000 marks. W. A. Mertens, smelter superintendent, at last accounts. Development is by 2 shafts. Presumably idle.

EL CAPITAN COPPER CO. **ARIZONA.**

Dead. Was a swindle, perpetrated by the notorious firm of Douglas, Lacey & Co. This firm reported, Jan. 30, 1904, that the property had been absorbed, and that its stock was to be exchanged, but, for purposes best known to the firm, the company apparently has been kept alive, and the office address in New York continued in the city directory. Formerly at Kirkland, Yavapai Co., Ariz.

EL CAPITAN MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Kirkland, Yavapai Co., Ariz. Lands, 5 claims, 5 miles from Kirkland, having a 60′ two-compartment shaft showing a quartz vein, of 18″ to 3′ width, carrying auriferous and argentiferous copper ore.

EL CARMEN COPPER CO. **MEXICO.**

Office: 52 Front St., New York, N. Y. Mine office: San Juan de Heredia, El Oro, Durango, Mex. Thos. P. Ball, president; Stephen A. Levy, secretary and treasurer; I. Wayne Von Leer, general manager. Organized August, 1899, under laws of New York, with capitalization $750,000, shares $100 par. Lands, 400 acres, 45 miles from a railroad, also 31,000 acres miscellaneous lands. Development has shown a considerable body of auriferous and argentiferous cop-

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per ore, of concentrating grade. Has a large pumping plant, with a 3½-mile pipe-line, and a 40-stamp mill. Idle.

EL CARMEN MINING CO. **MEXICO.**

Mine office: San Javier, Hermosillo, Sonora, Mexico. Organized 1905, under laws of Arizona. Presumably idle.

EL COBRE MINES. **CUBA.**

Dead. Succeeded Jan. 5, 1907, by Cuba Copper Co. Formerly at El Cobre, Santiago de Cuba. Very fully described Vol. VI.

EL COBRE MINING CO. **MEXICO.**

Office: 248 Equitable Bldg., Denver, Colo. Mine office: Hermosillo, Sonora, Mex. A. S. Mackenzie, vice-president and general manager; Guy C. Clemens, secretary. Organized under laws of District of Columbia, with capitalization $5,000,000, shares $1 par.

Lands, circa 1,000 acres, including La Gran Duquesa and Transvaal mines, and a smelter site, in the Ures district, about 60 miles east of Hermosillo, to which point there is a good wagon road. Ores are claimed to give average smelter returns of 20.1% copper, 1.75 oz. silver and $4 gold per ton. The company's fiscal agent, F. A. Wright, of Chicago, advertised, October, 1904, that it was estimated by experts that on less than 50 acres of this ground the first 10 feet in depth would give more than 500,000 tons of gold-copper ore that, when smelted, would yield a net profit of over $10,000,000. Such abominable lies necessarily place both management and property under suspicion. Idle and apparently moribund.

EL DIAZ GOLD & COPPER CO. **MEXICO.**

Dead. Formerly at San Martín Hidalgo, Ameca, Jalisco, Mex. Described Vol. V.

EL DORADO COPPER CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. J. M. Bice, Chas. E. Beck, Forest L. Zimmerman, Jas. Rocks and H. C. Hanawalt, directors. Organized Jan. 29, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

EL DORADO COPPER MINING CO. **CALIFORNIA.**

Dead. Succeeded, circa 1906, by Woodside-Eureka Mining Co. Formerly at Georgetown, El Dorado Co., Cal.

ELDORADO GOLD MINING & MILLING CO. **UTAH.**

Office: 549 25th St., Ogden, Utah. Mine office: Hot Springs, Box Elder Co., Utah. Don Maguire, manager. Ores carry silver, lead and copper. Idle.

ELDORADO MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Kellogg, Shoshone Co., Idaho. Organized circa July, 1907. Lands, 4 claims, about 1 mile east of Kellogg.

ELDORA ENTERPRISE GOLD MINING CO. **COLORADO.**

Mine office: Eldora, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power and a 10-ton smelter. Presumably idle.

ELECTRA MINING & MILLING CO. **ARIZONA.**

Office: care of Alfred Day, fiscal agent, P. O. Box 513, Steubenville, Ohio. Lands, somewhere in Arizona, are claimed to show ore giving average assays of $27 per ton. Out of money, idle and apparently moribund.

ELECTRIC IRON & STEEL CO. **CALIFORNIA.**

Dead. A fraud, perpetrated by W. C. Brunson and J. W. Turner, who falsely claimed to own 7,000 acres of rich mining land in Shasta county, California.

ELECTRIC MINING & MILLING CO. **NEW MEXICO.**

Mine office: Orogrande, Otero Co., N. M. In 1907 planned building a concentrator.

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ELECTRIC SMELTING & REFINING CO. **ONTARIO.**

Works office: Sturgeon Falls, Nipissing, Ont. Was said, early 1908, to have completed a custom smelter.

SOCIEDAD ELECTROLITICA MANUFACTURERA DE COBRE. **CHILE.**

Office and works: Santiago de Chile. Organized Jan. 13, 1906, under laws of Chile, with capitalization 500,000 pesos, shares 100 pesos par.

ELECTROLYTIC COPPER CO. **OREGON.**

Office: 14 Century Blk., Mason City, Iowa. A. L. Ober, chairman; preceding officer, F. S. Kingsbury, F. B. Platt and J. F. Ferry, executive committee. Organized under laws of Washington, with capitalization $1,500,000, shares $1 par. Has no connection with the Electrolytic Copper Mining & Smelting Co. Lands, 28 claims, partly fractional, said to be located somewhere in Oregon, showing 5 ore bodies, said to range 10′ to 25′ in width, with a large gossan covering the wider ledge, veins being crosscut by tunnel.

ELECTROLYTIC COPPER MINING & SMELTING CO. **OREGON.**

Dead. Formerly at Imnaha, Wallowa Co., Ore.

ELECTROLYTIC REFINING & SMELTING CO OF AUSTRALIA, LTD. **AUSTRALIA.**

Works office: Port Kembla, N. S. W., Australia. Capt. G. A. Richard, general manager; Benj. Mangus, supervising engineer. Organized 1907, with capitalization £150,000, practically as a subsidiary corporation of the Mount Morgan Gold Mining Co., Ltd. Lands, 50 acres, at Port Kembla, in vicinity of Sydney, but said, November, 1907, to be negotiating with the Queensland government for new site, owing to trouble with government over an attempt to levy oppressive harbor dues, the Australian federal and state governments seeming very obtuse, and perniciously active in penalizing new industries. Works are planned to smelt copper ores and concentrates, and to convert matte to blister copper, and are planned to include, ultimately, an electrolytic refinery. Works have a capacity of about 40 tons daily of refined metal, and are planned to treat ores and blister copper from the Mount Morgan and other Australian mines now shipping their products abroad for refining.

ELENITA DEVELOPMENT CO. **MEXICO.**

Office: Wolvin Bldg., Duluth, Minn. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Louis W. Powell, manager. Capitalization $200,000, shares $10 par; $5 paid in. Lands, circa 700 hectares, including property formerly owned by Bonanza de Cobre Mining Co., lying north of the Greene smelter, and extending to a point nearly opposite the Puertecitos mines of the Greene-Cananea. Mine gives a promising surface showing, and has 2 shafts, in good ore. Property considered promising and management good.

EL GLOBO MINING & MILLING CO. **MEXICO.**

Office: 821 Railway Exchange Bldg., Milwaukee, Wis. Mine office: Nacozari, Moctezuma, Sonora, Mex. Chas. A. Romadka, president and general manager; C. G. Porter, secretary. Organized 1905, under laws of Arizona, with capitalization $400,000, shares $100 par. Ores carry mainly gold and silver values. Has a 15-stamp mill and cyanide plant.

AGUSTO ELGÜE. **CHILE.**

Mine office: Guayacan, Peña Blanca, Aconcagua, Chile. Property is the San Pablo mine, 15 kilometers from Peña Blanca, showing a vein of about 1 meter average width, which has produced about 600 metric tons of 9% copper ore.

ELITE GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Index, Snohomish Co., Wash.

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KUPFERERZBERGWERK ELIZA. **GERMANY.**

Mine office: Mallau, Elsass, Germany. Idle some years.

ELIZABETH COPPER CO. **VERMONT.**

Dead. Succeeded, circa 1907, by Vermont Copper Co. Formerly at South Strafford, Orange Co., Vt. Fully described Vol. VI.

ELIZABETH MINING CO. **VERMONT.**

Dead. Succeeded, 1905, by Elizabeth Copper Co. Formerly at South Strafford, Orange Co., Vt. Fully described Vol. V.

ELKHORN COPPER MINING CO. **MONTANA.**

Office: Dillon, Mont. Mine office: Argenta, Beaverhead Co., Mont. H. H. Swain, secretary. Mine, known as the Blue Eyed Annie, has a 100′ shaft. Presumably idle.

ELKHORN GOLD & COPPER MINING CO. **UTAH.**

Office and mine: Ogden, Weber Co., Utah. S. W. Cragun, president; M. S. Poulton, vice-president; Carl Allison, secretary and treasurer. Organized circa November, 1907, under laws of Utah, with capitalization $500,000, shares 10 cents par. Lands are in the Sierra Madre district of Box Elder county, Utah.

ELKHORN MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Greenwood, Boundary district, B. C. Jas. Sutherland, president. Mine, under development at last accounts, had auriferous and argentiferous lead and copper ores.

ELK MOUNTAIN MINING CO. **NEVADA.**

Mine office: Three Creek, Owyhee Co., Idaho. M. S. Estes, president and general manager; Neil Beaton, vice-president; C. W. Robinett, secretary and treasurer. Capitalization $500,000, shares $1 par. Lands, 5 claims, in Elko county, Nevada, 8 miles from the Idaho line, about 16 miles northwest of Contact, Nev., and connected therewith by a good wagon road. Has a 14′ contact vein, between limestone and granite, of silicious sulphide ore, said by company to average 6% copper, 7 oz. silver and 0.04 oz. gold per ton, apparently from a paystreak, opened by a 40′ tunnel. Company planned installing a smelter, 1908, but such installation is not justified by the limited development secured.

ELK MOUNTAIN MINING & MILLING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. T. B. Smith, president; M. R. Phelps, vice-president; S. E. Phelps, secretary and treasurer; J. F. Tillou, general manager; G. S. Taylor, superintendent. Organized 1900, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 640 acres, patented, well timbered, in the northernmost hills of the Medicine Bow Mountains, showing contact deposits between limestone and schist, opened by an 80′ tunnel and 3 shafts, deepest 183′, carrying bunches of chalcocite in upper workings, giving place at depth to chalcopyrite. Has steam and electric power. Property considered promising. Idle.

ELLA COPPER MINING & DEVELOPMENT CO. **CALIFORNIA.**

Letter returned unclaimed from former office, San José, Cal. Mine office: New Almaden, Santa Clara Co., Cal. Lands, near the New Almaden cinnabar mine, are claimed to show a 40′ vein of 10% copper ore, which is a wilful and monstrous exaggeration.

ELLAMAR MINING CO. **ALASKA.**

Mine office: Ellamar, Prince William Sound, Alaska. J. D. Meenach, manager; Wm. Page, superintendent. Lands, on Virgin Bay, circa 20 miles south of Valdez, known as the Gladhaugh mine, have a 600′ shaft, with 6 levels opened, on a lense that is about 80′ wide and 190′ long, on the 200′ level, ore occurring as a contact vein between limestone and slate, carrying mainly chalcopyrite, associated with pyrite and pyrrhotite in a gange of country rock,

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with occasional massive sulphides, ore bodies apparently improving in depth. Was the first copper producer of Alaska, beginning shipments circa 1901. Ore, as shipped, averages about 7.4% copper and 1 oz. silver per ton, with a trace of gold. Has substantial mine buildings. Was said in press, May, 1907, to have been sold to the Hubbard-Elliott Copper Mines Development Co., but apparently this was not true. Production, 1907, estimated at 1,000,000 lbs. fine copper. Property considered promising.

ELLA MINING CO. **MONTANA.**

Dead. Was capitalized at 16,000 shares. Lands, lying next east of the Reins, were sold, Dec. 1, 1906, for a reported consideration of $240,000, to the Reins Copper Co. Formerly at Butte, Silver Bow Co., Mont.

EL MAGISTRAL COPPER CO. **MEXICO.**

Office: 1 Madison Ave., New York, N. Y. Mine office: Choix, Fuerte, Sinaloa, Mex. H. L. McNair, president; Hon. C. F. Wright, vice-president; A. G. Nash, secretary and treasurer; preceding officers, Hon. W. S. Leib, Thos. H. Carvin, H. R. Woodward, John J. Dowdle, John P. Fiebig, John G. Whitmore and Hon. G. E. Green, directors. Property is the entire capital stock of the San Lucas Copper Co.

EL MAJIN COPPER CO. **MEXICO.**

Dead. Formerly at Hermosillo, Sonora, Mex.

ELM ORLU MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Arthur H. Wethey, manager; preceding officer, Hon. Wm. A. Clark, Wm. A. Clark, Jr., Wm. Bickford and A. J. McGinn, directors. Organized January, 1907, with capitalization $1,000,000, shares $1 par.

Lands, 2 claims, known as the Elm Orlu and Poser, north of Walkerville and west of the Black Rock group of the Superior & Boston. Mine has a 1,000′ shaft, showing, at depth of 500′, a 6′ vein of highly argentiferous copper ore, assaying up to 4.5% copper and 100 to 300 oz. silver per ton, with small gold values. The 700′ level shows chalcocite, and management plans crosscutting extensively on the 1,000′ level. Property considered promising and management good.

ELM RIVER COPPER CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; preceding officers, John C. Watson, Stephen R. Dow and Chas. N. King, directors; Capt. Samuel Chynoweth, superintendent. Organized Apr. 20, 1899, under laws of New Jersey, with capitalization $1,200,000, shares $12 par, fully paid. Old Colony Trust Co., Boston, registrar. Annual meeting, third Wednesday in April, at Jersey City.

Expenditures, 1907, were $40,274.92, leaving a balance on hand, Jan. 1, 1908, of $86,341.74, with liabilities of only $980.62.

Lands, 2,300 acres, in Section 6, Town 52 North, Range 35 West; Sections 1, 2, 11 and 12, Town 52 North, Range 36 West, and Section 36, Town 53 North, Range 36 West; also a millsite in Section 30, Town 54 North, Range 36 West, on the shore of Lake Superior. Nearly a complete cross-section of the tract has been secured by upwards of 5,000′ of diamond drill borings, these showing a heavy overburden on nearly all of the lands. Borings have given cores carrying copper, in variable quantities, from a number of different beds.

Considerable sinking and drifting has been done on several copper-bearing beds, at different points. Shafts No. 1 and 2, former 800′ and latter 200′ deep, are on the Winona lode. No. 3 shaft, 100′, and No. 4 shaft, 50′, are on the Shawmut lode. No. 5 shaft was sunk on an unidentified lode, located by diamond drill. No. 1 shaft, the first shaft started, was abandoned at 100′, but was re-

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opened, 1903. No. 1 shaft is 9x14′ in size, sunk in the footwall of the Winona amygdaloid, at an angle of 72°. Crosscuts and drifts on the 500′ level show a 35′ amygdaloid carrying copper in unpayable quantities. On the 800′ level north and south drifts show a healthy bed of 12′ to 16′ width, but no profitable ground was opened there. In crosscutting west from the Winona lode 12 other cupriferous amygdaloids were cut, but none were found of commercial value.

In 1907 the equipment was moved from No. 1 shaft to a new site, about 2,000′ east of the Winona lode, and No. 7 shaft was started, in virgin territory, to open unidentified bed from which a core showing copper had been secured some years previously.

A new vertical shaft is being sunk in search of the Lake bed. This is located about 1 mile northeast of the former workings, north of the center of the Southeast ¼ of Section 11, somewhat west of the hypothetical horizon of the Lake lode. This shaft was 104′ deep, Oct. 15, 1908, having cut a few stringers of copper, and is planned to be sunk to a depth of 200′ or 300′, thence crosscutting to the eastward, in search of the Lake lode. A drill-hole, bored 1906, showed a little copper in an amygdaloid occupying the hypothetical horizon of the Lake lode.

Equipment includes a duplex hoist good for 1,000′ depth, 2 Burt marine boilers and a 4-drill air-compressor. Water is taken from a dam by a Blake pump. Buildings include a 40x40′ carpenter-shop, 28x65′ two-story warehouse, a boarding house with accommodations for 100 men, schoolhouse and a number of dwellings.

The Elm River has been searching nearly ten years for some payable copper bed on which to open a mine, and, while results to date have been of a negative nature, the company is following the correct policy in continuing work, and its prospects are perhaps better than ever before, notwithstanding a decade of work without results.

EL PORVENIR MINING & MILLING CO. **MEXICO.**

Office: 406 Wilson Bldg., Dallas, Tex. Mine office: Cuatro Ciénegas, Monclova, Coahuila, Mex. J. Y. Webb, Jr., president; W. W. Batcheler, vice-president; Frank Reedy, secretary and treasurer. Organized under laws of Arizona, with capitalization $1,000,000. Lands, 244 acres, 30 miles northwest of Cuatro Ciénegas. Company expects to have railroad transportation within 6 miles. Deepest shaft, circa 250′, remains in the oxidized zone, mine having a quarter mile of workings, with one tunnel in ore. Has shipped several carloads of low grade ore, returning circa 4.3% copper and 300 grams silver per ton.

EL PROGRESO COPPER MINING CO. **MEXICO.**

Dead. Stockholders were given shares of Imperial Corona Gold Mining Co. in exchange. Formerly at Ayutla, Autlán, Jalisco, Mex. Described Vol. III.

EL REY GOLD & COPPER MINING CO. **WYOMING.**

Letter returned unclaimed from former office and mine, Encampment, Carbon Co., Wyo. J. W. Hedding, secretary. Idle since 1905, but annual meeting held at Encampment, July 15, 1908.

EL RICO COPPER MINING CO. **MEXICO.**

Mine office: Tepezalá, Ocampo, Aguascalientes, Mex. J. Frank Gray, secretary and treasurer. Organized 1907, under laws of Colorado, with capitalization $1,000,000.

ELSIE ADAIR COPPER MINING CO. **AUSTRALIA.**

Mine office: Port Augusta, South Australia. A. M. Hardy, manager, at last accounts. Has steam power. Presumably idle.

ELSIE MINING CO. **COLORADO.**

Dead. Formerly at Winfield, Chaffee Co., Colo.

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EL SUEÑO MINING CO. **MEXICO.**

Mine office: Tijuana, Norte, Baja California, Mex. Hugh T. Duff, superintendent. Has auriferous and argentiferous copper ores. Has gasoline power and Huntington mill, and is said to have a very small smelter, known as El Cuera de Venado.

MINA EL TESORA. **MEXICO.**

Office and mine: care of Don Emiliano Ybarra, owner, Calmallf, Sur, Baja California, Mex. Has highly auriferous and argentiferous copper ores, with steam power and 10-stamp mill.

EL TIRO COPPER CO. **ARIZONA.**

Office: 5 Nassau St., New York, N. Y. Mine office: Red Rock, Pinal Co., Ariz. Employs circa 80 men. Franklin B. Richards, president; Edw. B. Kurtz, vice-president; Chas. E. Ellis, secretary and treasurer; preceding officers, Wm. Grief, Clement A. Griscom, Jr., Henry G. Moore and Geo. K. Barnes, directors; H. C. Smith, general manager; Louis S. Noble, consulting engineer. Organized May 22, 1907, under laws of Arizona, with capitalization $4,500,000, shares $10 par, fully issued. Bonds, $1,000,000 authorized, first mortgage, at 6%; issued, $550,000. Was promoted by the American Finance & Securities Co., practically as successor of Cleveland-Arizona Mining Co. Annual meeting, third Thursday of April.

Lands, 14 claims, 10 patented, area 250 acres, also a 5-acre millsite, in the Silver Bell district, near the Imperial mine. Property shows various contact deposits between quartz-porphyry and limestone, and there are large masses of porphyry containing disseminated chalcocite, with local segregations of oxidized ores, the zone of oxidation being 50′ to 150′ in depth. Ores developed are cuprite, melaconite, chalcocite and chalcopyrite, with decomposed porphyritic and limestone gangue. Two ore bodies are under development, these being irregular in shape, apparently about 10 acres in combined area, and proven to depth of about 300′.

Development is by several shafts of 50′ to 400′ depth, including the 220′ Daisy shaft, 400′ Kurtz shaft and 120′ Burtis shaft, with tunnels of 750′, 430′, 350′, 250′ and 200′, there being several shorter tunnels, mine having about 6,000′ of workings, estimated to show 250,000 tons of ore, a large body of oxidized ore on the 120′ level carrying mainly cuprite and melaconite.

Equipment includes a 600-h. p. steam plant, a 150-kw. electric plant and a 120-h. p. gasoline plant. The 600-h. p. mining plant has a 16x20″ hoist with double drum, good for 1,000′ depth, and 3 gasoline hoists. There are Nordberg and Sullivan air-compressors, of 18 drills aggregate capacity. Buildings are 18 in number, and a complete surface plant is being built.

A 50-ton concentrator, 60x60′, of wood, built 1907, for test purposes, has a 7x10″ Blake crusher, 30-ton Huntington mill, 2 rolls, 1 vanner, 5 Wilfley tables, Vezin automatic sampler, Richards pulsator and hydraulic sizer. It is planned to enlarge this mill to 250 tons, when the nature of the permanent ore bodies is fully developed. Smelting ore and concentrates will go to the Sasco smelter, 10 miles distant. Property is served by the Arizona Southern railway.

In 1907 ten carloads of mine-run ore returned 7.55 to 14.6% copper, with an average of 9.92%, shipments realizing $11,390. The company plans sinking the Kurtz and Daisy shafts below the 200′ level, and doing extensive opening. No attempt has been made at regular production, but about 400 tons of 10% ore, extracted in regular development work, has been shipped to smelters at Douglas, El Paso and Kansas City, and several thousand tons of 3% ore were treated for experimental purposes, mill giving an average extraction of better than 75%.

The principal officers of the company draw salaries for their services,

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which is proper. The argument that none of the officials are salaried is a poor one, frequently used by developing companies. There is no reason why an official of a mining company should work for nothing, and very few do so, those who draw no salaries usually finding their account otherwise. Property is considered promising and management good.

EL TRIUNFO CONSOLIDATED MINING CO. **MEXICO.**

Office:, 28 Greene St., New York, N. Y. Mine office: Bacoachi, Arizpe, Sonora, Mex. Company gives its mine address as El Triunfo, Arizpe, Sonora, Mex., but there is no such postoffice, and the postmaster at Bocoachi returned a letter addressed to this company, stating there was no such company in existence. Bocoachi, however, apparently is the nearest postoffice point, being circa 10 miles from the company's mine. A. C. Charlott, president and general manager; Dr. S. Newton Lee, vice-president; Robt. Friedman, secretary; Julius G. Miller, treasurer; preceding officers, W. B. Hunnewell and Dr. Harry Bock, directors; Antoino Acuna, superintendent; Augustin Rieutard, mine superintendent; John W. Ward, mill superintendent; F. E. Mansfield, smelter superintendent; W. C. Albers, engineer.

Company is organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. Property is held through a Mexican incorporation, capitalization 10,000 pesos, shares 100 pesos par, stock of which is owned outright by El Triunfo Consolidated Mining Co. Annual meeting, first Monday in October.

Lands, 55 pertenencias, area 136 acres, circa 10 miles southwest of Bacoachi and 2 miles from the Sonora river, said to be within 4 miles of the Picacho mine, circa 30 miles northwest of Las Chispas mine, and about 75 miles, by wagon road, from La Cananea. Company claims to have in operation the Triunfo, Louisiana, Providencia and Esmeralda mines, with 5 ore bodies under development, of 2′ to 5′ average width, traceable 2 miles, carrying malachite, azurite, bornite, chalcopyrite and chrysocolla, all silicious, and occasional native silver, with an estimated average of 5% copper, 25 to 600 oz. silver and $3 gold per ton. Mine is reported as having 3,300′ of workings, showing 3,000 tons of ore, with about 3,000 tons on the dump, stated to range $20 to $150 per ton in value. Development is by 5 shafts, 6 tunnels and various opencuts. The main vein is a fissure of 4′ to 5′ width, and practically vertical dip, carrying oxidized ores above and sulphides below.

The equipment includes a 90-h. p. steam plant at the mine, and there are 26 buildings, including dwellings. There also is a small sawmill. Wells provide water for boilers and potable use.

The mill, of 50 tons daily capacity, has 4 Behrend tables and a 25-h. p. steam engine.

The smelter, ½ mile from the mine, having a 40-h. p. engine, has a 30-ton Medbery rotary furnace, turning out matte carrying 56% copper, 600 oz. silver and 1.5 oz. gold per ton. The smelter was blown in circa April, 1908, and is said to have worked well, but did not remain in blast, owing to poor transportation facilities, nearest railroad being at Cos, 38 miles distant by mule trail, but the company hopes to get a wagon road.

The company claims to have expended about $150,000, and to be out of debt, and stated, August, 1908, that it expected to declare a dividend in December, but on what grounds such expectations were entertained is not readily apparent, as further development seems necessary to put the property on a satisfactorily productive basis.

EL VERDE GRANDE COPPER CO. **MEXICO.**

Office: care of Percy Sharpe, Nogales, Ariz. Letter returned unclaimed from former mine office, Imuris, Magdalena, Sonora, Mex. Capitalization

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$2,000,000, shares $1 par. Lands are in the foothills of the Sierra Azul, 14 miles from Imuris, which is on the Sonora railroad. Idle.

ELY AMALGAMATED COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Ely, White Pine Co., Nev. J. R. Murdock, president; B. F. Grant, vice-president; S. Y. Taylor, secretary and treasurer; preceding officers, J. B. Taylor and A. B. Kingsbury, directors. Capitalization $100,000, shares 10 cents par. Lands, 30 claims, in the Duck Creek district, ownership of 3 of which, lying near the Steptoe smelter, is in dispute with the Steptoe Valley Mining & Smelting Co.

ELY AMALGAMATED COPPER CO. **NEVADA.**

Office: 407 Jackson Bldg., Denver, Colo. Mine office: Ely, White Pine Co., Nev. F. H. Harding, president; J. E. Romer, vice-president; G. A. Killan, secretary and treasurer; preceding officers, Fred L. Humphrey and Mat. R. Root, directors. Organized November, 1906, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands, 6 claims, area 120 acres, in the northwestern section of the Ely district. Operations confined mainly to very lurid advertising.

ELY ARCH COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized circa March, 1907, with capitalization $5,000,000, shares $5 par.

ELY BELL MINING CO. **NEVADA & UTAH.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. F. O. McFall, president and general manager; W. T. Binford, vice-president; J. E. Hanway, secretary and treasurer. Organized April, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 3 unpatented claims, in the Ely district, and 15 claims, area 300 acres, in the Draper district, adjoining the Little Cottonwood district of Salt Lake county, Utah, held under bond and lease, said to show a 12′ vein. Was negotiating, late 1907, for sale of property to Corona Consolidated Mines Co.

ELY BLACKHORSE MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Blackhorse, White Pine Co., Nev. Organized 1907, under laws of Colorado, with capitalization $1,250,000, by M. D. McKane, et al. Is said to have a fair showing of copper ore.

ELY-BONANZA COPPER CO. **NEVADA.**

Dead. Letters returned unclaimed from former office, 148 Broad St., New York, N. Y., and former mine office, Ely, White Pine Co., Nev. Francis H. Sherrerd was manager. Organized 1907, under laws of New Jersey, with capitalization $1,000,000, shares $1 par. Lands were 12 claims, south of the Giroux Consolidated, having a 350′ shaft, with gasoline hoist.

ELY-CALUMET COPPER CO **NEVADA.**

Mine office: Ely, White Pine Co., Nev. A. D. Myers, manager. Capitalization $5,000,000, shares $5 par. Lands, 21 claims, said to have cost $75,000.

ELY CENTRAL COPPER CO. **NEVADA.**

Office: 211 Keyser Bldg., Baltimore, Md. Mine office: Ely, White Pine Co., Nev. O. A. Turner, president; B. A. Hazell, vice-president; H. S. Turner, secretary; E. S. S. Turner, treasurer; Fred S. Pheby, general manager; preceding officers and J. H. Preston, directors. Organized March 31, 1906, under laws of Delaware, with capitalization $12,000,000, shares $10 par, fully issued. Was said, March, 1907, to have paid $323,000 for property. Trust Co. of North America, Philadelphia, registrar.

Lands, 35 claims, unpatented, area 508 acres, centrally located in the Robinson district, being surrounded by the Nevada Consolidated and Ely

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Mines Co., showing limestone carrying a monzonite dyke of 3,000′ claimed width, estimated to carry average values of 3% copper, 1 oz. silver and 40 cents gold per ton. Property also has an ore body of 20′ to 95′ estimated width giving assays of 2 to 17% copper, and shows native copper and chalcocite. The Weber shaft shows copper sulphides at a depth of 400′, and the company plans sinking a working shaft, and has started a tunnel planned to be driven 1,000′. The tract has been quite thoroughly tested by churn drilling, about 150 holes having been bored.

ELY CONSOLIDATED COPPER CO. **NEVADA.**

Office: 1111-25 Broad St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. Willard F. Snyder, president; J. H. Everett, vice-president; Chas. O. Collingwood, secretary and treasurer; preceding officers, Col. Nicholas Treweek and Gideon Snyder, directors; Olaus Jeldness, manager. Organized Oct. 2, 1906, under laws of Utah, with capitalization $10,000,000, shares $1 par. Windsor Trust Co., New York, registrar. Lands, 15 claims, area circa 300 acres, near the Ruth group of the Nevada Consolidated and Jupiter group of the Cumberland-Ely, bought for circa $125,000, and considered well located. The Brilliant shaft, 625′, is said to show 55′ of cupriferous pyrite on the bottom level, carrying about 3% copper and $1.50 per ton combined gold and silver values. The American shaft is 500′ and the Zack shaft 360′ deep. Shipped a little ore, 1907, carrying excess of iron, reducing smelting cost to 3 cents per ton, and netting $81.99 per ton. Property considered promising.

ELY CONSOLIDATED MINING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization, $5,000,000, shares $5 par. Presumably idle.

ELY COPPER CO **NEVADA.**

Office: 815 Ernest & Cranmer Bldg., Denver, Colo. Mine office: Ely, White Pine Co., Nev. Geo. F. Fry, president; F. P. Berchy, vice-president; R. J. Grant, secretary; E. C. Newcombe, treasurer; preceding officers and F. J. Shipman, directors; Lee Lockner, engineer. Organized September, 1906, under laws of Wyoming, with capitalization $5,000,000, shares $5 par.

Lands, 7 claims, 2 fractional, area 225 acres, lying west of the Giroux Consolidated, having some open-cuts and a shaft, reported by company as 405′ deep, having a 25-h. p. hoist.

Stock in this company was placed through the General Finance Co., of Denver, on 25% commission, the fiscal agency advertising that: "The Ely copper district has been held within the clutches of the captains of finance, but by Yankee aggressiveness, the captains of industry and high finance have been thwarted, and after an outlay of vast expense we are able to burst through their phalanxes, and cut the Gordian knot that has kept the investor from obtaining even a small interest in this, the world's newest, and, without doubt, the greatest copper camp ever known since the production of copper as a commercial commodity." It would be a work of supererogation to criticise such a literary gem of purest ray serene as the foregoing excerpt, which would have been a credit to Sir Boyle Roche, though it is not on record that Sir Boyle ever turned his talents toward peddling cheap and dubious mining shares. Idle.

ELY COPPER QUEEN MINING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized circa December, 1906, under laws of Arizona, with capitalization $1,250,000, shares $5 par by E. J. Daughters and W. J. Wallace.

ELY-COPPERTON MINING CO. **NEVADA.**

Office: 16 East South Temple St., Salt Lake City, Utah. Mine office: McGill, White Pine Co., Nev. Lorenzo L. Stahl, president; Jas. B. Taylor,

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vice-president; N. Y. Stringham, secretary and treasurer; preceding officers, R. B. Kingsbury and John Stringham, directors. Organized May 1, 1907, under laws of Nevada, with capitalization $100,000, shares 10 cents par; issued, $60,000. Annual meeting, first Monday in February.

Lands are in the Duck Creek district, which is mainly a lead camp, but property shows surface ores carrying up to 3% copper. Idle.

ELY-DUCK CREEK LEAD & COPPER CO. **NEVADA.**

Office: care of David Westwood, secretary and treasurer, Provo, Utah. Mine office, Ely, White Pine Co., Nev. Chas. F. Ruffner, president. Organized circa December, 1906, with capitalization $50,000, shares 10 cents par. Lands are sundry claims in the Duck Creek district.

ELY-GIBRALTER COPPER CO. **NEVADA.**

Dead. Formerly at Ely, White Pine Co., Nev.

ELY-GIROUX EXTENSION COPPER CO. **NEVADA.**

Office: 25 Broad St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. Arthur U. Magnan, president; Ramón McCue, vice-president; E. B. Tustin, treasurer; Richard Stewart, secretary; preceding officers, R. P. Russell, Henry C. Haun and Zeno B. Drum, directors. Capitalization $5,000,000, shares $5 par. Lands, 130 acres, south of the Giroux Consolidated and east of the Ely Central, lands being considered fairly located. Advertised its stock on the strength of its neighbor's work, not its own. Apparently idle.

ELY GLOBE COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. C. L. Fuller, manager. Lands are in the northern part of the Ely district. Idle and apparently moribund.

ELY-GOLDEN LEDGE MINING CO. **NEVADA & UTAH.**

Mine offices: Ely, White Pine Co., Nev., and Callao, Juab Co., Utah. Jos. F. Schweswohl, general manager; R. N. Lesher, superintendent. Lands include claims at Ely, claims in the vicinity of Callao and 320 acres of placer lands on Red Hill, near Hogum. Presumably idle.

ELY-GRAND CENTRAL COPPER MINING CO. **NEVADA.**

Office: care of S. D. Crump, president and general manager, Denver, Colo. Mine office: Ely, White Pine Co., Nev. Organized, 1906, under laws of Arizona, with a capitalization $1,000,000, shares $1 par.

ELY-HERCULES MINING CO. **COLORADO & NEVADA.**

Office: 215 Kittredge Bldg., Denver, Colo. Mine offices: Lake City, Hinsdale Co., Colo., and Blackhorse, White Pine Co., Nev. Chas. T. Eckhardt, president; C. C. Moon, vice-president; Geo. E. Denny, secretary and treasurer; Wm. Jenkins, assistant secretary; T. R. Cudahy, superintendent. Organized January, 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par.

Colorado lands are 5 claims, on Henson Creek, and a millsite, near Lake City, having tunnels of 165′ and 258′, cutting a 3′ vein carrying ore assaying up to 40% lead, with small values in copper, silver and gold. Has several mine buildings and is said to have been a considerable producer in the past.

The Nevada property includes 4 claims known as the Atlas group, in the Robinson district, near Ely, White Pine county, and 5 claims near Blackhorse, latter showing argentiferous and slightly auriferous copper sulphides. Cost of lands is said to have been $12,000, and company is said to have agreed to pay $15,000 for a 51% interest therein.

ELY HIDDEN TREASURE CONSOLIDATED MINING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization $1,500,000, shares $1 par. Lands, 6 claims, having a 400′ tunnel, driven by previous owners, and a 115′ shaft, showing ore up to 15% copper, 40% lead and $15 gold per ton.

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ELY-JACKPOT MINING CO. **NEVADA.**

Office and mine: Ely, White Pine Co., Nev. P. J. Killcullen, president; Jas. A. Curran, vice-president; Eugene Cullity, secretary and treasurer; M. S. Fitz-Morris, general manager; preceding officers and P. Metzdorf, directors. Organized 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, area 200 acres, in the eastern portion of the Ely district. Presumably idle.

ELY-JUMBO COPPER CO. **NEVADA.**

Dead. Was promoted by G L. Rickard, and merged, circa 1907, in Ely National Copper Co. Formerly at Ely, White Pine Co., Nev.

ELY KING COPPER & LEAD CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized 1907, under laws of Utah, with capitalization, $3,000,000, by Alfred Adams, J. Norton, et al. Idle and apparently abortive.

ELY MINES CO. **NEVADA.**

Dead. Was capitalized at $1,000,000, shares $5 par. Property sold, Aug. 8, 1907, to Consolidated Copper Co Formerly at Ely, White Pine Co., Nev.

ELY MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Was organized, circa 1900, as a gold mining company. Lands, 13 claims, having considerable development, showing gold ores. Has a cyanide plant. At last accounts was under option to Hon. Thos. Kearns and David Keith.

ELY MINING & MILLING CO. **NEVADA.**

Dead. Lands sold, 1906. Formerly at Ely, White Pine Co., Nev. Described Vol. VI.

ELY-MIZPAH COPPER CO. **NEVADA.**

fice: 346 Commonwealth Bldg., Denver, Colo. Mine office: 10 Ely Trust Bldg., Ely, White Pine Co., Nev. Geo. D. Wilson, president; Jas. D. Conway, vice-president; A. M. Kearns, secretary. Organized June 28, 1907, under laws of Arizona, with capitalization, $2,000,000, shares $1 par. Lands, 7 claims, area 140 acres, known as the Modoc group, near the Vulcan-Ely, circa 4 miles southeast of Ely, on which only assessment work has been done. Is said also to have 4 claims near Goldfield, Esmeralda county, Nevada. Apparently organized mainly to sell stock.

ELY NATIONAL COPPER CO. **NEVADA.**

Office: 314 Century Blk., Denver, Colo. Mine office: Ely, White Pine Co., Nev. Max Straus, president; Hon. Jas. B. Grant, vice-president; Edw. B. Morgan, secretary; Thos. Keeley, treasurer; G. L. Rickard, resident manager; John D. Murphy, mine manager; preceding officers, Henry E. Wood, A. B. Whitcher and Hon. Samuel D. Crump, directors; Richard A. Parker, consulting engineer. Organized circa 1907, as successor of the Ely Jumbo, Mizpah Verde and Anaconda companies, with capitalization $5,000,000, shares $2.50 par; issued, $3,750,000.

Lands, 24 claims, area 480 acres, including the Cowen group of 4 claims adjoining the Nevada Consolidated on the south, property being located southwest of the Nevada Consolidated and immediately south of the Manhattan & Ely Copper Co. At last accounts, 1907, company contemplated diamond drilling and sinking a shaft. Presumably idle.

ELY-NEVADA COPPER CO. **NEVADA.**

Office: 35 Wall St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. Volney D. Williamson, president; F. L. Underwood, vice-president; Chester S. Bonham, second vice-president and secretary; Hamilton H. Durand, treasurer; R. H. Eggleston, assistant treasurer; preceding officers, G. L. Rickard, E. A. Davidson and J. Markham Marshall, directors. Organized May 17,

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1906, under laws of Maine, with capitalization $1,000,000, shares $1 par. Trust Company of America, New York, transfer agent Lands, 9 claims, area 170 acres, near the Cumberland-Ely, considered fairly located.

ELY NEVADA EXPLORATION CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization $250,000, shares $5 par.

ELY NORTHERN COPPER CO. **NEVADA.**

Office and mine: Ely, White Pine Co., Nev. Thos. B. Pheby, president; Jos. Pheby, vice-president; J. W. Biggane, secretary and treasurer; Fredk. S. Pheby, general manager. Organized May, 1906, under laws of Nevada, as successor of Nevada Northern Copper Co., with capitalization $1,000,000, shares $1 par; issued, $750,000.

Lands, 8 claims, patented, area 97 acres, adjoining the Vesta mine, said to show numerous ore bodies, of which 3, under development, are reported by company as of 15′ average width, carrying oxidized ores as replacements in limestone, of 3% copper average tenor, the zone of secondary enrichment not having been reached. Mine has about 1,000′ of workings.

ELY-OGDEN MINING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization $1,000,000, shares $1 par.

ELY & OSCEOLA LEDGE MINING & MILLING CO. **NEVADA.**

Letters returned unclaimed from former office, care of North American Banking & Trust Co., Philadelphia, Pa., and former mine offices, Ely, White Pine Co., Nev., and Osceola, White Pine Co., Nev. Jos. F. Schwohl, vice-president; B. N. Lesher, superintendent. Lands, 9 lode claims, area circa 180 acres, at Ely, and 8 placer claims, area 320 acres, at Osceola. Employed about 25 men, late in 1907. Idle.

ELY-PHOENIX COPPER MINING CO. **NEVADA.**

Dead. Organized circa 1907, with capitalization $1,000,000, shares $1 par. Formerly at Ely, White Pine Co., Nev.

ELY-RAND COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized 1907, under laws of Arizona, with capitalization $2,000,000, by Alfred Adams, Norton Adams and Hunter B. Supple. Presumably idle.

ELY-RESURRECTION COPPER CO. **NEVADA.**

Office: Herald Bldg., Salt Lake City, Utah. Mine office: Ely, White Pine Co., Nev. C. Freed, president; Jos. Lippman, vice-president; Frank Knox, treasurer; C. R. Raymond, secretary and manager; preceding officers, T. Jacobson, G. W. Lynch and Wm. L. Moyer, directors. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $5 par. Lands, 30 claims, patented, area circa 550 acres, lying north and east of Ely and considered promising, though somewhat out of the center of the district. Mine has 2 short tunnels and a 140′ shaft, showing 18′ of ore assaying up to 5% copper, with gold and silver values. Also has some high grade ore assaying up to 46% lead and 110 oz. silver per ton, with good gold values.

ELY REVENUE COPPER CO. **NEVADA.**

Office: Durango, Colo. Mine office: Ely, White Pine Co., Nev. C. E. McConnell, president. Organized circa January, 1907, with capitalization $1,000,000, shares $1 par. Lands, known as the Revenue group, are near the Chainman and Altman mines.

ELY-ROCHELLE COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized Nov. 23, 1906, under laws of Maine, with capitalization $1,000,000, shares $1 par.

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ELY SILVER, LEAD & COPPER CO. **NEVADA.**

Office: Whinery Blk., Union, Iowa. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. H. J. Benson, president; R. L. Bixby, vice-president; E. A. Corfe, secretary; F. K. Long, treasurer; C. R. Fuller, general manager; preceding officers, J. D. Cundiff and A. R. Bavender, directors. Lands, 9 claims, area circa 180 acres, having several shallow shafts and short tunnels, said to have produced a little silver-lead ore in the past. Idle.

ELY STANDARD COPPER CO. **NEVADA.**

Office: care of W. F. Snyder, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized circa January, 1907. Lands, circa 1,000 acres. Idle.

ELY SULPHIDE COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized 1907, with capitalization $1,000,000, shares $1 par.

ELY WANETA MINING & MILLING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized circa March, 1907, to operate in vicinity of Ely. Idle and apparently moribund.

ELY WESTERN COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized July, 1906, with capitalization $1,000,000, shares $1 par. Lands, 40 acres. Presumably idle.

ELY-WILDHORSE COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized circa February, 1907, to develop a group of about 18 claims, in the vicinity of Pilot Knob. Idle and apparently moribund.

ELY-WITCH COPPER CO. **NEVADA.**

Office: 1204-32 Broadway, New York, N. Y. Mine office: Ely, White Pine Co., Nev. J. E. Bamberger, president; D. M. Hyman, vice-president; J. L. Tilton, secretary; Ernest Bamberger, treasurer and general manager; preceding officers and W. W. Armstrong, directors; L. D. Osborne, superintendent. Organized Nov. 22, 1906, under laws of Maine, with capitalization $5,000,000, shares $5 par.

Lands, 7 claims, 1 fractional, area 54 acres, patents applied for, said to have been bought for $275,000, lying in the porphyry zone between the Nevada Consolidated and Cumberland-Ely mines, showing large blowouts of ferruginous porphyry. Development is by a 300′ shaft, with levels at 100′ intervals, and by tunnels of 1,200′, 600′ and 1,050′, with 3,500′ of workings, showing ores, mainly chalcocite and chalcopyrite, assaying up to 25% copper and 2 oz. silver per ton, with traces of gold. Equipment includes a second-motion hoist, good for 500′ depth, and 5 small mine buildings. Property has some good ore on the dumps, and is well located between the Wedge group of the Cumberland-Ely and the Ruth mine of the Nevada Consolidated.

EMERALD COPPER CO. **MEXICO.**

Mine office: Llano, Magdalena, Sonora, Mex. F. C. Emery, president; W. D. Fredericks, superintendent. Lands, 88 hectares, on which development, begun January, 1907, shows ore assaying 10 to 25% copper, 15 to 20 oz. silver and up to $6 gold per metric ton, silver values increasing with depth.

EMERALD MINING CO. **WYOMING.**

Office and mine: Wheatland, Laramie Co., Wyo. H. A. Robinson, manager. Lands, including the Cooney Hill and Emerald mines, on Slate Creek, show a prominent gossan. The Emerald has a 60′ shaft in ore, and a 100′ shaft bottomed in a gossan showing traces of copper sulphides.

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EMERALD MINING & SMELTING CO. **MEXICO.**

Dead. Succeeded by Esmeralda Copper Mining & Smelting Co. Formerly at Santa Catarina del Norte, Baja California, Mex.

EMMA COPPER CO. **UTAH.**

Office: care of E. O. Howard, secretary and treasurer, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. John A. Kirby, president; Joseph Lippman, vice-president; E. O. Howard, secretary and treasurer; preceding officers, W. M. Wantland, D. H. Peery, Rufus K. Cobb, S. A. Baugh and L. D. Gordon, directors; Jas. E. Beveridge, superintendent. Organized, circa November, 1906, under laws of Utah, with capitalization $1,000,000, shares $1 par. Is no relation to the Old Emma Mining Co. Lands, 8 claims, area 160 acres, with bond and lease on 3 adjoining groups, near the Columbus Consolidated. Property is the old Emma mine, which was a considerable producer in early days, and is said to have been the first mine opened in Utah, with claimed production of about $5,000,000. Development is through the Flagstaff tunnel, showing a 15′ vein, carrying a paystreak of 1′ to 4′ width, giving assays of 2.5% copper, 11.8% lead, 40 oz. silver and 83 cents gold per ton. Property considered promising.

SOCIEDAD MINERA EMMA LUISA. **CHILE.**

Mine office: Taltal, Antofagasta, Chile. J. S. Marion, superintendent, at last accounts. Has auriferous copper ores, with steam power. Idle.

EMMA MINE. **BRITISH COLUMBIA.**

Owned three-fourths by the British Columbia Copper Co., Ltd., and one-fourth by the Hall Mining & Smelting Co., Ltd., and is described under title of former.

EMMA MINE. **MONTANA.**

Held by Butte Copper & Zinc Co. at last accounts. Changes hands so frequently it is difficult to keep track of.

EMMA MINE. **NEW MEXICO.**

Mine office: Santa Rita, Grant Co., N. M. Property, owned by Phelps, Dodge & Co., is under lease to P. C. Cramer, who was producing 2 to 3 carloads of ore weekly, at last accounts.

EMMA MINING & DEVELOPMENT CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont.

GEWERKSCHAFT EMMANUEL. **GERMANY.**

Letter returned unclaimed from former mine office, Wülfrath, Rheinprovinz, Prussia, Germany. Mine, opened by one shaft, has chalcopyrite and sphalerite.

EMPIRE COPPER CO. **IDAHO.**

Office: 52 William St., New York, N. Y. Mine office: Mackay, Custer Co., Ida. Frank M. Leland, president, treasurer and general manager; John H. Hobbs, vice-president; Robt. Leslie Moffett, secretary; preceding officers, John C. Montgomery and Thos. J. Barbour, directors; Ralph R. Osborn, mine superintendent; Timothy E. Guhin, smelter superintendent; Frank M. Sweeney, master mechanic; A. F. Wuensch, consulting engineer.

Organized May 29, 1907, under laws of Maine, with capitalization $6,000,000, shares $5 par, reduced, July 16, 1908, to $1,200,000, shares $1 par; issued, $1,000,000. On Jan. 1, 1908, had quick assets of $32,997.42, including $18,060.65 cash, with liabilities of only $389.58. Annual meeting, third Tuesday in May.

Company bought the Mackay property of the White Knob Copper & Development Co., Ltd., taking over also a 5-year lease on the property from the MacBeth Leasing Co., giving 250,000 shares of stock to the White Knob and 750,000 shares to the owners of the MacBeth lease, and begun business

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without any cash in the treasury, but with 200,000 shares of stock. Quick assets now possessed have been secured from earnings, in addition to the installation of new machinery costing $7,735.69.

Lands, 39 claims, 6 fractional, 6 patented, area 700 acres, also mill and smelter sites of 184 acres, and a railroad right-of-way, in the Alder creek district. Property carries a large number of lenticular contact deposits, between granite-porphyry and limestone, of which 31 are more or less developed, these being erratic in size, strike and dip, carrying all of the ordinary copper oxides, carbonates and sulphides. Former owners claimed a 23′ vein carrying 3 to 9% copper and $1.75 to $3 combined gold and silver values per ton, but present owners merely claim what they have, and give the average of one year's ore extraction as 3.9% copper, 2.02 oz. silver and 80 cents gold per ton. The property was opened circa 1884, and worked at various times. For some years it was under the control of a succession of White Knob corporations, which succeeded each other with deadly monotony, each making a flat failure of the mine, until the property was leased, circa July 1, 1905, to the MacBeth Leasing Co., which worked the mine on a business basis, at a profit, which the old owners never succeeded in doing.

The mine has a glory-hole of 125′ to 200′ width, but extraction is mainly by tunnel, the main shaft of 700′ depth connecting with the Albert tunnel, of circa 1,500′ length, the mine having about 7 miles of workings, estimated to show 60,000 tons of ore, with 30,000 tons blocked out for stoping. The mine is dry.

Equipment includes steam, electric, gasoline, water and air power, with a total of 152 h. p. at the mine and 125 h. p. at the smelter. There are 20-h. p., 10-h. p. and 8-h. p. hoists, and an 8-drill air-compressor. The company has about 20 buildings at the mine, including a sawmill, 20x30′ carpenter-shop and 20x30′ smithy, with a 40x100′ machine-shop at the smelter.

The mine is reached by a 96-mile branch of the Oregon Short Line railway, running from Blackfoot to Houston, and is connected with the smelter by the Empire railroad, owned by the company, 7¾ miles in length with 36″ gauge, equipped with two 23-ton Shay mountain climbing locomotives, and 38 cars. The line has a maximum gradient of 6%, with a rise of 2,000′, and has one 6% grade on a 34° curve.

The smelter has two 125-ton water-jacket blast-furnaces 44x160″ at the tuyeres, with Connersville blowers, making matte carrying about 40% copper, 26 oz. silver and 1 oz. gold per ton, sent to the Murray smelter for conversion, and does occasional custom smelting. The mine also has shipped some ore to the Garfield smelter.

Production, 1906, under the old management, was circa 3,200,000 lbs. fine copper, and, for 1907, was 2,750,000 lbs., from 42,800 tons of ore treated. Mining costs are about $3 per ton, and smelting costs $4.25, the gold and silver values about offsetting conversion and refining costs, giving copper at an average cost of about 10 cents per pound.

The Empire Copper Co. was promoted just in time to be caught in the 1907 panic, but every share of stock sold to the public was redeemed, at subscription price, for which the promoters deserve great credit. The property is considered valuable, notwithstanding its bad record under the various White Knob companies. The present management is efficient, and probably will resume operations shortly, only a few men being employed, doing assessment work on unpatented claims, in October, 1908.

EMPIRE COPPER CO. **NEVADA.**

Dead. Lands now held by Pacific Consolidated Mining Co. Formerly at Reno, Washoe Co., Nev.

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EMPIRE COPPER & GOLD MINING CO. **ARIZONA.**

Office: 217-122 West Third St., Los Angeles, Cal. Mine office: Johnson, Cochise Co., Ariz. J. L. Brooks, president and general manager; M. J. Gress, vice-president; H. H. Morrow, secretary and treasurer; preceding officers, J. O. Pace, H. Hermanson, Angus Graham and M. M. Gustin, directors. Organized Jan. 31, 1905, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Annual meeting, second Monday in January. Lands, 24 claims, area 480 acres, in the Little Dragoon Mountains, in 2 groups, including the Empire group of 16 claims, and the Cowboy group of 8 claims, 2 miles from Johnson. Lands show a good gossan carrying carbonate stains. Has 2 shafts, one a 2-compartment 400′ shaft, with about 500′ of drifts, showing ore of 3.4% copper tenor on the 100′ level, with some ore assaying up to 30% copper, 4 oz. silver and $2.80 gold per ton. Has a hoist good for 1,000′ depth, and an air-compressor.

EMPIRE COPPER MINING & MILLING CO. **NEW MEXICO.**

Mine office: Tusas, Rio Arriba Co., N. M. Property, known as the H. S. P. mine, has a shaft showing copper ore of fair grade.

EMPIRE-GOLD BUG MINING CO. **COLORADO.**

Dead. Formerly at Empire, Clear Creek Co., Colo.

EMPIRE GOLD & COPPER CO. **COLORADO.**

Office and mine: care of Harry W. Kane, Central City, Gilpin Co., Colo. Organized 1907, under laws of Colorado, with capitalization $1,500,000. Lands include the Aduddell group and the Jimtown millsite. Has a 200-ton reduction plant, at Idaho Springs. Production is partly through the Aduddell shaft, and partly through the Newhouse tunnel.

EMPIRE MINES CO. **NEW MEXICO.**

Dead. Formerly at Hanover, Grant Co., N. M.

EMPIRE MINING CO. **ARIZONA.**

Office: Utica, N. Y. Mine office: Bisbee, Cochise Co., Ariz. W. L. Scott, president; A. W. Daggett, treasurer; J. G. Pritchard, managing director; preceding officers, R. E. King, F. L. Guillame, L. E. Browne, W. A. Fenn, J. A. Losse and F. M. Penny, directors; Alex. Erickson, superintendent. Organized June 27, 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 10 claims, area 200 acres, near the Modern mine, opened by a 350′ tunnel, claimed to show a 5′ vein of auriferous and argentiferous copper ore, of circa $14 per ton gross value. Ore is found in small stringers, typical of this district, and property is not considered well located.

EMPIRE MINING CO. **ARIZONA.**

Mine office: Pantano, Pima Co., Ariz. E. A. Pike, superintendent. Is supposed to be controlled by Col. Epes Randolph and associates. Mine, formerly known by the Total Wreck, made small ore shipments, 1908, to the smelter at El Paso.

EMPIRE MINING CO. **MICHIGAN.**

Dead. Lands sold, 1905, to Keweenaw Copper Co. Formerly at Delaware Mine, Keweenaw Co., Mich.

EMPIRE-NEVADA COPPER MINING & SMELTING CO. **NEVADA.**

Office: 29 Broadway, New York, N. Y. Mine office: Yerington, Lyon Co., Nev. Wm. Gelder, president; L. R. Bittman, secretary. Organized under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands, circa 500 acres, 2 miles west of Yerington, having numerous pits and 4 shafts of about 100′ depth each. Considerable drilling has been done. Company claims an outcrop of red copper ore more than 1,000′ wide, which seems an unduly

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optimistic statement. Is said to have a 200-ton mill and a 100-ton smelter, but statement not verified. Presumably idle.

EMPIRE SMELTING CO. **ARIZONA.**

Dead. Property sold, under foreclosure, Sept. 15, 1906, to Walter F. Wilje, for $16,193. Formerly at Benson, Cochise Co., Ariz.

EMPIRE & STAR MINING, MILLING & SMELTING CO. **WYOMING.**

Dead. Succeeded by Hecla Mining Co. Formerly at Hecla, Laramie Co., Wyo.

EMPIRE STATE MINING CO. **ARIZONA.**

Dead. Succeeded by Empire Mining Co. Formerly at Bisbee, Cochise Co., Ariz.

EMPIRE TUNNEL & GOLD MINING, MILLING & TRANSPORTATION CO. **COLORADO.**

Office: Georgetown, Colo. Mine offices: Empire, Clear Creek Co., Colo., and Leadville, Lake Co., Colo. Frank A. Maxwell, president and manager; Clarence Jarbeau, secretary. Property includes the Empire tunnel and gold mines, at Empire, and the Cloud City mine, at Leadville, carrying auriferous and argentiferous copper and lead sulphides. Has water power at Empire, and steam power at Leadville. Has a 50-ton concentrator, employing circa 30 men.

EMPRESS MINING CO. **ARIZONA.**

Dead. Merged in Great Belcher of Arizona Co. Formerly at Belcher, Yavapai Co., Ariz.

ENCAMPMENT BOSS MINING & MILLING CO. **WYOMING.**

Dead. Was organized September, 1906, under laws of Wyoming, property being the Boss group, adjoining the Itmay. Formerly at Encampment, Carbon Co., Wyo.

ENCAMPMENT MINING CO. **WYOMING.**

Dead. Lost lands, 1903. Formerly at Encampment, Carbon Co., Wyo.

ENCINITAS COPPER & SMELTING CO. **CALIFORNIA.**

Mine office: Encinitas, San Diego Co., Cal. J. Andrew Wauchope, superintendent. Supposedly has a concentrator. Presumably idle.

ENCINITO COPPER CO. **CALIFORNIA.**

Dead. Was succeeded, circa 1905, by Encinitas Copper & Smelting Co. Formerly at Encinitas, San Diego Co., Cal.

ENGELS COPPER MINING CO. **CALIFORNIA.**

Office: 421 Market St., San Francisco, Cal. Mine office: Taylorsville, Plumas Co., Cal. Lands, in Light's Cañon, 3 miles northeast of Taylorsville, adjoining the Superior mine, have a crosscut tunnel running into Iron Cap Mountain, showing sulphide, carbonate and silicate ores, assaying well in copper, gold and silver.

ENGLISH & AUSTRALIAN COPPER CO., LTD. **AUSTRALIA.**

Office: 17 Gracechurch St., London, E. C., Eng. Works offices: Port Adelaide, South Australia, and Waratah, Newcastle, N. S. W., Australia. John Harvey, chairman; Wm. Owen Robinson, deputy chairman; preceding officers, W. S. Cuff and W. Russell, directors; G. E. C. Clarke, secretary; F. S. Chany, general manager; Thos. Johnson, smelter superintendent. Organized 1851, and reorganized March 15, 1864, under laws of Great Britain, with capitalization reduced to £150,000, shares 30s. par; issued, £102,988 10s. Debentures, £35,000, at 6%, due January, 1912. Dividends have been as follows: 6d. in 1901; 1s. each in 1902, 1903, 1904, 1905, 1906 and 1907. Net profits were £4,210 in 1906 and £4,055 8s. 6d. in 1907.

Property includes smelting works at Waratah and Port Adelaide, employing circa 100 men, also an interest of 3,904 shares in the Clara St. Dora

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Copper Mining Co., principal value of latter being in the way of supplying ore to the smelters.

ENTERPRISE COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Barossa, South Australia. Lands, freehold, 2 miles from Williamstown, have a 4′ quartz vein, with footwall paystreak of 6″ to 8″ carrying melaconite, malachite and chalcopyrite, all with good silver values, opened by a 200′ main shaft. Has steam power and a hoist. Property was worked, many years ago, then shipping a little ore of 40 to 50% copper tenor.

ENTERPRISE MILL & MINING CO. **COLORADO.**

Dead. Was succeeded by Enterprise Mining Co., which was merged, circa 1907, in the Swarthmore Consolidated Mining Co. Formerly at Eldorado, Boulder Co., Colo.

ENTERPRISE MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Tonopah, Nye Co., Nev. At last accounts was prospecting a property in the Lone Mountain district, circa 16 miles southwest of Tonopah, having an 86′ shaft showing a vein of 4′ to 8′ width, giving average assays of $12 to $60 per ton in gold, silver and copper. Presumably idle.

ENTERPRISE MINING & MILLING CO. **NEW MEXICO.**

Office: care of W. B. DeShon, secretary and treasurer, Pittsburg, Pa. Mine office: Cooney, Socorro Co., N. M. Geo. A. Freeman, vice-president and general manager. Lands, 2 claims, known as the Kat and Kittens, also the Enterprise group, having a 130′ shaft showing a 4′ ore body and a 200′ shaft bottomed in a 10′ vein carrying values mainly in gold. Has a 150-light electric plant. A 25-ton concentrator and 50-ton cyanide plant were burned June, 1908, at an estimated loss of $33,000, with $20,000 insurance.

ENTERPRISE MINING, REDUCTION & IMPROVEMENT CO. **ARIZONA.**

Office and mine: Kingman, Mohave Co., Ariz. Maj. W. A. Mensch, president, treasurer and general manager; M. L. Summers, vice-president; S. A. Mensch, secretary; preceding officers, J. N. Turrentine, F. M. Townsend, Arthur Gleason and E. E. Engeart, directors. Organized July 15, 1900, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, $1,165,000. Annual meeting, first Tuesday after first Monday in January.

Lands, 15 claims, area 300 acres, in the Maynard district of the Hualapai Mountains, adjoining the Arizona Le Roy Copper Mining Co., circa 30 miles southeast of Kingman and about 13 miles from the Santa Fé railroad, with a good wagon road connecting, lands being well watered, with timber available. Property shows 7 ore bodies, in granite and porphyry, one, under development, known as the American vein, being estimated at 30′ average width, opened by a 200′ shaft, with 1,410′ of workings, estimated to show 70,000 tons of ore, with 40,000 tons blocked out, carrying bornite, chalcopyrite and tetrahedrite, averaging 7% copper, 25% lead and 206 oz. silver, and from $4 to $8 gold per ton, which estimates are unduly high. Has a 35-h. p. steam plant, with 8 mine buildings. Company plans continuous development.

EPHIA MINING CO. **MEXICO.**

Office and mine: Douglas, Cochise Co., Ariz. W. F. Nihart, general manager. Organized 1906, under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, circa 20 miles from a railroad, are in the Nogal de Carrizo district of Arizpe, Sonora, Mexico. Has an 80′ shaft, showing ore assaying up to 27.5% copper and 55 oz. silver per ton. Presumably idle.

EQUATOR MINING & SMELTING CO. **ARIZONA.**

Office: 49 Wall St., New York, N. Y. Mine office: Jerome, Yavapai Co., Ariz. Hon. Wm. A. Clark, president; Jas. A. Macdonald, vice-president; Harry H. St. Clair, secretary and treasurer; preceding officers, Chas. W. Clark and

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Jas. H. Anderson, directors. Organized March 19, 1900, under laws of West Virginia, with capitalization $500,000, shares $5 par; issued, $275,000. *Annual meeting*, third Monday in February.

Property, commonly known as the Iron King mine, is on Equator Hill, in the Agua Fria district, south of Jerome, 4 miles by trail or 6 miles by wagon-road. Property shows a mineralized zone up to 600′ in width, with north and south strike, traceable for upwards of 1,000′. It was feared that *the ore body* was a blanket vein, but diamond drill borings proved it to hold to depth, carrying auriferous and argentiferous copper ores. Mine has a 300′ main shaft, and a 5,000′ gravity tram-line connecting the portal of the upper tunnel with the roast-yard of the reduction plant.

Property had a 250-ton smelter, and production, 1904, was circa 800,000 *lbs. fine* copper, but operations were suspended August, 1905, smelter dismantled and machinery removed.

EQUITABLE COPPER CO. **WYOMING.**

Office: Altoona, Pa. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. A. Brile, president; Geo. W. McWilliams, *Jr.*, secretary and general manager; A. L. Ritchie, superintendent. Organized 1907. Lands, 9 lode claims, area 180 acres, and 320 acres of placer claims, known as the Mountain View group, between Battle Creek and Roaring Fork, near the Itmay mine, showing a vein in limestone with gossan capping, opened by a 50′ shaft. Has a 30-h. p. steam plant and several mine buildings. Presumably idle.

EQUITY COPPER & GOLD MINING CO. **OREGON.**

Office: care of Rev. W. J. Hughes, president and general manager, Baker City, Ore. Mine office: North Powder, Union Co., Ore. F. M. Saxton, vice-president; Kate Palmer, secretary; G. J. Bowman, treasurer; preceding officers, E. L. Hughes, H. A. Kenyon, R. W. Hughes, J. Hamilton Smith and R. T. Roberts, directors. Capitalization $150,000. Lands, 8 gold claims, in the Quartzburg district of Grant County, and 10 copper claims, known as the Equity group, circa 6 miles from North Powder, having a 200′ crosscut tunnel.

ERIE & COLORADO COPPER CO. **COLORADO.**

Office: care of Henry Tibbals, secretary and treasurer, Erie, Pa. W. A. Walker, president; Ernst Behrend, vice-president. Lands, 160 acres, patented, somewhere in Boulder County, Colorado, slightly developed and presumably *idle*.

ERIE CONSOLIDATED MINING & REDUCTION CO. **MICHIGAN.**

Dead. Name changed from Wahnita Copper Co. Both fraudulent. Formerly at Matchwood, Ontonagon Co., Mich.

ERIE COPPER MINING CO. **UTAH.**

Dead. Formerly at Milford, Beaver Co., Utah. Fully described Vol. VI.

ERIEGA COPPER & COAL MINING & SMELTING CO. **MONTANA.**

Dead. Formerly at Bozeman, Gallatin Co., Mont. Fully described Vol. VI.

ERIE-ONTARIO DEVELOPMENT CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, vice-president; Jas. Chynoweth, superintendent. Organized January, 1905, with capitalization $50,000, shares $10 par, fully paid.

Lands, 640 acres, held under option, including the old Erie and Ontario *mines, midway* between the Champion and Winona mines. The tract shows a copper bed, supposedly a continuation of the Baltic amygdaloid, opened by a 148′ shaft, sunk at 68°, running into the hanging wall, which shows a bed of about 25′ width, carrying considerable epidote, but little copper. Machinery includes a 500′ hoist and 4-drill air-compressor, and some diamond drilling

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was done, 1907, from the bottom of the shaft. Operations suspended, 1907, by reason of lack of funds.

COMPAÑIA MINERA ESCUADRA, S. A. MEXICO.

Mine office: Ocotlán de Morelos, Oaxaca, Mex. Thos. A. Hamilton, manager. Has good silver and copper ores, latter being practically a by-product only. Employs about 150 men.

ESCURIAL COPPER MINES, LTD. SPAIN.

Offices: 4 Union Court, London, E. C., Eng., and Pelayo, 2, Barcelona, Spain. Mine office: Calmenarijos, Madrid, Spain. Jas. Taylor, chairman; Joaquin Lorena, mine manager; Henry N. Gardiner, secretary. Organized Oct. 17, 1901, under laws of Great Britain, with capitalization £125,000, shares £1 par; issued, £109,177. Lands, 342 acres, held under perpetual lease from the Spanish Government, including the Gloria, Ramón, Jaime and Nuestra Señora del Pilar mines. Work is confined to the latter, which shows 8 ore bodies and was worked by the ancients, either Romans or those who preceded them, to a depth of 135', by 3 shafts, with several drifts. Sundry small shipments of selected ore from the Pilar mine have given returns of 7.73 to 20.36% copper. Property considered promising.

NEGOCIACIÓN MINERA ESMERALDA. MEXICO.

Mine office: Chalchihuites, Sombrerete, Zacatecas, Mex. Leopoldo Viadero, manager. Property includes the Anaconda, Esmeralda and La Luz mines, developed by shafts and tunnels, and producing argentiferous and auriferous lead and copper ores. Employs about 75 men.

COMPAÑIA MINERA ESMERALDA DE COLLAHUASI. CHILE.

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized Dec. 21, 1905, under laws of Chile, with capitalization 200,000 pesos, shares 100 pesos par.

ESMERALDA COPPER CO. NEVADA.

Dead. Lands were circa 100 acres, vein carrying argentiferous and auriferous copper ore of good average tenor, being proven, at intervals, by trenching, for a distance of circa 4,500', having 4 shafts, deepest 74'. Formerly at Luning, Esmeralda Co., Nev.

ESMERALDA COPPER MINING & SMELTING CO. MEXICO.

Mine office: Santa Catarina del Norte, Baja California, Mex. Fred W. Burns, superintendent. Mine, known as La Esmeralda, is opened by shaft, with considerable development, and shipped some ore previous to 1902. Presumably idle.

ESMERALDA COPPER PRECIPITATING CO. ARIZONA.

Dead. Formerly at Ryan, Coconino Co., Ariz. Described Vol. VII.

ESMERALDA MINE. AUSTRALIA.

Mine office: Rockley, N. S. W., Australia. Has a 100' shaft, with a vein of circa 10' width, carrying ore averaging 8 to 10% copper tenor.

ESPAÑOLA COPPER SYNDICATE, LTD. SPAIN.

Office: St. Helen's Place, London, E. C., Eng. Stanlake Lee and T. S. Marshall, joint managers. Organized Jan. 6, 1906, under laws of Great Britain, with capitalization £500, shares 1s. par, fully issued. Property, in province of Huelva, Spain, formerly owned by Spanish Minerals Development. Ltd., is supposed to have been sold to Esperanza Copper & Sulphur Co., Ltd.

SOCIEDAD MINERA ESPAÑOLA DEL NORTE DE ESPAÑA. SPAIN.

Mine office: Herrera de Rio Pisuerga, Palencia, Spain. Don Federico Villanueva, president. Organized 1902. Lands include various concessions carrying coal, iron and copper. Presumably idle.

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COMPAÑIA MINERA ESPERANZA y CONSTANCIA. **MEXICO.**

Mine office: Sierra Mojada, Monclova, Coahuila, Mex. Guillermo Hagemann, manager. Operates La Fortuna and San Antonio mines, former opened by a 350′ shaft, equipped with steam power. Has argentiferous lead and copper ores. Employs about 75 men.

ESPERANZA COPPER CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. M. G. Samaniego, president; Arturo M. Elias, vice-president; H. C. Young, secretary; Francis M. Hartman, treasurer and manager. Capitalization $600,000, shares $1 par. Lands, 6 claims, area 90 acres, known as the Esperanza group, 35 miles from a railroad, in the Cañada del Oro district, Catalina Mountains, developed by about 1,000′ of workings, greatest depth 75′, showing carbonate and sulphide copper ores.

ESPERANZA COPPER & SULPHUR CO., LTD. **SPAIN.**

Office: 74 Palmerston House, London, E. C., Eng. Mine office: Almonáster, Huelva, Spain. Robt. J. Price, M. P., chairman; Jos. Pasfield, secretary; Addie & Pringle, consulting engineers. Organized Feb. 14, 1906, under laws of Great Britain, with capitalization £350,000, shares £1 par, as successor of Spanish Minerals Development Co., Ltd. Debentures, £100,000, at 5%, redeemable not later than 1916, at 110, by annual drawings of 20% of profits.

Lands, 476 acres, known as the Esperanza group, carrying cupriferous pyrites, circa 40 miles from Huelva, property including the Esperanza and Angostura mines, which are the most developed, also the Nueva, Mosquitos, Forzosa, Santo Tomás and Palmira minés. Some of these properties have been worked from very ancient times, mainly on a very small scale, showing characteristic narrow Roman shafts, with footholes alternately on either side for ingress and egress of miners.

The Esperanza mine is estimated to show circa 100,000 tons of ore of all grades, averaging 40.5% sulphur. There also is considerable ore developed by the Forzosa and San Esteban tunnels. Ore is divided into three classes, the lower grade carrying mainly sulphur values.

A railroad is building to pass the eastern end of the property, and the company is constructing a narrow-gauge line to connect therewith. Production, 1907, was circa 50,000 long tons of ore, and, for the first nine months of 1908, was 68,840 tons. Production of fine copper, 1907, is estimated at 1,200,000 lbs. Property is considered promising.

ESPERANZA MINING CO. **MEXICO.**

Office: care of W. R. Nicholson, president, Land Title Bldg., Philadelphia, Pa. Mine office: Ensenada, Norte, Baja California, Mex. Geo. P. Brown, general manager; Harold Playter, superintendent; D. A. Conolly, smelter superintendent. Lands, 83 pertenencias, also 40 acres miscellaneous lands, on Cedros Island, on the west coast. Country rock is diorite, showing 3 lenticular ore bodies, carrying carbonate and sulphide ores, estimated by company to average 40′ width, 300′ depth and 1,100′ length, and to contain an average of 2.5% copper, 3% zinc, 2 oz. silver and $3.50 gold per ton. Mine has been extensively developed, having about 8,500′ of workings, showing circa 150,000 tons of low-grade ore, with about 100,000 tons blocked out for stoping. Property was opened 1891, closed 1901, reopened 1905. Surface gold ores change to basic copper ores at depth. Property has produced about $450,000 in values, from shipment of high-grade ores to smelters at Denver, Pueblo, San Francisco and Tacoma. A reduction plant started at the mine is planned to have a 50-ton blast-furnace, to turn out matte carrying about 16% copper, 6 oz. silver and 1.5 oz. gold, to be sent to Tacoma for refining.

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Fuel at smelter is coke, costing $18 per ton. Production, 1905, was circa 275,000 lbs. fine copper. Presumably idle.

MINAS ESPARANZA y VISITACION. **SPAIN.**

Mine office: Albarracín, Teruel, Spain. D. Santiago Maorad, owner. Property is sundry iron mining lands, on which a promising lense of copper ore was discovered, 1903. Presumably idle.

ESPIE BAY MINES DEVELOPMENT SYNDICATE, LTD. **TURKEY IN ASIA.**

Dead. Voluntarily wound up, June, 1904. Formerly at Tereboli, Trebizond, Turkey in Asia.

JOSÉ RAMÓN ESPINOZA. **CHILE.**

Office and works: Petorca, Aconcagua, Chile. Mine office: Las Palmas, Petorca, Aconcagua, Chile. Works office: Pedegua, Petorca, Aconcagua, Chile. Lands include Las Reices mine, 60 meters deep, which in 1903 produced 537 metric tons of ore of 13% copper tenor, and La Louisa mine, 150 meters deep, which, 1903, produced 300 metric tons of 5% copper ore. Cement copper, made by leaching mine waters, also is produced, in small quantities. Mines, slightly developed, show large quantities of low grade ore, unavailable commercially until railroad transportation, now lacking, is secured.

Has 2 smelters, El Cantarito at Petorca, and El Hueso at Pedegua. El Fundicion Cantarito, 13 miles north of Cabildo, has 1 reverberatory and 1 blast-furnace, burning wood, at cost of 6 pesos per metric ton, nearly 3 tons of wood being required to smelt 1 ton of mineral, producing Chile bars of 90% tenor, with slags averaging 1% copper. Works about half time, employing circa 40 men when running, at average wages of 1 peso daily.

El Fundicion Hueso, at Pedegua, 24 kilometers north of the railroad station at Cabildo, has a single reverberatory furnace, burning wood, employing, when working, circa 50 men, at average wages of 1 peso daily. Installation of a blast-furnace is contemplated. Production, 1903, was 264,243 pounds fine copper.

ALEXANDER ESQUER y CA. **MEXICO.**

Mine office: Baroyeca, Alamos, Sonora, Mex. J. J. Esquer, manager. Property is the Mexicána, Esperanza and other mines, developed by shafts and tunnels, carrying auriferous and argentiferous copper ores.

ESSEX COPPER CO. **MICHIGAN.**

Office: care of Marmaduke Richardson, president, 12 John St., New York, N. Y. Alfred Meads, agent. Lands, which included the old Norwich mine, Ontonagon county, Michigan, were sold, circa 1901, and company is being liquidated. Paid $1 per share, 1906, and a further dividend is to be paid.

ESTERBROOK MINING CO. **WYOMING.**

Office and mine: Douglas, Converse Co., Wyo. Geo. W. Metcalf, president; John Foxton, secretary and treasurer. Organized 1897, under laws of Wyoming, with capitalization $10,000; reorganized Sept. 9, 1903, with capitalization $1,000,000. Lands, 120 acres, also 120 acres miscellaneous lands, in Albany county, Wyoming, about 40 miles south of Douglas, showing a 4' fissure vein, in country rocks of diorite, schist and granite, giving assays of 2 to 4% copper, 25 to 30% lead, 2 to 4 oz. silver and $1 to $2 gold per ton, from cerussite, galena, cuprite and chalcopyrite. Has 2 short tunnels and 5 shafts, deepest 284'.

ESTEY MINING & MILLING CO. **NEW MEXICO.**

Dead. Succeeded, circa 1902, by Dividend Mining & Milling Co. Formerly at Estey, Socorro Co., N. M.

NUEVA SOCIEDAD PROPRIETARIA LA ESTRELLA. **SPAIN.**

Dead. Formerly at Los Martires, Granada, Spain.

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SOCIEDAD GRANADINA LA ESTRELLA. **SPAIN.**

Dead. Lands sold, circa 1907, to La Estrella Copper Mines, Ltd. Formerly at Los Martires, Granada, Spain.

SOCIÉTÉ ANONYME LA ESTRELLA. **SPAIN.**

Office: 161 Boulevard Haussmann, Paris, France. Mine office: Los Martires, Grenada, Spain. Capitalization, 200,000 francs. Lizardo González, vice-president; Louis Vardón, agent; Huberto Meersmans, general manager; Antonio Melián, superintendent. Property includes La Jerezana, El Ensueño and other copper mines, at Los Martires, which were undergoing developments at last accounts; an argentiferous copper group at Alpujara, Granada, and an argentiferous copper group at Trevelez.

ESTRELLA MINING CO. **UTAH.**

Dead. Formerly at Milford, Beaver Co., Utah. Described Vol. VI.

ETHEL CONSOLIDATED MINES CO. **WASHINGTON.**

Office and mine: Index, Snohomish Co., Wash. Geo. A. Pounder, president and general manager, at last accounts. Organized 1902, with capitalization $3,500,000, shares $1 par, as merger of Ethel Copper Mining Co. and John D. Copper Co. Lands, 37 contiguous claims, carrying 21,000' of the strike of the vein. The Ethel group has a 2,000' tunnel, showing a considerable body of low-grade oxidized ores, bornite and chalcopyrite, with quartz gangue, claimed to average 4% copper, with small gold and silver values. Has a Pelton water-wheel and 75-ton concentrator, latter, connected with mine by a 4,000' gravity tram, having a crusher, rolls and Huntington mill. Ores slime badly in concentration. Company began the payment of 1% monthly dividends in 1903, and mine was shut down shortly thereafter. Property under option to McAllister-Rowland Copper Mining Co. Idle at last accounts.

ETHEL COPPER MINING CO. **WASHINGTON.**

Dead. Succeeded, 1902, by Ethel Consolidated Mines Co. Formerly at Index, Snohomish Co., Wash.

ETHEL GOLD MINING CO. **COLORADO.**

Dead. Formerly at Turret, Chaffee Co., Colo. Described Vol. VI.

ETRUSCAN COPPER ESTATES, LTD. **ITALY.**

Office: 139 Queen Victoria St., London, E. C., Eng. Mine office: Campiglia Marittima, Tuscany, Italy. E. J. Vavasour Earle, chairman; Henry Pope, secretary; E. Hibbert, general manager; R. C. Alabaster, superintendent. Organized Dec. 13, 1900, under laws of Great Britain, and reorganized Dec. 7, 1904, under same title, with capitalization £575,000, shares £1 par, fully issued. Debentures, £199,000, at 6%, redeemable at 105, March, 1912, or earlier, at company's option; also £24,000 second-mortgage debentures, at 6%, payable July, 1912. In July, 1907, first-mortgage debenture holders received second-mortgage debentures, in payment of 2 years' accumulated interest, and payment of interest on second-mortgage debentures, due January, 1908, was postponed until July, 1908. Company also is supposed to have a considerable floating indebtedness.

Lands, 2,000 acres freehold, and 600 acres held under perpetual mining rights, including the old Lanzi, Temporino and Rombola mines. These properties show numerous and extensive old workings, certainly as ancient as the Roman era, and probably dating back to Etruscan times. During the Nineteenth Century various Italian, French and English companies attempted, without success, to work these mines, which are honeycombed by ancient inclines, adits, drifts, winzes and stopes. The property was examined by C. Algernon Moreing, Edgar P. Rathbone, R. J. Frecheville, Alexander Hill and J. H. Fawcett, all of whom reported unfavorably. For statements made by Mr. Moreing, the company sued his firm, but dropped the suit, for good reasons. Mr. Faw-

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cett examined the mine, and accepted the management, but resigned shortly after, and recovered damages of £250 from Mr. Earle, for slander. Mr. Earle, the chairman, considers all experts incompetent, relying for mining knowledge upon his own extensive experience as a manufacturer of cement, this, of course, having given him a peculiarly fitting training for acting as the head of a copper mining company, as is shown by the fact that Mr. Earle, his friends and followers, have spent about £500,000 on this property, which probably is worth at least a penny in the pound.

The company claims to have 4 cupriferous veins, of 60′ to 120′ width, nearly parallel and traceable 1½ miles, but all competent experts agree that the ore bodies, while extensive, are pockety and uncertain, while the principal values unquestionably were removed by the ancients. The present company has sunk on the Cava del Piombo mine the Walter vertical shaft, of 75 meters depth, having a 13-meter headgear and duplex hoist, this shaft showing extensive old workings—more workings than ore. Operations have been suspended on the west vein. The Govett shaft, of 100 meters depth, shows extensive old workings, with little ore. The Earle shaft, formerly the Coquand, 90 meters in depth, appropriately renamed after the chairman of the company, shows extensive workings, and little else. Le Marchant shaft, of 30 meters depth, shows a little chalcopyrite, disseminated in pyrite, with amphibole gangue. While the property is called a copper mine, it seems the practically unanimous opinion of experienced engineers that the principal values, doubtful as these may be, are in lead and zinc, rather than in copper.

The reduction works, at Rombola, are connected by rail with the mines at Lanzi and Temporino. The plant includes a concentrator and smelter, latter having a copper furnace of 100 tons nominal daily capacity.

Despite the claims of the management that the ore returned 2.68% copper, analysis of the figures shows returns of but 1.5% copper for the first 5 years, when only 625 long tons of metal were produced. For July, 1906, the company smelted 2,565 long tons of ore, said to have given returns of 2.19% copper, with average slag losses of 0.2%.

The Etruscan Copper Estates, Ltd., is one of the best examples extant of a perfectly bad management. There is no suspicion of dishonesty, but there is the amplest evidence of utter incapacity, and a density of intellect that scarcely could be looked for in a civilized country. The stone age produced better miners.

EUCLID DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Benson, Cochise Co., Ariz.

EUREKA CONSOLIDATED COPPER CO. **NORTH CAROLINA.**

Mine office: Gold Hill, Rowan Co., N. C. J. E. Manter, president; P. E. Eaton, treasurer; Walter George Newman, manager. Organized Dec. 1, 1906, under laws of Maine, with capitalization $10,000,000. Lands, circa 3,500 acres, including the Troutman and Stockton mines, near the Gold Hill Copper Co.

EUREKA CONSOLIDATED MINING CO. **MEXICO.**

Dead. Succeeded by Don Carlos & Eureka Consolidated Copper Co. Formerly at Nombre de Dios, Durango, Mex.

EUREKA CONSOLIDATED MINING CO. **NEVADA.**

Dead. Merged, 1905, in Richmond-Eureka Mining Co. Formerly at Eureka, Eureka Co., Nev.

EUREKA COPPER CO. **ARIZONA.**

Dead. Formerly at Globe, Gila Co., Ariz.

EUREKA COPPER MINES, LTD. **BRITISH COLUMBIA.**

Office and mine: Nelson, Kootenay district, B. C. J. J. Malone, president; A. B. Ritchie, vice-president; L. B. Reynolds, managing director; H. Y.

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Anderson, secretary and treasurer; preceding officers and R. Bowlby, directors. Organized March 2, 1906, under laws of British Columbia, with capitalization $250,000, shares 25 cents par; issued, $197,500.

Lands, 7 claims, 3 fractional, area 250 acres, showing 5 ore bodies, of which one, opened by a 200′ shaft, shows carbonate and sulphide ores estimated to average 5.5% copper and 0.21 oz. gold per ton. Has a 40-h. p. steam plant, Lidgerwood hoist and 5 small mine buildings. In 1907 shipped 890 tons of smelting ore, netting $15,806.11. Company plans continuing development work and building a tramway.

EUREKA COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

EUREKA DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. VII.

EUREKA DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Tucson, Pima Co., Ariz.

EUREKA DIAMOND DRILL MINING CO. **CALIFORNIA.**

Office: 303 Union Savings Bank Bldg., Oakland, Cal. Letter returned unclaimed from former mine office, Jackson, Amador Co., Cal. Capitalization $75,000, in $25,000 preferred and $50,000 common shares, $1 par. Lands, 8 claims, area 150 acres, 4 miles west of Jackson, having a 60′ shaft showing ore assaying 20% copper, 5 oz. silver and $20 gold per ton.

EUREKA EXPLORATION CO. **COLORADO.**

Office: Sioux City, Iowa. Mine office: Eureka, San Juan Co., Colo. Theodore Ivens, manager. Property, known as the Ridgeway group, carries auriferous and argentiferous lead and copper ores. Has steam and water power and a 10-stamp mill.

EUREKA GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. C. W. Woods, president; H. M. Gibbs, secretary and treasurer; Thos. Taylor, general manager and lessee. Lands, 8 claims, 7 miles south of Jerome, near the Iron King mine, opened by tunnel showing a 30′ vein with an 8′ paystreak carrying auriferous bornite and chalcopyrite, with occasional visible gold, but has not developed ore in commercial quantities. Lands were bonded to Thos. Taylor, and mine resumed work June, 1907, after several years' idleness.

EUREKA HILL MINING CO. **UTAH.**

Office: 11 East First South St., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Moylan C. Fox, president; Geo. W. Riter, secretary and managing engineer. Organized Nov. 12, 1875, under laws of Utah, with capitalization $1,000,000, shares $100 par. Is a close corporation. Has paid considerable dividends, but accounts are not published. Annual meeting, third Tuesday in February. Lands, 5 claims, area 27 acres, patented, also a 25-acre millsite and 100 acres miscellaneous lands, in the Tintic district. Mine, extensively developed, has a 1,500′ main working shaft, and about 25 miles of workings. Ore bodies are lenticular deposits, carrying cuprite, malachite and enargite, with average values of about 1.4% copper, 6% lead, 25 oz. silver and $3 gold per ton. There is a 450-h. p. steam plant at the mine, and a 500-h. p. steam plant at the mill. Main hoist is 16x48′, good for 1,600′ depth, and equipment includes a 30-drill Norwalk air-compressor. Buildings, 16 in number, include a 30x50′ frame machine shop, 30x40′ frame carpenter shop, frame smithies of 30x30′ and 30x40′, and a 30x60′ foundry. The reduction plant includes a 25-ton combination mill, with concentrator and pan-amalgamation mill combined, in a 240x250′ wooden building, having 100 gravity stamps, 2 Blake crushers, 2 Gates centrifugal crushers and 50 vanners. The amalgamating plant has 32 pans. Company has a sawmill. Production is principally

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silver and lead, copper being secured as a by-product. Latest reported copper production was 134,000 lbs., in 1904. Production, 1907, was 200 carloads of ore.

EUREKA MINE. **ARIZONA.**

Office and mine: care of I. N. Kinsey, lessee, Globe, Gila Co., Ariz. D. D. Sullivan, superintendent. Lands, 8 miles west of Globe, in vicinity of Inspiration and Live Oak mines, carry silicious ores of 5 to 6% copper tenor, and shipments were made, 1906-1907, to Old Dominion and Calumet & Arizona smelters, for fluxing purposes. Production, 1907, was 528,000 lbs. fine copper.

EUREKA MINE. **CALIFORNIA.**

Office and mine: care of H. F. Dimock, Corrville; Trinity Co., Cal. Lands, 2 claims, in Sections 17 and 18, T. 37 N., R. 7 W. Ore, silicious and low in grade, is slightly developed by a 50′ tunnel. Idle for several years.

EUREKA MINE. **HONDURAS.**

Mine office: Orica, Tegucigalpa, Honduras. At last accounts was a small producer of gold, silver and copper.

EUREKA MINING & MILLING CO. **ARIZONA.**

Office: P. O. Box 552, Tombstone, Ariz. Mine office: Ft. Huachuca, Cochise Co., Ariz. O. B. Steen, president; E. P. Draper, vice-president; F. W. Goodbody, secretary; F. N. Wolcott, treasurer. Lands, 7 claims, in 2 groups. The Copper Glance group, opened by tunnels, is claimed to have shipped more than $100,000 worth of ore and concentrates averaging 27% copper, 184 oz. silver and $6 gold per ton. The Eureka group has produced about $15,000 worth of ore. Property considered valuable, but is idle, and the company is a dead-beat and apparently moribund.

EUREKA MINING, SMELTING & POWER CO. **OREGON.**

Office: P. O. Box 53, Clarkston, Wash. Mine office: Imnaha, Wallowa Co., Ore. W. E. Howard, secretary; G. E. Nehrhood, superintendent. Lands, 40 claims, patents applied for, but adverses filed, poorly located for transportation. Company claims to have well developed mines, with much ore in sight and on the dump, but apparently this is either a mistake or something worse, sundry shareholders alleging grossly fraudulent misrepresentations by the management while selling stock. Idle since circa 1905 and apparently moribund.

EUREKA-SWANSEA EXTENSION MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jesse Knight, president; Richard B. Shepard, vice-president; W. Lester Mangum, secretary and treasurer; preceding officers, Jacob Evans and Will Knight, directors. Lands, 140 acres, patented, adjoining the Centennial-Eureka.

EUSTIS MINING CO. **QUEBEC.**

Mine office: Sherbrooke, Sherbrooke Co., Que. F. C. Davis, superintendent. Mine has a 2,000′ incline shaft, sunk at 20° to 45°, and a long crosscut tunnel, showing lenses of cupriferous pyrite in schistose rocks, mined primarily for making of sulphuric acid, but carrying appreciable values in copper. Equipment includes an electric hoist with 6′ drums, and a hydro-electric power plant with 2 alternators mounted on same shaft, run in parallel, driven by turbine water-wheels, one 150-kw. generator and one 200-kw. generator, using a 3-phase, 25-cycle, 2,200-volt current, with electric efficiency of 90 to 93% for alternators, and efficiency of 60 to 80% for water-wheel, according to load. Has a mill for preparing ore for shipment to the acid plant of the company in New Jersey.

EVANGELINA COPPER MINING CO. **MEXICO.**

Office: 202½ So. Broadway, Los Angeles, Cal. Mine office: Santa Catarina del Norte, Baja California, Mex. D. R. Wilder, president; J. H. Coleman vice-president; Josephine H. Wilder, secretary and treasurer; Tomás Vidaurraza, superintendent. Lands, circa 150 acres, carrying a fissure vein of 3″ to

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6′ width. Has steam power. Idle.

EVANS-TANZER CONSOLIDATED COPPER CO. **CALIFORNIA.**

Dead. Formerly at Lavic, San Bernardino Co., Cal.

EVANSTON MINING CO. **MEXICO.**

Mine office: Gabriel, San Juan del Rio, Durango, Mex. J. B. Davis, manager; F. Boland, superintendent. Property, known as La Purísima group, carries auriferous copper and argentiferous lead ores. At last accounts employed a considerable force.

EVELYN MINING & LEASING CO. **COLORADO.**

Mine office: Leadville, Lake Co., Colo. Morris Sterne, manager. Has argentiferous and auriferous lead, copper and zinc sulphides. Has steam power.

EVENING STAR MINING CO. **WYOMING.**

Dead. Formerly at Riverside, Carbon Co., Wyo. Described Vol. VII.

EVERGREEN BLUFF MINING CO. **MICHIGAN.**

Dead. Was succeeded by Evergreen Mining Co. Formerly at Mass, Ontonagon Co., Mich.

EVERGREEN-EUREKA GOLD & COPPER CO.

Dead. A fake that peddled stock, accompanied by a personal "guaranty" of 5% dividends, and a 10-year bond against loss. Formerly had an office at 31 Union Square, New York, N. Y.

EVERGREEN GOLD & COPPER MINES CO. **COLORADO.**

Office: Empire Bldg., Denver, Colo. Mine office: Apex, Gilpin Co., Colo. Dr. W. H. Grayson, president and manager; W. C. Hollister, secretary and treasurer. Organized 1904, under laws of Colorado, with capitalization $500,000, shares $1 par. Lands, 6 claims, 3 patented, area 33 acres, also a 10-acre placer claim and quarter-acre millsite, in the Pine Creek district, showing 2 fissure veins, one opened by 3 shafts of 40′ to 80′ depth, and by tunnels of 850′ and 400′, showing a considerable body of low grade disseminated sulphide ore, with some malachite and tetrahedrite. Carload shipments, 1905, gave returns of 31% copper and 24 oz. silver per ton, from first grade ore, and 15% copper and 12 oz. silver from second grade ore. Has a Leyner air-compressor. A site has been graded for a 50-ton mill of 40x50′ size, to have rolls, Richards jigs and Card tables.

EVERGREEN MINING CO. **MICHIGAN.**

Office: 15 William St., New York, N. Y. Mine office. Mass, Ontonagon Co., Mich. Jos. E. Gay, president; John R. Stanton, secretary. Organized September, 1853, under laws of Michigan, with capitalization $500,000, shares $25 par, under name of Evergreen Bluff Mining Co., and reorganized, under present title, with capitalization $1,000,000, shares $25 par.

Lands, 600 acres, adjoining the Mass Consolidated on the east and the Ridge mine of the Mass Consolidated on the south. Mine was worked at intervals, 1854-1870, producing 1,351,174 lbs. fine copper, at a cost of $223,582.24.

In 1862 the predecessor of the present company deeded to the Ogima company, succeeded later by the Mass Consolidated, 16 acres of land from the northeast corner of its territory, adjoining the Ridge mine, to enable the Ridge to sink its shafts and work the bed lying north of the Evergreen lode, in exchange for which the Ogima transferred all right and title to the Evergreen bed under the entire Ogima territory to the Evergreen company, hence it follows that the Evergreen Mining Co. owns a portion of the Evergreen lode on the property of the Mass Consolidated. Idle since 1870.

EVERGREEN MINING & TUNNEL CO. **UTAH.**

Office: care of H. G. McMillan, manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. Lands are opened by tunnel with about 1,700′ of underground workings, claimed to

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show considerable copper ore of low grade. Idle for several years and company apparently moribund.

EVOLUTION-KEYSTONE MINING CO. **IDAHO.**

Letter returned unclaimed from former office, Missoula, Mont. Mine office: Osburn, Shoshone Co., Idaho. Mrs. J. McCormick, president; W. W. Woods, vice-president; A. E. Robinson, secretary; preceding officers, J. H. Nordquist and Edw. Lindsley, directors. Lands, in McFarren Gulch, adjoin the Gray and Verde mines. Surface shows rich stringers of silver-lead ore, opened by trenches. Has 2 tunnels, longest 400'.

EXCELSIOR COPPER CO. **ARIZONA.**

Dead. Was a swindle, perpetrated by the notorious Wm. F. Wernse gang. Formerly at Pima, Graham Co., Ariz. Described Vol. V.

EXCELSIOR COPPER CO. **QUEBEC.**

Mine office: West Broughton, Megantic Co., Quebec. Mine is developed open-cast and by shafts. Idle.

EXCELSIOR COPPER & GOLD MINING CO. **WYOMING.**

Dead. Formerly at Riverside, Carbon Co., Wyo.

EXCELSIOR GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Flagstaff, Coconino Co., Ariz.

EXCELSIOR MINING CO. **NEW MEXICO.**

Dead. Formerly at Organ, Donna Ana Co., N. M.

EXCELSIOR MINING & DEVELOPMENT CO. **NEW MEXICO.**

Office: St. Joseph, Mo. Mine office: Orogrande, Otero Co., N. M. A. D. Warnock, general manager. Lands include the Nashville and Three Friends claims, said to carry a 4' vein of 4% silver-copper ore, also lead carbonate up to 50% in tenor.

EXCELSIOR MINING & SMELTING CO. **NEVADA.**

Dead. Formerly at Yerington, Lyon Co., Nev.

EXCELSIOR MOUNTAIN COPPER CO. **NEVADA.**

Mine office: Hawthorne, Esmeralda Co., Nev. F. D. Qualey, president and general manager; J. H. Suits, secretary. Lands, 13 claims, area 260 acres, in process of patenting, 16 miles southeast of Hawthorne and 16 miles from Sodaville, the nearest railroad point, giving promising surface showings of copper for a distance of circa 9,000' along a contact between granite and limestone. Has several shallow shafts and about a dozen short tunnels, with one 500' tunnel showing ore averaging circa $8 gold per ton. Has a good power plant, with 12-drill air-compressor, and 15 mine buildings.

EXPECTATIVA MINING CO. **MEXICO.**

Office: care of W. R. Ramsdell, Guadalajara, Jal., Mex. Mine office: Ameca, Jalisco, Mex. Lands, 10 miles southwest of Ameca, show auriferous and argentiferous copper and lead ores, assaying up to 27% copper.

FAEO GRUBE. **NORWAY.**

Mine office: Haugsund, Christiania, Norway. Property is several small mines, having ore averaging about 4% copper tenor. Idle at last accounts.

FAIRVIEW MINING CO. **MONTANA.**

Dead. Formerly at Basin, Jefferson Co., Mont.

FALLS CREEK MINING CO., LTD. **BRITISH COLUMBIA.**

Office: care of R. H. Finley, secretary, Spokane, Wash. Mine office: Nelson, Kootenay district, B. C. L. H. Snyder, president and treasurer; J. M. Porter, vice-president; M. C. Monoghan, mine manager; preceding officers and J. P. Swedebery, directors. Organized 1907, under laws of Washington, with capitalization $1,500,000, shares $1 par, and registered under laws of British Columbia. Lands, 6 claims, 2 crown-granted, area circa 240 acres, adjoining

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the Queen Victoria mine, about 7 miles from Kootenay Lake, having a 30′ vein giving average assays of about 5% copper, with small gold values.

FALUN MINES. **SWEDEN.**

Owned by Stora Kopparberg Berslags Aktiebolag.

FAMATINA COPPER & GOLD SYNDICATE, LTD. **ARGENTINA.**

Dead. Succeeded, Jan. 21, 1903, by Famatina Development Corporation, Ltd. Formerly at Chilecito, Rioja, Argentina.

FAMATINA DEVELOPMENT CORPORATION, LTD. **ARGENTINA.**

Office: 56 Cannon St., London, E. C., Eng. Mine office: Chilecito, Rioja, Argentina. Capt. Wm. Bell McTaggart, D. L., J. P., chairman; preceding officer, Harry J. Meyerstein, A. W. Haschkel, Emilio N. Casares and Claude Lowther, directors; A. Dangerfield, secretary; John Taylor & Sons, consulting engineers; Arthur Thomas, superintendent; J. S. Pryor, sub-manager. Organized Jan. 21, 1903, under laws of Great Britain, as a reconstruction of Famatina Copper & Gold Syndicate, Ltd., with capitalization £400,000, shares £1 par; issued, £398,978. Debentures, £100,000 first-mortgage 6% bonds authorized, redeemable at 105; issued, £70,100, reduced, late 1907, to £40,650. Also has an issue of £50,000 income bonds, of £10 each, without interest, but repayable at face, plus 25% out of profits, within 7 years, with a bonus of £25 per bond, making £5 per annum repayable. Income bonds are being refunded into debentures. Has been sued for £61,750, with interest and costs, by heirs of C. Buxeiro.

Lands, circa 700 acres, in 4 groups, that include the 6 principal mines of the Famatina district, including the Upulungos group of 7 acres, the Mellizas group of 75 acres, the Compañía group of 15 acres, and the San Pedro group of 45 acres. The lands lie at an elevation of more than 16,000′, in the Mexicana district of the Famatina Mountains, being very rugged and difficult of access and transport. The property shows an intricate network of fissure veins traversing metamorphic slate, with 14 auriferous and argentiferous copper veins, of 4′ estimated average width, traceable circa 2 miles, the veins being numerous, narrow and rich, with ore occurring in irregular chutes. The Upulungos and San Pedro are the principal veins, these being about 1,000′ apart. The Upulungos lode is estimated to show 31,357 long tons of ore, averaging 3.67% copper, 14 oz. silver and 14.34 dwts. gold, the San Pedro ore being materially richer. Principal minor veins are the Andueza, Esperanza, Placilla and Verdeona. Ores are estimated to average 7.6% copper, 12.4 oz. silver and 10.5 dwts. gold per long ton.

The mine is developed mainly by the Sacovon Anita, but there are other tunnels, including the Restauradora. New openings, 1906, were 5,770′, and for the first 8 months of 1907 were 4,561′. The Pacifica and Forastera tunnels also are developing important ore bodies. Company estimated, September, 1907, that 137,214 tons of ore were developed.

Transportation between the mine and mill is by a Bleichert aerial tram, of circa 35 kilometers length, connecting with the railhead of the state road, with a difference in level, between terminals, of about 10,000′. The tram line has a capacity of circa 40 tons on down freight and 20 tons on up freight, and has reduced the average cost of transport from about 50s. per metric ton to circa 5s., a saving of about 90%. A branch ropeway was built, late 1907.

A hydro-electric installation, near the works, was nearing completion at last accounts, and should effect a material saving in power costs.

The smelter, at Chilecito, apparently known as the Santa Florentina works, is about one mile from the Rio Amarilla, with water rights owned in perpetuity. The smelter has a matting furnace only, blown in March 20, 1908. Production, June, 1908, from 3,000 long tons of ore treated, was 550 tons of matte,

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assaying 17.1% copper, 38.1 oz. silver and 2.3 oz. gold, showing an average extraction of 3.13% copper, 6.98 oz. silver and 0.42 oz. gold per long ton.

About 300 men are employed at the mines and works. Native labor is inefficient, but cheap, wages being about 30 cents per day. The company, having reached the end of its resources, is being financed by the International Copper Co., Ltd., up to the amount of £60,000. The property is of considerable promise, though much overestimated in its early stages, and, under the capable management of Mr. Arthur Thomas, who is a thoroughly good man, should be made a success, if success is attainable, provided his suggestions are followed, and the company does not come to grief from lack of funds.

LES MINES DE CUIVRE DE LA FARE, LTD. **FRANCE.**

Office: Dashwood House, New Broad St., London, E. C., Eng. Mine office: Vaujan, Isère, France. Chas. Dufaure de la Prade, chairman. Organized Oct. 25, 1904, under laws of Great Britain, as Les Mines Françaises, and name changed to present title November, 1907, with capitalization £47,000, shares £1 par, in £30,000 cumulative 8% preference shares and £17,000 common shares; issued, £19,997.

Lands, 563 hectares, on the left bank of the river Flumet, on the west flank of the Grandes Rousses Alpes, circa 50 kilometers from Grenoble. Property shows slightly auriferous and argentiferous chalcocite and chalcopyrite, with quartz gangue, company claiming average assays of 16.17% copper, which seems excessive. Mine is opened on 6 veins by 21 tunnels and galleries, with about 500 meters of workings, estimated by company to expose 400,000 tons of ore, which is considered an overestimate.

Transportation is by 6 aerial trams, leading from the mine workings to the mill, and company plans an aerial tram from the mill to the public road. The mine and mill have electric power.

The mill, of 5 tons hourly capacity, has a Classeur centrifuge, which effects dry centrifugal concentration, company claiming to produce a 50% concentrate, which also is regarded as improbable.

SOCIEDAD MINERA FARELLÓN DE TONGOY. **CHILE.**

Office: Valparaiso, Chile. Mine office: Tongoi, Coquimbo, Chile. Organized Jan. 21, 1901, under laws of Chile, with capitalization 150,000 pesos, shares 1,500 pesos par.

FARGO GOLD & COPPER MINING CO. **OREGON.**

Dead. Formerly at Imnaha, Wallowa Co., Ore. Described Vol. VII.

FARMINGTON GOLD & COPPER MINING & MILLING CO. **UTAH.**

Office: care of J. Stuart Wallingford, secretary and treasurer, Paris, Ky. Letter returned unclaimed from former mine office, Farmington, Davies Co., Utah. H. C. White, president. Capitalization, $250,000, shares $1 par. Former manager, Fred. H. Perkins, was arrested, 1906, on charge of embezzling $2,000 from the company. Idle.

FARRELL COPPER CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. W. C. Lewis, president; Carlton H. Hand, vice-president; J. D. Simons, secretary and treasurer; preceding officers, A. T. Morgan, Walter C. Lewis, Donald Campbell, W. H. Hall and Daniel Tewey, directors. Organized July 24, 1906, under laws of Montana, with capitalization $1,000,000, shares $2.50 par. Lands, 17 acres, in the southeastern part of the Butte district, having a 200′ shaft, sunk jointly with the Alliance Copper Co., with a crosscut on the 200′ level showing a little ore carrying copper, lead, zinc and silver values.

FARRELL COPPER CO. **MONTANA.**

Dead. Succeeded, circa 1902, by Pittsburg & Montana Copper Co. Formerly at Butte, Silver Bow Co., Mont. Described Vol. II.

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FARWELL MOUNTAIN COPPER CO. **COLORADO.**

Office: care of Elisha T. Hewitt, Evans Blk., Denver, Colo. Mine office: Steamboat Springs, Routt Co., Colo. Organized 1907, under laws of Colorado, with capitalization $5,000,000. Lands, 4 lode claims and 560 acres of gold placer claims, in the Farwell Mountains, 3 miles from Hahn's Peak, and circa 25 miles from Steamboat Springs. Plans developing a water power by dam.

FAUQUIER COPPER CO. **VIRGINIA.**

Mine office: Warrenton, Fauquier Co., Va. Idle several years.

FAVORITE GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Nelsonville, Ohio. Mine office: Nighthawk, Okanogan Co., Wash. J. M. Parker, president; J. F. Baldridge, secretary; H. D. James, general manager; Ed. Williams, mine superintendent. Organized December, 1902, with capitalization $2,000,000; shares $1 par. Lands, 14 full and 14 fractional claims, area circa 300 acres, adjoining the Nighthawk mine, on Mt. Ellemeham, in the Wanicutt Lake district, 34 miles from the Canadian Pacific railway, showing 5 veins, of which one, ranging 1′ to 5′ in width, is opened by a 950′ upper tunnel and an 850′ lower tunnel on the Giant claim, carrying mainly silver-lead values, with some gold and copper.

FAY-CANANEA COPPER CO. **MEXICO.**

Office: 610 First National Bank Bldg., Duluth, Minn. Mine office: La Cananea, Arizpe, Sonora, Mex. Marcus L. Fay, president and general manager; W. H. Yawkey, vice-president; Geo. M. Fay, secretary; J. A. Daugherty, treasurer and local manager; preceding officers, Peter A. Kemp and Peter Manney, directors; Albert Weir, mine superintendent. Organized Sept. 4, 1904, under laws of Arizona, with capitalization $3,000,000, shares $5 par, and is organized under laws of Mexico as Cananea-Eastern Mining Co., S. A.

Lands are very extensive, having been added to at frequent intervals since organization of company. Original lands were 2 tracts of 16 denouncements, a total of 900 pertenencias, area 2,127 acres, in 2 groups about 2 miles apart, circa 20 miles south of La Cananea, formerly held by Fortuna Mining Co. and Sonora Development Co. Bought, 1907, circa 1,100 acres in the Sierra Manzanal, about 6 miles northeast of Cananea, lying north of the lands of the Arizpe Development Co. Bought, circa November, 1907, lands of Dorotea Mining Co., in the Sierra Cananea, about 6 miles northwest of Puertecitos Pass, and, from same company, the Dorotea group of 5 claims, circa 50 miles northwest of La Cananea, in the Magdalena district of Sonora, having about 300′ of workings, showing ore giving fair assay values in copper. Bought, circa December, 1907, two groups, area 149 hectares, on the southwestern slope of the Ajo Mountains, from the Cananea-Eastern Mining Co., including La Zona group, area 49 pertenencias, lying 8 miles southeast of Douglas, Ariz., in the northern part of the Moctezuma district of Sonora, and La Princesa and La Costoza groups, area 100 hectares, in the Sierra Ajo, 21 miles east of Cananea, latter opened by a 180′ tunnel showing promising sulphides, and a 40′ shaft carrying copper oxides and bornite averaging about 10% copper, with small gold and silver values. Lands also include the Forest and Fortuna groups, circa 40 miles south of Cananea, and the Big Duluth, circa 8 miles northeast of Cananea.

Principal workings are on the Sulphide group, having a vein traceable circa kilometers, of which the Fay-Cananea owns nearly 2 miles of the outcrop, this vein being claimed to average about 150′ in width, but it is improbable that the full width will be found workable. The Sulphide group includes an antigua having two 100′ shafts, from which more or less high grade silver ore was stoped in the past. New work includes 2 permanent shafts, deepest 162′ at last accounts, and a tunnel planned to cut 20 or more veins in a length

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of circa 6,000'. A 26' shaft on the Azurite claim shows ore giving average assays of 6% copper, 10% lead and 30 oz. silver per ton.

Property is considered promising and officers are men of good local standing, though company was unable to redeem its promise of beginning shipments prior to July, 1907.

FEDERAL COPPER CO. **WYOMING.**

Dead. Formerly at Laramie, Albany Co., Wyo.

FEDERAL COPPER CO., LTD. **WISCONSIN.**

Dead. Succeeded, circa 1902, by Federal Gold & Copper Co. Formerly at Superior, Douglas Co., Wis.

FEDERAL COPPER MINING. & SMELTING CO. **ARIZONA, NEW MEXICO & TEXAS.**

Dead. Wound up by receiver, 1907, and property sold. Formerly at El Paso, El Paso Co., Tex. Described Vol. VI.

FEDERAL-ELY COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Ely, White Pine Co., Nev. Adrian C. Ellis, Jr., president; W. J. Craig, vice-president and general manager; R. J. Evans, secretary; L. H. Farnsworth, treasurer; preceding officers, John T. Hodson, Wm. K. Bradley and Hon. W. H. Dickson, directors; Geo. W. Kessler, superintendent. Organized 1906, and articles of association amended, circa April, 1908, to render stock assessable, and a 5-cent assessment levied. An issue of treasury stock, 1907, was said to be underwritten by Peter Whitney, et al., of New York.

Lands, 20 claims, 3 fractional, area 383 acres, also the Huesser ranch, of 600 acres, near Lane, bought Dec. 8, 1906. Mining lands include 8 claims north of the Nevada Consolidated, 3 claims between the Cumberland-Ely and Turner Ely, and the Queen of the West group, in Robinson Cañon. Company is said to have paid $215,000 for its lands.

The property shows a limestone capping, pitching to the east, said to be underlaid by cupriferous monzonite, and to carry 3 parallel fissures, about 600' apart, the fissures also being said apparently to be shear zones, each about 400' in width, showing a little copper and lead ore, both argentiferous and auriferous. The limestone capping on the Savage claim is said to carry argentiferous lead ore. Churn-drill borings are said to have given a satisfactory showing of ore, and there also has been some test-pitting and surface trenching.

Development is by 4 shafts, the main shaft, planned to be sunk 400', being said to be near the contact of the 3 ore zones, which seems peculiar, if they are parallel, as claimed.

The Queen of the West shaft shows, at depth of 110', a sulphide ore body of considerable size, averaging circa 3% copper, 1 to 2 oz. silver and 40 to 50 cents gold per ton.

The Kessler shaft, about 100' deep, near the tunnel, shows lead carbonates of fair tenor.

The main tunnel, planned to be driven 1,500', starts from a cañon, and will connect with the shaft to give a 400' back. It is expected that the tunnel will cut cupriferous porphyry before reaching the shaft.

The property has a steam plant, and a water supply estimated at 875 miner's inches in the dry season, which will be more than sufficient for the company's own use, and constitutes a valuable asset, as water is scarce in the camp.

Transportation is available by a railroad running through the company's lands that passes near the mouth of the tunnel.

Late 1906 the company was said to plan building a 500-ton mill in 1907,

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but these plans were premature. Idle at last accounts, but planned resumption.

FEDERAL GOLD & COPPER CO. **NEVADA & WISCONSIN.**

Office: 214 Lumber Exchange, Minneapolis, Minn. Mine office: Eureka, Eureka Co., Nev. C. S. Dudley, president and general manager; M. B. Coburn, vice-president; H. S. Dudley, secretary and treasurer. Organized, 1902, under the laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands include 600 acres in the St. Croix valley, Burnett county, Wisconsin, and 520 acres 6 miles southeast of Superior, Douglas county, Wisconsin, these tracts lying on the St. Croix and Minong native copper ranges. Nevada lands are 7 claims, including the Como-Eureka mine, showing 4 parallel veins, estimated by management to carry average values of $8 to $20 per ton. Mine has a 350′ shaft, with 750′ of drifts and crosscuts. Equipment includes an electric light plant and a 100-ton concentrator. Mill was run, 1905, several months, apparently for gold values, and produced about $16,000. As management estimates average cost of mining and milling at $3.50 or less per ton, it is evident, either that value of ore has been overestimated, cost of mining and milling underestimated, or that amount of ore in sight is very small. Idle and apparently moribund.

FEDERAL GOLD & COPPER MINING CO. **UTAH.**

Dead. Formerly at Blue Acre, Beaver Co., Utah. Fully described Vol. VII.

FEDERAL MINES CORPORATION. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Mine has argentiferous and auriferous lead and copper sulphides. Has steam power. Presumably idle.

FEDERAL MINING CO. **ARIZONA.**

Dead. Reorganized, 1905, as Gila Valley Copper Co. Was a bad egg. Formerly at Safford, Graham Co., Ariz. Fully described Vol. V.

SOCIETA MINIERE DELLA FENICE MASSETANA. **ITALY.**

Dead. Lands sold to Societa Anonima delle Minière di Montecatini. Formerly at Massa Marittima, Grosseto, Tuscany, Italy.

FENTRESS MINING CO. **NORTH CAROLINA.**

Dead. Succeeded by Century Development Co. Formerly at Centre, Guilford Co., N. C.

FERGUSON MINING & SMELTING CO. **NEW ZEALAND.**

Office: Auckland, N. Z. John Strathern, general manager. Capitalization, £30,000. Lands, 565 acres, in the Thames Goldfield, also upwards of 2,000 acres of native land at Whangaroa, on the Coromandel peninsula, circa 125 miles northwest of Auckland, showing outcrops of cupriferous pyrite. Lands show nearly 100 veins and stringers, of various sizes and forms, principal veins ranging 2′ to 8′ in width, carrying mainly massive cupriferous pyrite, with a little galena, giving average assays of about 4% copper and up to £6 combined gold and silver values per long ton. Development is by about 20 short crosscut tunnels. Has a mill and a smelter, latter, on tidewater, erected at a cost of about £8,000, having a 150-ton Colorado Iron Works hot-blast pyritic matting furnace. Previous to erection of smelter, ore was milled, and concentrates shipped in bulk to Australia, Swansea and the United States, concentrates averaging £33 per ton in value. Wages are $2 per 8-hour shift.

MINA FERNANDO. **MEXICO.**

Mine office: San Fernando, Tamazula, Durango, Mex. Property includes La Fortuna group, carrying auriferous and argentiferous copper ores. Has water and electric power, with a 100-ton concentrator and 40-ton smelter, and formerly was operated by Fernando Mining Co. Production, 1903, was 554,609 lbs. fine copper. Idle several years.

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FERNANDO MINING CO. **MEXICO.**

Dead. Formerly at San Fernando, Tamazula, Durango, Mex. Described Vol. VI.

FERRIS-HAGGARTY COPPER MINING CO. **WYOMING.**

Mine office: Rudefeha, Carbon Co., Wyo. Is controlled, through stock ownership, by Penn-Wyoming Copper Co.

COMPAÑIA DE MINAS FERROCOBRIZAS. **SPAIN.**

Office: San Isidro, 16, Sevilla, Spain. Mine office: El Carpio, Cortegana, Huelva, Spain. Don Salvador Sánchez Castañer, agent. Lands, area 73 hectares, include the Santa Maria de Gracias group, worked in very ancient days. Property is leased to the Sociedad Française de Etudios. Ore is cupriferous pyrite.

FIDELITY COPPER CO. **IDAHO.**

Office: care of Commonwealth Trust Co., Portland, Ore. Mine office: Homestead, Washington Co., Idaho. Capt. Herbert L. Davis, superintendent. Lands, 17 claims, area 340 acres, 5 miles from Homestead, in the Seven Devils district, opened by 10 pits and shafts and a 240′ tunnel, said to show a contact vein between granite-porphyry and limestone, carrying native copper, azurite, malachite and chalcocite. Prospectus of company gives no particulars regarding capitalization, organization and officers, and company is not regarded favorably.

FIDELITY MINING CO., LTD. **MICHIGAN.**

Office: care of I. P. Griswold, chairman, Allegan, Mich. Mine office: Victoria, Ontonagon Co., Mich. C. G. Turner, secretary; H. F. Marsh, treasurer. Organized February, 1903, with capitalization $300,000. Lands are in Section 15, T. 50 N., R. 40 W., 2½ miles northwest of the Victoria mine. Idle since organization.

FIFTH CREEK CENTRAL SILVER & COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Fifth Creek, South Australia.

FAUSTO FIGUEROA. **PERÚ.**

Office and mine: Morococha, Junín, Perú. Property is the Santo Toribio mine, from which a little ore was extracted, 1905, in development work.

FINDLAY COPPER CHIEF MINING CO. **NEVADA.**

Office: Findlay, Ohio. Mine office: Las Vegas, Lincoln Co., N. M. John N. Dotz, president; P. M. Cox, secretary; R. E. Taylor, treasurer. Organized 1907, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, in the Yellow Pine district, circa 25 miles southwest of Las Vegas, having a 30′ shaft and a 60′ tunnel, said to show ore.

FINLEY GOLD & COPPER MINING & MILLING CO. **UTAH.**

Dead. Formerly at Castleton, Grand Co., Utah.

FINNISH-AMERICAN MINING CO. **FINLAND.**

Office: Calumet, Mich. Mine offices: Kisko, Abo, Finland, and Joensuu, Kupio, Finland. John Daniell, president; Edw. Ulseth, first vice-president; Henry Ketti, treasurer; Oscar J. Larson, secretary; preceding officers, John Saari, Chas. J. Wickstrom, John Benson and Albert Julin, directors; Capt. Jacob Wilson, general superintendent. Organized December, 1906, under laws of Minnesota, with capitalization $750,000, shares $1 par. Lands, 4 groups, bought of the Fiskars company, including the Orijarvi and Hokka mines, former being the more important. Properties have both water and rail transportation, and have been prospected by 8 diamond-drill holes, one of the groups showing gold ore.

The Hokka group, area 240 acres, includes four 40-acre claims, freehold, and two 40-acre claims, leasehold, latter held for 25 years under option of

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purchase, 2 miles from Joensuu, in the Maanseka Mountains, circa 200 miles from Viborg, near the boundary between Finland and Russia. This mine, opened 1860, secured a small production of chalcopyrite under the most primitive conditions, ore having been shipped on horseback to the Pitkaranta smelter.

The Orijarvi mine, credited with an output of $5,000,000 in copper and silver, has surface indications giving little evidence of the large amount of ore lying below, ore bodies being deposits in silicious limestone, near an intrusive quartz-diorite contact; ore being mainly cupriferous pyrite and pyrrhotite, associated with small quantities of galena and large quantities of sphalerite, all slightly auriferous and argentiferous. The Orijarvi tract, of circa 10 square miles, is a parallelogram of approximately 2x5 miles, opened by 9 shafts, deepest 600′, showing large ore bodies, with stopes up to 60′ in width. Mine, opened A. D. 1757, and worked until 1873, was idle thereafter until taken over by predecessor of present company, circa 1904. The old dumps at the Orijarvi contain large quantities of sphalerite, discarded as worthless, but probably of present value, as a zinc smelter could be built at a reasonable cost, if shipping were found impracticable. Mine has a good machinery plant, from Chicago, and employs circa 75 men. Property considered promising and management good.

FIRST CHANCE MINING CO. **WASHINGTON.**

Mine office: Excelsior, Pierce Co., Wash. F. M. Lewis, president. Ores are refractory. Presumably idle.

FIRST NATIONAL COPPER CO. **CALIFORNIA.**

Office: 25 Broad St., New York, N. Y. Mine office: Kennett, Shasta Co., Cal. Thos. W. Lawson, president; T. M. T. Raborg, treasurer; preceding officers, Edgar L. Newhouse, Geo. N. Towle, Thos. J. Barbour and R. N. Bishop, *directors*. Organized February, 1908, with capitalization $3,000,000, shares $5 par; $2.50 paid in. Apparently 525,000 shares were issued at $2.50, providing $1,312,500, less the expense of organization. Corporation is a securities holding company, planned to finance the Balaklala Consolidated Copper Co., which came to grief, and is practically a reorganization of that company. It was said, July, 1908, that 98% of the Balaklala stock had been deposited for exchange into First National stock, time for exchange having been extended. Company plans loaning the Balaklala Consolidated $1,312,500, to pay off its floating indebtedness and leave a working capital of $375,000 to $500,000 for the latter. Company is said to have circa 4,500 shareholders.

The mine is fully described under name of Balaklala Copper Co., which holds direct title. It was hoped to have the property on a producing basis late in 1908. There was much grumbling by shareholders over the rather drastic method of reorganization, but, while the Balaklala was sadly mismanaged, the plan of reorganization followed seemed to be the only way out of the muddle into which the company had fallen. The standing of the company, none too good at best, was further injured by placing Lawson at the head of the corporation.

FIRST NATIONAL MINING CO. **NEW MEXICO.**

Office: Chickasha, Okla. Mine office: Orogrande, Otero Co., N. M. J. A. Bogart, president; John Wells, vice-president; S. Howard Leech, secretary; M. A. Goff, treasurer; preceding officers, Wilton M. Bartlett, N. H. Ledford, E. C. Wells and Edw. Burson, directors. Property is the Forest Queen mine, said to show a 20′ vein, opened by tunnel, with a shaft planned.

FIRST TRANSBAIKALIAN MINING CO. **SIBERIA.**

Office and mine: corner Sofeyska and Soongareyska Sts., Chita, Transbaikalia, Siberia. Company advertises that it possesses great mineral wealth,

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including copper, but the principal mining values undoubtedly lie in the pewter ore that the company claims to possess. As pewter ore never has been found before, the company's prospects are bright. Doubtless more careful search of the wonderful lands of this corporation would show brass ore also, and possibly native babbitt metal.

FISKUM SYNDICATE, LTD. **NORWAY.**

Office: 53 New Broad St., London, E. C., Eng. Mine office: Kongsberg, Christiania, Norway. H. V. Anthony, managing director; C. S. Goodwin, secretary. Organized March 2, 1905, with capitalization £2,400, shares £1 par; issued, £2,375. Property is an option on 50 claims, carrying copper, lead and zinc, on which a little work has been done. Presumably idle.

FITTS COPPER CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

FITZPATRICK & DODD. **MEXICO.**

Office and mine: Teocaltiche, Ayutla, Jalisco, Mex. Patrick Fitzgerald, manager. Lands include the Chapuza, Falda and Puerta mines, carrying argentiferous lead and auriferous copper ores. Employed circa 25 men at last accounts.

FITZROY COPPER MINES, LTD. **AUSTRALIA.**

Dead. Was succeeded, 1907, by Great Fitzroy Copper Mines, Ltd. Formerly at Mount Chalmers, Queensland, Australia. Described Vol. VII.

FIVE BEARS MINING CO. **CALIFORNIA.**

Office: 301 Gaff Bldg., Chicago, Ills. Mine office: Genesee, Plumas Co., Cal. F. A. Meidinger, president; G. H. Goodhue, vice-president and superintendent; A. Vermaas, secretary; J. D. Meidinger, treasurer; preceding officers and E. C. Goeckel, directors. Organized Apr. 10, 1903, under laws of South Dakota, with capitalization $2,500,000, shares $1 par; issued $2,350,000.

Lands, 10 claims, 9 patented, area 200 acres, showing 6 ore bodies, as fissure veins in talcose schist and as contact deposits between schist and porphyry, of which one, under development, of 4′ to 20′ width, is traceable circa 9,000′, carrying chalcopyrite, associated with pyrite estimated by company to average 2.6% copper, 1.8 oz. silver and $1.40 gold per ton. Development is by tunnels of 1,296′, 380′ and 60′, on the vein, and a 240′ crosscut tunnel, with 3,420′ of workings, estimated to show 80,000 tons of ore, with 9,000 tons blocked out for stoping. Property was worked, 1876-1893, for gold values in the gossan.

Company has a 50-h. p. water plant for the mine and a 1,400-h. p. hydro-electric installation for commercial use. Equipment includes 11 mine buildings, a 3-drill air-compressor and a 10-stamp mill. Nearest railroad is 34 miles, but the Western Pacific is to build into the district, upon the completion of which ore will be shipped. Company estimates average cost of mining at only 55 cents per ton. Continuous development is planned. Property, though low in grade, is considered promising.

FIVE POINTS COPPER MINING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. A. T. Hammons, treasurer; J. C. Britt, superintendent. Is said to be controlled, through stock ownership, by Cananea & Globe Exploration & Development Co.

Lands, 39 claims, including the Peabody group of 5 claims near Bloody Tanks. The Clark, Lockwood and Van Wagenen groups, aggregating 34 claims, are near the Gibson mine, at the head of Pinto Creek, circa 14 miles west of Globe. Property shows malachite near surface, with some azurite and chalcocite at shallow depth, and company claims assays of 33% copper and 49 oz. silver per ton, with traces of gold. Development is by the Solace 150′ incline shaft, and the Crackerjim 350′ shaft, circa 1,500′ apart, latter showing a vein

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of 29′ estimated width, giving assays of 4 to 12% copper, a 20″ paystreak being claimed to give average assays of 25% copper, 415 oz. silver and 38.5 oz. gold per ton, which is entirely too good to be true, with balance of vein carrying chalcopyrite of circa 4.5% average copper tenor, the paystreak figures being gross exaggerations.

Equipment includes a small steam plant and hoist, and plans were drawn for a 300-ton concentrator, which failed to materialize. Shipped, 1906, a little ore to the Old Dominion smelter. Property considered promising, notwithstanding its ridiculously exaggerated claims.

FLAG GOLD & COPPER MINING CO., LTD. **AUSTRALIA.**

Office: Morgans St., Ravensthorpe, Western Australia. Mine office: Kundip, Phillips River Goldfield, Western Australia. Ralph Anderson, secretary; Charles Grant, mine manager. Organized March 14, 1907.

Lands, 70 acres held under gold mining lease, and 5 acres held under tailings area lease. Property shows a 6′ vein, from which former owners shipped 1,222 long tons of ore, yielding 39 long tons fine copper and 889 oz. gold, and present company shipped 405 tons, to the Ravensthorpe smelter, returning 41.84 long tons copper, 250 oz. silver and 559 oz. gold. Test shipments of 32 tons, circa June, 1908, returned 9.7% copper and 21 dwts. gold per long ton. Apparently ores average about 17 dwts. gold per long ton. Development is by 3 shallow shafts, workings not being well laid out. Property has an old stamp-mill.

FLAGSTAFF COPPER MINING CO. **UTAH.**

Office: 902 Wells Bldg., Milwaukee, Wis. Operating office: 17 West Second South St., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Thos. J. Pringle, president; Chas. H. Moss, vice-president; Paul D. Durant, secretary; Kenneth W. Jacobs, treasurer; preceding officers, Wm. P. Harlow, Bishop Canfield, F. G. Gaston and W. D. Ladd, directors; Jas. E. Beveridge, superintendent. Organized Apr. 22, 1908, under laws of Arizona, as successor of Consolidated Flagstaff Mines Co., with capitalization $2,000,000, shares $5 par. Annual meeting, first Tuesday in October.

Lands, 29 claims, partly patented, area circa 500 acres, and .14 acres miscellaneous lands, in the Little Cottonwood and Big Cottonwood districts, carrying several ore bodies, of which one, ranging up to 300′ in claimed width, and traceable 2,000′, is developed by the 2,850′ Tom Moore tunnel, which also cuts 6 smaller veins, and has a 450 crosscut to the northeast, with about 4,000′ of workings. Property also has the 500′ Burgess tunnel, 1,200′ Burnswood tunnel, 1,200′ Flagstaff tunnel and 700′ Flagstaff shaft. Company plans extending the Tom Moore tunnel, to cut the Flagstaff ore zone at considerable depth. Present workings show mainly chalcopyrite, with occasional bornite.

The mine, opened circa 1869, was operated extensively, and presumably at a profit, by the Flagstaff Mines, Ltd., and by the Alta Consolidated Mining Co. Former produced circa $9,000,000 worth of ore from above the 400′ level, mainly silver-lead carbonates, being unable to treat the argentiferous galena and copper sulphides profitably in early days. A considerable quantity of ore of payable tenor remains on the old dumps, and some of this has been shipped.

Equipment includes electric power, with 7-drill and 3-drill Ingersoll air-compressors and necessary mine buildings.

Company is said to have a profitable contract with the American Smelting & Refining Co., receiving a premium of 10 cents for each unit of silica, with a base rate of $2.25 per ton. In the case of some shipments company has received a bonus from the smelter, for excess of iron, with smelting done free. About 30 men are employed, and the company plans advancing the Tom Moore tunnel, drifting on parallel fissure veins, and cutting the Flagstaff

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ore bodies, at a depth of circa 960', in the Flagstaff shaft. Property considered promising and management good.

FLATIRON MINE. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Is owned jointly by Adolph Lewisohn and the Leonard Lewisohn Estate. Lands are circa one-half acre, being a triangular fraction just east of the Mountain Chief mine of the Butte Coalition Mining Co. Is developing with a 3-compartment shaft. Property, though small, considered well located and promising.

FLEMING-FOX MINING & SMELTING CO. **NEW MEXICO.**

Mine office: Jicarilla, Lincoln Co., N. M. W. G. Fleming, president and general manager. Development is by shaft, with steam power.

FLINT STEEL MINE. **MICHIGAN.**

Mine office: Greenland, Ontonagon Co., Mich. Lands, 400 acres, bounded by the Mass and Adventure on the north and east, and by the Michigan on the south and west. Produced 415 tons, 458 lbs. fine copper and was owned by the Flint Steel Mining Co. and the Flint Steel Copper Co. Has the only developed fissure vein in Ontonagon county, with 3 connected shafts. Idle since circa 1875.

FLOREDIA COPPER MINING CO. **COLORADO & NEW MEXICO.**

Office: care of Financial Security & Trust Co., Denver, Colo. E. H. Wahl, president; C. A. Hubbard, vice-president; W. E. Kreamer, secretary. Organized 1907, with capitalization $3,000,000, shares $1 par. Lands claimed are 3 claims in the Floredia Mountains, Luna Co., N. M., and 3 claims 25 miles west of Canyon City, Frémont Co., Colo., with total holdings of 90 acres. Apparently was promoted by Financial Security & Trust Co., which was responsible for the Lost Bullion Spanish Mines, and other notorious swindles, and company is regarded with much suspicion.

FLORENCE COPPER CO. **UTAH.**

Mine office: Newhouse, Beaver Co., Utah. Lands, 4 claims, near the Utah Amalgamated, slightly developed by tunnel.

FLORENCE SMELTING, MINING & MILLING CO. **ARIZONA.**

Office: care of J. H. McCabe, president and manager, Phœnix, Ariz. Mine office: Price, Pinal Co., Ariz. Lands include the Mineral Hill group, Grace, Blue Bell, Alice and other properties, having lead and copper ores. Company has a smelter, with a 35-ton lead stack, apparently moved from Phœnix to Price, and was said to plan erection of a copper stack. Apparently idle almost since birth, and moribund.

FLYING DUTCHMAN MINING CO. **UTAH.**

Dead. Presumably lands sold to Copper Jack Mining Co. Formerly at Ibapah, Tooele Co., Utah.

F. M. & D. COPPER MINING CO. **COLORADO.**

Office: care of Bernard McCaffrey, Denver, Colo. Letter returned unclaimed from former mine office, Morrison, Jefferson Co., Colo. Lands, 560 acres, patented, near Bear Creek, about 8 miles west of Morrison, opened by 600' of tunnels and a 165' main shaft, upper 150' passing through a gossan capping of 15' to 30' width, carrying small gold values, and showing about 5' of ore below, mainly sulphide, with some malachite, said to carry circa 11% copper and $3.50 gold and silver per ton. Presumably idle.

FOLDAL COPPER & SULPHUR CO., LTD. **NORWAY.**

Office: 6 Old Jewry, London, E. C., Eng. Mine office: Foldal, Trondhjem, Norway. Alex Davidson, chairman; preceding officer, Lee Hoskyns, Stanley Clay, Sidney St. J. Steadman, Edw. W. Abrams, Henry A. Barton and E. E. Berthoud, directors; Chas. Forbes, secretary; Pellew, Harvey & Fell, consulting engineers;

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W. H. Lund, mine manager. Organized Jan. 27, 1906, under laws of Great Britain, with capitalization £350,000, shares £1 par, in 150,000 shares preferred and 200,000 shares deferred stock. Company has invested circa £100,000 in property, development and equipment. Lands, circa 3,000 acres, on the west bank of the Foldal river, carrying considerable timber, include 4 old mines, known as the Juliana Marie, Knutshovd, Grev Moltke and Grimsdal, worked for about 150 years, and which produced circa 350,000 tons of ore, under former ownership. Mines, opened mainly by tunnel, show a vein of about 10′ average width, carrying massive cupriferous pyrite estimated to average 2% copper and 46% sulphur, ore being decidedly arsenical, vein giving every indication of persistence. Ore, as produced, is divided into 3 classes, first averaging 2.1% copper and 48.17% sulphur, other grades carrying less copper and slightly less sulphur. Property also has some ore of high copper tenor that eventually may become of considerable importance. Ore reserves, 1907, estimated at 363,190 long tons. Has a good mining plant, installed at a cost of £7,000, and has expended about £8,000 for substantial mine buildings, including a general store.

Company has developed hydro-electric power from a large waterfall on the Einuna River, held under 25-year lease, subject to renewal, at rental of £25 yearly. Good wagon roads have been built at the mine, and a 22-mile Pohlig aerial tram, which is one of the longest in the world, has been built from the mines to the Lille-Elvedal Railway, at a cost of £38,412, line having a capacity of 40 tons per hour. Miscellaneous improvements include a telephone line and a quay at Trondhjem, for ore shipments. Production, September, 1907, was 5,161 long tons, but was cut to about 1,000 tons monthly for last quarter of year, owing to a miners' strike. Equipment has been provided for an ore-production of circa 100,000 tons yearly. Property is decidedly promising, and management seems vigorous and effective.

SOCIÉTÉ ANONYME DES FONDERIES ET LAMINOIRS. FRANCE.

Works office: Biache, St. Vaast, France. Property is an electrolytic copper reduction plant with five 6-kw. generators and 100 tanks, in multiple arrangement, with estimated daily capacity of 2 metric tons fine copper.

FORD COPPER CO. CALIFORNIA.

Mine office: Georgetown, El Dorado Co., Cal. Has highly auriferous copper ores. Idle since circa 1903.

FOREST HILL CONSOLIDATED MINING & MILLING CO. COLORADO.

Dead. Bondholders foreclosed. Formerly at Tin Cup, Gunnison Co., Colo.

FOREST QUEEN COPPER CO. NEW MEXICO.

Office: El Paso, Texas. Mine office: Silver City, Grant Co., N. M. H. F. Kettler, president; M. D. Gaylord, superintendent. Lands, 10 claims, area 200 acres, known as the Cleveland group, 8 miles north of Silver City, in the Pinos Altos district, having a 700′ tunnel cutting 9 veins of 3′ to 70′ width, carrying chalcocite, associated with sphalerite disseminated in pyrite, giving average assays of 4.5% copper, 20% zinc and 10 oz. silver per ton. Plans a 3-compartment shaft. Has office and store buildings, and plans a mill at mouth of No. 1 tunnel, to make copper and zinc concentrates. Shipments, 1907, from practically surface ores, gave returns of 11% copper and 8 oz. silver per ton. Is said to plan a concentrator.

FORT BOURKE MINE. AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. Has a new plant, which was not giving entirely satisfactory results at last accounts, circa May, 1908.

FORT HALL MINING & MILLING CO. IDAHO.

Mine office: Pocatello, Bannock Co., Idaho. E. E. Howson, superin-

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tendent. Lands, 7 miles from Pocatello, are said to give a good showing of medium grade auriferous copper ore.

FORT HENRY MINING CO. **ARIZONA.**

Office: care of R. G. Hourtienne, president, Pasadena, Cal. Letter returned unclaimed from former mine office, Wickenburg, Maricopa Co., Ariz. Geo. Dobbler, superintendent. Lands, in the Black Rock district, have a 55′ shaft in a 2′ vein of ore assaying up to 25% copper.

FORT PITT COPPER CO. **NEW MEXICO.**

Office: Curry Bldg., Pittsburg, Pa. Mine office: Clayton, Union Co., N. M. Jared Sater, president; C. L. Mohney, vice-president; W. H. Staley, secretary; Dr. W. W. Wolfe, treasurer. Organized Jan. 22, 1907, under laws of Delaware, with capitalization $2,500,000, shares $5 par, being said, in the press, to have been organized "to acquire mines of gold, silver, copper, brass, etc." The Fort Pitt Copper Co. succeeded the Sater Copper Co., which succeeded the Copper Chief Mining Co., which in turn succeeded the Old Hickory Copper Mining Co., all of the dead ones having departed this life accompanied by the curses of deluded shareholders.

Lands, 27 claims, area 540 acres, also a 5-acre millsite, in the Black Mesa district, said to show 7 fissure veins in sandstone, of which 2, slightly developed, are claimed to be of 6′ average width, and to carry melaconite, malachite, azurite and chalcopyrite, averaging 14% copper and 15 oz. silver per ton, which is a very serious exaggeration. Development is by shafts of 85′ and 225′, and by tunnels of 25′, 50′ and 300′, estimated by company to show 60,000 tons of ore, which estimate is excessive.

Equipment includes a 190-h. p. steam plant, with 2 hoists, and the mine has 4 buildings and an 18x70′ mill. Company, by reason of its bad antecedents, is viewed with suspicion.

COMPAÑIA MINERA LA FORTUNA, S. A. **MEXICO.**

Office: Aguascalientes, Ags., Mex. Mine office: Tepezalá, Ocampo, Aguascalientes, Mex. Geo. B. Wardman, president and general manager; O. F. Westlund, vice-president; DeWitt Crevelling, secretary and treasurer; Alberto Pez, superintendent. Organized 1902, with capitalization 200,000 pesos, shares 100 pesos par. Lands include La Fortuna and adjoining mines, having 2 tunnels and a 100-meter blind shaft, mines having a vertical depth of 200 meters and greatest horizontal length of 600 meters of workings, showing minly oxidized argentiferous copper ores of good average tenor in both metals. Has animal power, employing circa 200 men, and shipped, 1905, about 200 tons of ore weekly.

FORTUNA COPPER CO. **CALIFORNIA.**

Office and mine: Fortuna, Humboldt Co., Cal. P. J. Mulley, president and general manager; Frank Legg, vice-president; C. A. Eastman, secretary; Fortuna Merchandising Co., treasurer; A. E. Purdy, superintendent. Organized June 8, 1901, under laws of California, with capitalization $70,000, shares $5 par. Lands, 32 claims, area 640 acres, in Trinity county, California, opened by tunnels of 60′ and 270′, showing ores that have assayed 28% copper and $3 gold per ton, in veins of 12″ to 16″ width. Presumably idle.

FORTUNA GOLD & COPPER CO. **ARIZONA.**

Office: J. B. Thompson, secretary and manager, Pittsburg, Pa. Mine office: Cave Creek, Maricopa Co., Ariz. L. E. Huddleston, president; Maj. R. N. Whitney, vice-president; F. E. Miller, treasurer; preceding officers and F. H. Kinner, directors; Clarence E. Dresser, general superintendent. Was practically reorganized, 1907, and old management eliminated. Lands, 12 claims, including the Scarlet mine, circa 28 miles north of Phœnix, said to give a promising ore showing. Plans a 150-ton cyanide plant.

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FORTUNA GRANDE COPPER CO. **NEVADA.**

Dead. Formerly at Ely, White Pine Co., Nev.

FORTUNA MINING CO. **MEXICO.**

Office: 274 Canal St., New York, N. Y. Mine office: Ahualuleo, Jalisco, Mex. Frank E. Lloyd, manager. Property is the Candelaria mine, carrying auriferous and argentiferous copper ore. Has steam power and a 15-ton mill with 3 Wilfley tables, employing about 25 men.

FORTUNA MINING CO. **MEXICO.**

Letters returned unclaimed from former office, Bisbee, Cochise Co., Ariz., and mine office, La Cananea, Arizpe, Sonora, Mex. Sold, 1907, to Fay-Cananea Copper Co., its holdings at La Cananea, but is said to have held a stockholder's meeting, Oct. 5, 1908, with a view to resumption.

FORTUNA MINING CO. **UTAH.**

Office: care of George F. Richards, Jr., secretary and treasurer, Salt Lake City, Utah. Mine office: Lark, Salt Lake Co., Utah. Employs 45 men. Simon Bamberger, president; Sidney M. Bamberger, general manager; W. H. Rossberg, superintendent. Organized March 10, 1904, with capitalization $300,000. Lands, circa 200 acres, adjoining the Ohio Copper Co., showing considerable development.

A blind shaft, starting from a tunnel, is planned to be deepened, on the vein. Property is said to show a 4′ vein averaging 35% lead, 8 oz. silver and 0.08 oz. gold per ton, also a 7′ vein averaging about 15% copper, but these estimates are too high. Has a gasoline hoist and an old mill, which it is planned to equip with new concentrating tables. Property considered promising.

FORTUNA MINING & MILLING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Property was under lease to the Bingham Consolidated Mining & Smelting Co., and was operated by that corporation, hence presumably will be taken over by its successor, the Bingham Mines Co.

The mine has silver-lead ores in the upper workings, with argentiferous and auriferous copper sulphides at depth, latter giving average assays of about 3.5% copper, 8 to 10 oz. silver and $1.50 gold per ton. Mine carries a little native copper also.

Equipment includes electric power and a 100-ton concentrator. About 40 men are employed, when working.

FORTUNE COPPER & FINANCE CO., LTD.

Dead. Dissolved Feb. 20, 1906. Formerly had an office at 10 Basinghall St., London, E. C., Eng.

FORTY-FIVE CONSOLIDATED MINING CO. **WASHINGTON.**

Dead. Lands sold to Magus Mining Co. Formerly at Silverton, Snohomish Co., Utah.

FOSS RIVER CONSOLIDATED COPPER CO. **WASHINGTON.**

Office: 315 American National Bank Bldg., Everett, Wash. Hon. Albert W. McIntire, president and general manager; E. A. Nickerson, vice-president; F. P. Smith, secretary; Leighton Howard-Smith, treasurer; Milnor Roberts, consulting engineer. Organized Dec. 10, 1901, under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, 18 claims, area 328 acres, also a 30-acre millsite and 40 acres timber lands, in the Foss River district of King county, Washington, opened by a 55′ shaft and tunnels of 35′, 45′, 65′ and 310′, showing several veins, of which the largest, estimated at 180′ width, carries bornite and chalcopyrite giving assays of 3 to 54% copper, 2 oz. to 40 oz. silver and 80 cents to $44 gold per ton. Management plans con-

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tinuation of development work and installation of water power and a 4-drill air compressor. Property considered promising and management good.

FOULD et COMPAGNIE. **SPAIN.**

Office: Paris, France. Operating office: care of Don Guillermo Sundheim, agent, Huelva, Spain. Mine office: Cazalla de la Sierra, Sevilla, Spain. Property includes La Cartagenera and other mines, undergoing development at last accounts. Presumably idle.

FOUR B'S MINING CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Property is the Jasper mine, having auriferous and argentiferous copper ores. Presumably idle.

FOUR METALS MINING CO. **ARIZONA.**

Office: 21 South Center St., Phœnix, Ariz. Mine office: Washington, Santa Cruz Co., Ariz. Lloyd B. Christy, president; Geo. H. N. Luhrs, vice-president; F. L. Blumer, treasurer; A. E. Turner, secretary; preceding officers, W. H. Black and Levi Henry, directors. Organized 1903, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 40 claims, area 680 acres, in 2 groups, known as the Gross and Phœnix-Hillside, lying south of the Mowry mines, in the Patagonia district, opened by shaft and tunnel, with circa 3,500′ of workings, showing ore giving fair assay values in copper, lead, silver and gold. A test shipment from the Chamberlain tunnel to El Paso smelter gave net returns of $60 per ton. Management plans building a mill.

FOUR METALS MINING CO. **CALIFORNIA.**

Mine office: Keeler, Inyo Co., Cal. Lands, 35 claims, 8 miles from Keeler, showing silver, lead, copper and zinc ores. At last accounts was developing water power on Lone Pine Creek, and had received part of material for an 8-mile aerial tram from mine to smelter. The Swansea smelter was built, circa 1906, at Keeler, and removed later to Swansea, 3 miles north. Employed about 40 men up to time of business depression in fall of 1907.

FOUR METALS MINING CO. **COLORADO.**

Office: Equitable Bldg., St. Louis, Mo. Mine office: Telluride, San Miguel Co., Colo. Letter returned unclaimed from former mine office, Silverton, San Juan Co., Colo. W. Frank Carter, president; R. M. Scruggs, secretary and treasurer. Organized Jan. 17, 1899, under laws of Colorado, with capitalization $2,000,000, shares $1 par. Lands were 47 claims, area 516 acres, at Silverton, San Juan county, and sundry claims, known as the Andrus mine, in Ingraham basin, near Telluride. Had a mill at the Palmyra mine, and a steam plant at the Andrus. Presumably idle.

FOUR METALS MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Callao, Juab Co., Utah. H. Hugo Brandeis, president; R. P. Hill, secretary. Lands, in the Dugway district, carry auriferous and argentiferous copper, zinc and lead ores. Mine is opened to depth of 400′ and has a small concentrator. Idle several years.

FOURTH OF JULY MINING & MILLING CO. **COLORADO.**

Mine office: Eldora, Boulder Co., Colo. Mine is opened by shafts and has a 220′ tunnel, planned to cut the Olympic and Fourth of July veins, from which assays of 25 to 45% copper, some lead, 50 to 125 oz. silver, and $30 to $80 gold per ton, have been secured. Idle several years.

DUNCAN FOX y CA. **CHILE.**

Mine office: Cobija, Tocopilla, Antofagasta, Chile. Firm owns a large number of copper claims, near Cobija and elsewhere, in the Tocopilla district of the province of Antofagasta. Presumably idle.

FOX COPPER MINING & MILLING CO. **MONTANA.**

Office and mine: Mullan, Shoshone Co., Mont. W. J. Hughes, president;

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W. E. Wilson, vice-president; W. G. Newberry, secretary and treasurer; preceding officers, J. W. Brown, C. A. Adams, Geo. E. Hughes and W. S. Morgoreidge, directors. Lands, 9 claims, circa 6 miles east of Saltese, on which it is planned to sink a shaft.

SOCIÉTÉ FRANÇAISE DE ETUDIOS. **SPAIN.**

Office: Paris, France. Mine office: El Carpio, Cortegana, Huelva, Spain. Property is sundry old mines of cupriferous iron pyrites, leased from the Compañía de Minas Ferrocobrizas. Presumably idle.

COMPAGNIE FRANÇAISE DES MINES DE CUIVRE D'AGUAS TENIDAS. **SPAIN**

Dead. Succeeded by Société Française des Pyrites de Huelva. Formerly at Valdelamusa, Huelva, Spain.

COMPAGNIE FRANÇAISE DES MINES DE CUIVRE D'AKHTALA. **RUSSIA.**

Office: Rue Tronchet, 27 bis, Paris, France. Mine office: Alverdaki, Bortschalo, Tiflis, Russia. Lands, circa 5 miles south of Tiflis, include ancient mines of auriferous and argentiferous copper and lead ores. Production, 1903, was approximately 2,000,000 lbs. fine copper. Presumably idle.

SOCIÉTÉ FRANÇAISE DES PYRITES DE HUELVA. **SPAIN.**

Offices: Rue de Chateaudun, 39, bis Paris, France. Mine office: Valdelamusa, Huelva, Spain. Don Carlos Marchal, agent; Victor Prevost, superintendent. Organized December, 1899, under laws of France, with capitalization 3,500,000 francs, succeeding Société Française des Mines de Cuivre d'Aguas Tenidas. Lands include the Confesonarios mines at Valdelamusa, Perrunal and others at Cortegana, and El Carpio at Huelva, all carrying cupriferous pyrite low in copper tenor but of good sulphur average. Production, 1904, was 157,821 metric tons raw ore and 13 tons cement copper.

SOCIÉTÉ FRANÇAISE MINIÈRE ET MÉTALURGIQUE EN SERBIE. **SERVIA.**

Office: 147 Rue de Courcelles, Paris, France. Lands are sundry copper claims in Servia. Idle.

SOCIÉTÉ FRANÇAISE POUR L'INDUSTRIE ET LES MINES. **FRENCH CONGO.**

Office: 45 Boulevard Haussmann, Paris, France. J. Belmone, manager. Property is concessions covering a cupriferous district circa 200 miles from the coast in the French Congo, presumably in the Kouilou-Niari basin, on which some exploratory work was done, 1906-1907.

SOCIÉTÉ DES MINES ET FONDERIES DE FRANCARDO. **CORSICA.**

Office: 46 Rue de Londres, Paris, France. Mine office: Francardo Ajaccio, Corsica. L. Bizouarne, manager. Organized Oct. 30, 1905, under laws of France, with capitalization 3,600,000 francs, shares 100 francs par. Lands are extensive, including the Morosaglia, San Lorenzo and other old copper mines, claimed to carry an average of 7% ore, which probably is too high. Paid, 1906, a dividend of 10%.

ANDRES FRANCHY. **PERÚ.**

Mine office: San Marcelo, Yauli, Junín, Perú. Mine has argentiferous copper ores. Was a small producer at last accounts.

COMPAÑIA MINERA DE FRANCISCO DEL AZUL. **MEXICO.**

Mine office: Matehuala, Catorce, San Luis Potosí, Mex. Has copper ores, developed by tunnel. Idle.

FRANK HOUGH MINING CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. Organized 1907, under laws

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of Colorado, by A. E. Reynolds, C. F. McKenna and D. Miller. Property is the Frank Hough mine, on Engineer Mountain, carrying ore giving assays up to 27% copper, 47 oz. silver and $5 gold per ton. Property shipped several hundred tons of high grade argentiferous copper ore under former ownership.

FRANKLIN JUNIOR MINE. **MICHIGAN.**

Owned by Franklin Mining Co.

FRANKLIN MINING CO. **MICHIGAN.**

Office: 60 Congress St., Boston, Mass. Mine office: Demmon, Houghton Co., Mich. Mill office: Point Mills, Houghton Co., Mich. Employs 575 men. Stephen R. Dow, president; Alvin R. Bailey, secretary and treasurer; Richard M. Edwards, superintendent; preceding officers, John C. Watson, Henry Tolman and Harry M. Howard, directors; Arno Jaenig, clerk; Edward Warne, mill superintendent; Cyrus Truan and John Doney, mining captains. Organized Apr. 3, 1857, under laws of Michigan, with capitalization $500,000; reincorporated, 1887, for 30 years, and capitalization increased, later, to $2,500,000, shares $25 par. Has paid dividends of $1,240,000. Federal Trust Co., Boston, registrar. Annual meeting, third Wednesday in April.

Lands, 160 acres at the old Franklin, and 1,359 acres at the Franklin Junior, with surface rights to 160 acres additional, and a millsite at Grosse Pointe, of nearly 200 acres area, with one mile of frontage on Portage Lake. The old mine is the SW. ¼ of Section 2, Town 55 North, Range 33 West.

The old Franklin mine, opened on the Pewabic bed, is surrounded on three sides by the Quincy, which has cut off the Franklin from following the lode beyond the boundary lines. Parallel with the Pewabic lode and lying circa 300′ west, is the so-called west lode, which carries copper in variable quantities. Several fair stopes were developed thereon, 1905, and worked to some extent through the old openings. A little native silver is produced by the Pewabic lode, which is picked out by boys at the stampmill. Mining is almost exclusively scramming old ground and robbing pillars, the lower levels having been gutted. The pillars removed are usually of fair grade, but the ground reworked varies greatly, ranging from very good to rock that is almost barren. The old mine has been on its death-bed for 15 years, but continues to supply about 300 tons of rock daily, and predictions of imminent demise have been proven false so frequently that it is unsafe to set any date for its death. No. 3 shaft is 3,200′ and No. 5 is 2,850′ deep, both bottomed at the Quincy line. No. 5 shaft, damaged by fire, March, 1908, has been repaired.

The Franklin Junior mine, bought 1895, was opened, 1860, as the Albany & Boston, and was reopened, 1882, as the Peninsula. The Franklin Junior consists of two distinct mines on parallel beds, these being the old Albany & Boston mine, opened on the Allouez conglomerate, and an amygdaloid mine, opened 1896-1899, on the Pewabic lode, the Pewabic lying 475′ west of and parallel with the Allouez conglomerate. The first work on the Franklin Junior was done on the Pewabic lode, which returned an average of only about 0.45%, or 9 lbs. fine copper per ton of rock stamped, hence the amygdaloid shafts were abandoned, February, 1902, and work was transferred to the old Albany & Boston workings, the reopening of which was begun 1900.

The Allouez conglomerage averages 18′ to 22′ width, with an extreme width of 30′, and 3′ to 5′ of lode rock of very poor grade is left unmined on hanging wall, very little assortment being attempted. The conglomerate is somewhat more regular in its copper contents than to the northward, where it is very bunchy at the Allouez, but is distressingly low in average grade at all points.

No. 1 shaft of the conglomerate mine, size 7x20′ over all, with inside measurement of 6′6″x18′6″, has 3 compartments and is 2,300′ deep. Water

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is forked by a Cornish pump with 10′ lift, the largest of its size in the Lake district, which handles water very cheaply. The shaft has a wooden combination shaft-rockhouse, 40x50′ on the ground and 96′ high. A direct-motion hoist, good for 5,000′ depth, raises 6-ton skips.

No. 2 conglomerage shaft, 1,200′ south of No. 1, is 7x18′4″ over all, and 1,200′ in depth, sunk 3′ under the footwall to secure solidity. Equipment includes a double-drum hoist good for 3,000′ depth, and a steel circular combination shaft-rockhouse, similar to that at No. 2 Centennial, built, 1906, by the Wisconsin Bridge & Iron Co.

In addition to the two conglomerate shafts opened, there is room for two additional shafts, one to the north and one to the south, on the same bed.

The Pewabic lode was tapped, circa 1906, by crosscuts from the conglomerate workings, on the 21st and 23d levels, and considerable drifting was done on the Pewabic bed, giving a rather encouraging showing. The Pewabic gave very poor results when worked formerly, but improved conditions in No. 7, the Mesnard shaft of the Quincy, and the decision of the Quincy management to sink the new Pontiac shaft, only about one mile south of the Franklin Junior, lends hope to the Franklin of better values at depth, and the Pewabic bed, while a very low grade proposition at the Junior mine, can be worked more economically than ten years ago. The Pewabic workings, reopened 1908, after 6 years idleness, were found in bad order. The amygdaloid shafts are numbered from north to south, and are sunk at an angle of 48°30′ on a lode varying from 3′ to 15′, and averaging about 9′ width.

The North amygdaloid shaft, about 900′ south of the Rhode Island line, is about 1,000′ in depth, and probably will be deepened.

No. 1 amygdaloid shaft, 1,100′ south of the north shaft, is 1,600′ deep.

No. 3 shaft, 1,500′ south of No. 2, is about 1,200′ deep.

No. 3 shaft, 1,100′ south of No. 2, was circa 400′ in depth when reopened July, 1908, and has been equipped with a wooden shafthouse and a temporary hoist. Drifting was begun on the 150′ level, August, 1908.

In addition to the Allouez conglomerate and Pewabic amygdaloid beds, the Franklin Junior tract carries the Mesnard epidote, Calumet conglomerate and Osceola and Kearsarge amygdaloids, all supposed to have been opened by a 975′ crosscut driven west on the Pewabic lode, many years ago, this crosscut showing several amygdaloid beds and one conglomerate carrying copper in small quantities. The formation was found considerably disturbed, and a crosscut at much greater depth might give better results. The Kearsarge lode is supposed to have been cut, 1906, by diamond drill borings, and also by a crosscut, but was found valueless where opened. Dr. L. L. Hubbard estimates, on data furnished by Reginald C. Pryor, that the Kearsarge amygdaloid should lie 1,308′ horizontally east of the Allouez conglomerate, which would indicate that the old 975′ crosscut, driven 1894, did not reach the Kearsarge lode. In consequence, the old crosscut was extended eastward, 1906, but the Kearsarge bed, or what is supposed to have been such, was not found to carry workable values, at that point and depth.

Surface equipment includes plants at the old mine and Franklin Junior. The former is adequate, but has not been added to for many years, in view of the ultimate exhaustion of the mine. Surface equipment at the Franklin Junior includes substantial and well equipped machine, carpenter and blacksmith shops, engine-houses, boiler-houses, warehouses, changing-house, office and a considerable number of substantial dwellings. There are air-compressors of, 10, 12 and 36 drill capacities.

The mill, of steel, on stone foundations, 177x194′ in size, is reached by the Mineral Range railroad. Equipment includes 5 Allis-Chalmers 2-way heads,

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with 20x24" cylinders, each capable of crushing 350 tons of conglomerate or 500 tons of amygdaloid rock daily. Each stamp is fed from a 1,000-ton rock-bin, and equipped with hydraulic separators, which remove considerable heavy copper. The washing plant includes, for each head, 20 roughing jigs, 15 finisher jigs, round tables and 1 Overstrom table. The jigs are of the Hodge eccentric type, with center-shield copper discharges, obviating skimming. Foundations have been rebuilt under 2 old heads.

Power for the mill is furnished by a 16x32" Allis-Chalmers engine, with steam supplied by two 500-h. p. Stirling boilers, the boiler-house having a self-supporting brick-lined smokestack of 7' diameter, 165' high, on a 52' brick foundation. Water is furnished by a 15,000,000-gallon Allis-Chalmers vertical compound pump having 12x42" high pressure cylinders and 42x42" low-pressure cylinders, with 47" stroke and plungers of 37½" diameter. Water is drawn through a 36" pipe line, running 200' under the rock to a crib protected by quarter-inch screens. The mill has a 5x12" duplex fire-pump with fire-hose, and is lighted electrically. There is a 267' wharf at the millsite, with 18' of clear water alongside, equipped with coal hoists and sheds. The millsite has about 20 dwellings for employes.

The old mine works about 10 drills and the new mine 25, the old mine producing about 20% of the rock tonnage and 25% of the copper, showing that the rock from the old mine runs 14 to 15 lbs. fine copper per ton, while the conglomerate workings average under 11 lbs. The amount of mass copper secured is very small, averaging only about 1 pound per ton. Mineral is dressed to an average fineness of about 52% only, in order to save fine copper formerly lost in the tailings. Mining and milling costs, 1907, were $1.78 per ton, mining costs being $1.16 and stamping cost only 32.5 cents, notwithstanding the very refractory nature of the rock. These figures compare with similar costs of $1.76 per ton in 1903, notwithstanding increased wages and higher prices for supplies. Costs for 1907, including circa $20,000 for construction, were $740,595.65, being nearly 17 cents per pound, as against 15.4 cents in 1906; 15.8 cents in 1905; 15.4 cents in 1904 and 11.3 cents in 1903. The cost per ton of rock stamped was only 2 cents greater in 1907 than in 1903, while copper costs were nearly 6 cents more, the explanation being found in the steadily declining percentage of copper secured from the conglomerate mine of the Franklin Junior. In 1903 the extraction was 15.25 lbs. per ton from rock stamped, and in 1907 was only 11.48 lbs. fine copper per ton of rock stamped.

Production of fine copper has been as follows: 5,309,030 lbs. in 1903; 4,771,050 lbs. in 1904; 4,206,085 lbs. in 1905; 4,571,570 lbs. in 1906, and 4,401,248 lbs. in 1907. Production for 1908 probably will show a small loss from 1907, owing to transference of mining work from the conglomerate to the amygdaloid mine, at the Franklin Junior.

The matter of selling the old Franklin mine to the Quincy Mining Co. is under consideration, as is a tentative plan for the absorption of the Rhode Island mine and acquisition of 640 acres adjoining. The tentative plans call for an increase of capitalization to $5,000,000, and the issue of 45,000 shares of new Franklin stock, in payment for the Rhode Island property and one square mile of land from St. Mary's Mineral Land Co. Such a merger would give the Franklin company 2 miles of outcrop of the Pewabic and Boston & Albany beds, and nearly 2 miles of the strike of the Kearsarge lode. The management is vigorous, efficient and economical in the highest degree. The Junior mine, as developed, is so low in grade, on both the conglomerate and amygdaloid workings, that the only possibility of rendering it successful lies in production on a very large scale, and upon a most economical basis, but

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the new deep workings of the Pewabic bed on the Junior are, without question, much more promising than anything ever found in the upper workings.

FRASER MOUNTAIN COPPER CO. **NEW MEXICO.**

Dead. Formerly at Twining, Taos Co., N. M. Described Vol. VI.

FRASER RIVER COPPER MINING CO. **BRITISH COLUMBIA.**

Letter returned unclaimed from former office, 27 Market St., Camden, N. J. Mine office: Kamloops, Yale district, B. C. Scott H. Richmond, mine *manager*. Organized 1906, under laws of New Jersey, with capitalization $1,200,000, shares $1 par.

FRATERNITY COPPER CO. **NEVADA.**

Office: 220 Shukert Bldg., Kansas City, Mo. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized under laws of *Arizona*, with capitalization $5,000,000, shares $1 par. Apparently was promoted by I. W. Dumm. Lands, claimed to be 125 acres, advertised to be located "in the midst of Ely's great successes," which seems doubtful. Apparently no work done, and company viewed with suspicion as a mere stock-jobbing enterprise.

FREDERICK WARDE GOLD & COPPER MINING CO. **NEVADA.**

Letter returned unclaimed from former office, Salt Lake City, Utah. Mine office: Goodsprings, Lincoln Co., Nev. Frederick Warde, president; A. W. Raybould, secretary; Jacob Myers, treasurer. Organized March 1, 1904, with capitalization $300,000, shares $1 par. Lands are in the Yellow Pine district. *Idle* and apparently moribund.

FREELAND CONSOLIDATED MINES CO. **COLORADO.**

Dead. Was succeeded, 1904, by Freeland Development & Transportation Co. Formerly at Freeland, Clear Creek Co., Colo.

FREELAND DEVELOPMENT & TRANSPORTATION CO. **COLORADO.**

Office and mine: Idaho Springs, Clear Creek Co., Colo. J. R. McKinnie, president; Jacob J. Elliott, second vice-president; Geo. E. Armstrong, secretary and treasurer; Geo. E. McClelland, managing director; preceding officers, Anthony W. Smith, Jr., Geo. L. Hibbs, John Trathen and John Riley, directors. Organized May, 1904, under laws of Colorado, with capitalization $5,000,000, shares $50 par.

Lands, 105 claims, patented, area circa 500 acres, including the Freeland mine and McClelland tunnel, also 30 acres of mill and smelter sites. The *mine*, opened 1861, is extensively developed, on fissure veins in granite, and is said to have produced upwards of $4,000,000 in gold, silver, copper and lead, the copper occurring as chalcopyrite. Ore is divided into 2 classes, smelting ore averaging circa $25 and milling ore about $12 per ton in value. The main shaft, 1,040′ deep, is filled with water, and property is being reopened by the *McClelland* tunnel, of 3,600′ projected length, planned to drain, ventilate and develop the principal mines of the company, at depths of 1,300′ to 3,000′.

FREELAND EXTENSION MINING & MILLING CO. **COLORADO.**

Office: care of Dr. R. C. Warne, Mitchell, S. D. Mine office: Idaho Springs, Clear Creek Co., Colo. N. L. Bras, president; Hon. Warren A. Haggott, *resident* agent; Jas. A. Wilson, superintendent. Lands, 4 claims, 7 miles from Idaho Springs, having a 400′ shaft showing ore carrying values mainly in lead, with considerable gold and some copper and silver. Idle since circa 1902.

FREELAND MERCANTILE & MINING CO. **COLORADO.**

Dead. Formerly at Freeland, Clear Creek Co., Colo.

FRÉMONT COPPER MINES CO. **COLORADO.**

Office: care of Standard Securities Co., St. Paul, Minn. Mine office: Copperfield, Frémont Co., Colo. A. J. Taber, general manager. Lands are near

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Cotopaxi. Company said, April, 1908, to have ordered full equipment for a mill.

FRÉMONT COPPER MINING CO. **WYOMING.**

Dead. Lands sold, circa 1907, to St. Joe Mining & Milling Co. Formerly at Riverside, Carbon Co., Wyo.

FRENCH-AMERICAN MINING CO. **NEVADA.**

Mine office: Lane, White Pine Co., Nev. Louis Symon, general manager. Lands include the Macon City group, 3 claims, near Lane, and the Douzette group, said to have produced circa 400,000 tons of lead ore, under a former management, ore so produced averaging 22% lead, 8 oz. silver and $2 gold per ton, with small and variable copper values. Property shows ore assaying up to 25% copper, 11 oz. silver and $14 gold per ton.

FRENCH CREEK COPPER CO. **PENNSYLVANIA.**

Dead. Formerly at French Creek, Chester Co., Pa.

FRENCH CREEK MINING CO. **WYOMING.**

Letter returned unclaimed from former mine office, Centennial, Albany Co., Wyo. G. W. Morris, superintendent. Capitalization $1,000,000, shares $1 par. Lands, near Centennial, show a 3′ to 4′ vein, with 12″ footwall paystreak carrying high grade auriferous copper ore.

FRESNO COPPER CO., LTD. **CALIFORNIA.**

Office: 188 St. Vincent St., Glasgow, Scotland. Mine office: Clovis, Fresno Co., Cal. Sir John H. N. Graham, Bart., chairman; J. S. MacArthur, consulting engineer; C. E. Levett, Jr., mine manager. Organized Apr. 2, 1902, under laws of Great Britain, with capitalization £400,000, and reorganized, under same title, Feb. 12, 1907, with capitalization £100,000, shares 4s. par. Lands, 480 acres, freehold and 1,880 acres leasehold, including the Blue Park mine, full of water at last accounts, carrying a vein claimed to be 50′ wide, having 4 shallow shafts showing ore that was claimed to average 10% copper and $2 gold per ton. Honest sampling of the principal ore dumps gave average assays of 1.04% copper and 13 cents combined gold and silver values per ton. Ore is cupriferous pyrite, apparently too low in grade to be rendered payable under any process of extraction now in use.

In 1901 H. B. Vercoe bought, for about $12,000, a ranch in Fresno county, California, having an old 120′ shaft, called a copper mine. This ranch was made the basis of the £30,000 California Copper Syndicate, which, in April, 1902, sold 80 acres to the Fresno Copper Co., Ltd., for £105,000 in fully paid shares, company having £400,000 capitalization in shares of £1 par, which went to a premium of more than 100% on the market, giving a market valuation of nearly £1,000,000 for a property costing originally only about £2,400. On the honest report of Fred Siebert, the shares fell from £2 to 2s. per share. The outcome gives a very sinister appearance to the actions of Vercoe, who was the original owner, promoter, vendor and managing director of this company, and who seems to have been an outright swindler. The moral is plain. "Lock the door before and not after the horse is stolen." Apparently property is of little or no value.

FRIDAY & LOWDEN. **CALIFORNIA.**

Office and mine: Redding, Shasta Co., Cal. Property, on which about $25,000 has been expended, is opened by tunnels. Idle several years.

SILBER- UND BLEIERZBERGWERK FRIEDRICHSSEGEN A. G. **GERMANY.**

Mine office: Friedrichssegen an den L., Hessen-Nassau, Germany. Max Rosenthal, president; C. Leuschner, superintendent, at last accounts. Production, 1903, was 380 metric tons of argentiferous lead ore, carrying 62.43% lead and 46.93 grams silver per ton; 5,524 metric tons of zinc ore, averaging

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46.31% zinc; 50.25 tons of spathic iron ore, and 8 tons of copper ore averaging 12.1% copper and 11.64 grams silver per ton.

FRISCO CONTACT MINING CO. **UTAH.**

Office: 209 Dooly Blk., Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. D. P. Rohlfing, president and general manager; Patrick Ryan, vice-president; H. S. Young, secretary and treasurer. Organized circa 1903, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. One-half of the capital stock is supposed to be pooled.

Lands, 18 claims, area circa 340 acres, adjoining the Horn Silver mine on the northeast, carrying what is supposed to be the extension of the Horn Silver vein, which has been opened to a depth of 600′ by a 2-compartment shaft, mine having 3 other shafts and several tunnels, with circa one-half mile of workings. Property also shows 4 contact deposits, between limestone and andesite, one ranging up to 150′ in width, carrying values up to 20% copper, 45% lead, 3% zinc, 45 oz. silver and 80 cents gold per ton.

Equipment includes a steam plant, with hoists of 50-h. p. and 80-h. p., and a 4-drill air-compressor, with necessary mine buildings. The Horn Silver mine, adjoining, has been a very large producer, and property is considered promising and development well-planned, though apparently as yet no important ore bodies have been developed.

FRISCO MINING CO. **UTAH.**

Dead. Title changed, circa 1903, to Frisco Contact Mining Co. Formerly at Frisco, Beaver Co., Utah.

FRONTENAC COPPER CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Operating office: Calumet, Mich. Mine office: Eagle River, Keweenaw Co., Mich. Quincy A. Shaw, Jr., president; Rodolphe L. Agassiz, vice-president; James MacNaughton, general manager; Geo. A. Flagg, secretary and treasurer; preceding officers and F. W. Hunnewell, directors. Organized June 26, 1905, under laws of Michigan, with capitalization $500,000, shares $25 par. Is controlled, through ownership of entire stock issue, by the Calumet & Hecla Mining Co. At end of fiscal year, Apr. 30, 1908, company had cash and bills receivable, $5,894, with indebtedness of $96,986.

Lands, 22,268 acres, in Keweenaw county, Michigan, lying mainly south and west of the Manitou, with the old Central mine as the nucleus. The Central mine, worked 1854-1897, on a fissure vein, was a large producer for many years and paid dividends of more than $2,000,000. Property also includes the Winthrop mine, area 800 acres, in Town 59, Range 39, adjoining the Central. Lands have been slightly prospected by diamond drill borings, but nothing of especial value found. The tract, however, is very extensive, and, in view of developments elsewhere, it is altogether probable that payable mines will be opened, eventually, on the holdings of the Frontenac.

COMPAÑIA MINERA LA FRONTERIZA. **MEXICO.**

Mine office: Lampazos de Naranjo, Décimo, Nuevo León, Mex. Property is the Buena Vista mine, carrying argentiferous chalcopyrite and sphalerite.

MINA FRONTON. **CHILE**

Owned by Société des Mines et Usines de Cuivre de Chañaral.

FUJITA-KUMI & CO. **JAPAN.**

Office: 180 Dojima-Kitamachi, Osaka, Japan. Mine office: Kosaka-mura, Kazuno-gori, Rikuchu, Japan. Denzaburo Fujita, chairman; Heitaro Fujita, vice-chairman; R. Tanaka, general manager; S. Saito, mine superintendent; K. Takenouchi, smelter superintendent. Organized 1875, under laws of Japan, with capitalization £6,000,000. Profits, 1906, were estimated at circa $3,000,000.

Mining property includes the Kosaka and Towada mines, located in the

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midst of high mountains, difficult of access. The Towada mine, opened A. D. 1670, has a vein of 30′ to 100′ width, carrying disseminated auriferous chalcopyrite and argentite.

The Kosoka mine, located at the extreme northern end of the main island of Nippon, 10 miles from the government railway, is an old silver mine, once apparently nearly worked out but proven, within the last few years, to carry immense underlying masses of copper ore. Country rock is brecciated porphyry tuff, ranging from a fine conglomerate to a coarse grit, with intrusions of liparite and andesite, ore bodies occurring along the contact zone between the tuff and andesite as impregnations of tuff near a dacite contact, practically as blanket veins, lying at an angle of about 45°, with diorite footwall and hanging of andesitic tuff, the hanging-wall being sharply defined, but the ore shading imperceptibly into the footwall. There are 5 of these ore bodies, of immense size, ranging from 20′ to 270′ in thickness, and proven to length of one-half mile, while drill borings have proven the formation to continue to a depth of 1,700′, with width, as shown by open-cuts, of 20′ to 140′. There is a zone of mixed sulphides immediately under the hanging wall, averaging about 2% copper, 10% lead, 10% zinc and 0.02 oz. silver, with a trace of gold, the gangue carrying 40 to 45% barium sulphate. Immediately below the mixed zone is a zone of cupriferous pyrite, associated with more or less sphalerite, carrying 1 to 2% copper only, succeeded by silicious ore of 1 to 1.5% copper tenor.

Ore is produced in 3 grades, the first averaging only about 2.25% copper, 2 oz. silver and 65 cents gold per ton, with 12 to 18% zinc and 20 to 35% barite, causing difficult smelting. The second grade of ore is chalcopyrite, with pyritic gangue, comparatively free from zinc, but averaging only about 1.75 to 2% copper. The third grade is silicious ore, very low in copper tenor, but necessary as a flux, all three varieties of ore being charged as a self-fluxing mixture. Average of all grades of ore smelted is about 2% copper only, with small gold and silver values. The mine has fully $30,000,000 in gross values in sight.

The mine, discovered 1860, and opened 1864 for silver values, has been under the management of the present owners since 1884. Development is by 9 shafts of 41′ to 221′ depth, and by 5 tunnels, of 250′, 714′, 1,084′, 1,212′ and 2,050′ length.

Power is generated by a turbine water-wheel, only about 200 h. p. being used at the mine, owing to extraction being mainly by tunnel, about 200 h. p. used for miscellaneous purposes. There are two 8-drill Leyner air-compressors. Buildings include a foundry, of 1,538 square yards area, carpenter-shop of 1,332 square yards, and boiler-shop of 812 square yards, all of wood and brick.

The smelter, one mile from the mine, of about 1,000 tons daily capacity, is one of the most complete in existence, having the very latest equipment throughout. Ore is brought to the works by an aerial tram. Equipment includes 8 Herreshoff calciners, of which 6 are used on ore, 1 on matte and 1 on slags. There are 6 rectangular water-jacket blast-furnaces, of which 2 are used for matting, 2 for casting anodes, 1 for blister copper and 1 for ingot and cake copper. Semi-pyritic smelting is employed, with fuel charges of only about 2% anthracite. Product is a lead-copper matte containing about 20% copper, which is crushed, roasted and resmelted in reverberatory furnaces to blister copper. The slag is essentially an iron and barium silicate.

Blister copper from the reverberatories is refined electrolytically, the capacity of the refinery having been greatly increased in 1906. Product is electrolytic copper of the exceptional purity of 99.95%.

The company owns and operates a private electric railway, of 8 miles

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length, equipped with 10 locomotives and 400 three-ton ore cars. The company also owns and operates 2 sawmills, and employs about 3,000 hands.

The Kosaka mine was under option, 1906, to an English syndicate, but, fortunately for the owners, the option was not exercised, and the property now is not for sale.

Production, 1906, of the Kosaka mine, was 14,811,152 lbs. fine copper, 29,594,094 grams silver and 290,772 grams gold, and in 1907 was 15,340,218 lbs. fine copper, 9,040,741 momme silver and 79,403 momme gold, copper production showing an increase of almost 50% in 4 years. The Kosaka, notwithstanding the extremely low average tenor of its ores, is the largest copper producer of Japan, and is owned by the strongest financial and commercial interests of the Empire. Not only is it the greatest copper mine of Japan, but it is one of the greatest copper properties of the world, in potential production, owing to the enormous size of its ore bodies.

FUKADA MINE. **JAPAN.**

Mine office: Fukada-mura, Kuma-gori, Higo, Japan. Country rocks are alternate strata of sandstone and clay-slate of Paleozoic age, ore body having strike and dip corresponding to country rocks, and ranging 5′ to 10′ in thickness. Ore is chalcopyrite, associated with iron pyrites, and averages 5 to 6% copper. Production, 1900, was only 18,266 lbs. fine copper. Idle.

FUNATSU MINE. **JAPAN.**

Mine office: Funatsu, Yoshiki-gori, Hida, Japan. Har argentiferous copper ore and made circa 500,000 lbs. fine copper yearly when working. Idle.

FURNACE CREEK CONSOLIDATED COPPER CO. **CALIFORNIA.**

Office: 604-20 Broad St., New York, N. Y. Mine office: Greenwater, Inyo Co., Cal. O. A. Montgomery, president; Jos. A. Chanslon, vice-president; Col. J. B. Lankershim, treasurer; Maj. J. W. A. Off, secretary; preceding officers, C. A. Burcham and C T. Silby, directors. Organized 1906, with capitalization $5,000,000, shares $5 par. Lands, circa 200 acres. Presumably idle.

FURNACE CREEK COPPER CO. **CALIFORNIA.**

Office: 506 Traders National Bank Bldg., Spokane, Wash. Mine office: Greenwater, Inyo Co., Cal. Patrick Clark, president; W. B. Matteson, vice-president; J. J. Stewart, secretary and treasurer; Abe S. August, assistant secretary; A. B. Harvey, general manager and mine superintendent; Jas. Hanley, foreman. Organized under laws of Washington, with capitalization $2,250,000, shares $1 par. Trust Company of America, New York, transfer agent. Guaranty Trust Co., New York, registrar. Shares are listed on the Butte stock exchange.

Lands, 21 claims, 3 fractional, area 350 acres, 2 miles west of Greenwater, held by location, with no adverses, except in case of the three fractional claims. Mine has about 3,000′ of workings, No. 1, or Copper Blue shaft, being 500′ deep, with crosscuts on the 40′, 250′ and 500′ levels. Work was begun December, 1906, this being the pioneer mine of the Greenwater district, hauling supplies 125 miles from Las Vegas, then the nearest railroad point, and water from Furnace Creek, 25 miles.

Property shows 4 distinct ledges within a cross section of about 600′, with a little copper in the country rock between, main ledge being andesite, with a strike of circa N. 30° E., and dip of 75° E., outcrop not being especially prominent. Formation shows intrusive granite and porphyry, with cross dykes of later porphyries, nearly covered by a later flow of rhyolite, and faulted by northeast and southwest faults. Main ledge is reported to be about 200′ wide between walls, but apparently has shrunk to width of 30′ to 50′ on the 250′ and 500′ levels, and at those depths is effectually leached of copper values, except for carrying paystreaks, up to 3′ width, and occasional bunches of cop-

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per ore, these frequently carrying good gold values, ores being melaconite, cuprite, azurite, malachite, chalcocite and chrysocolla, 2 latter ores predominating. Reports of large ore bodies opened in crosscuts were exaggerated. The wide dyke is claimed to average about 4% copper throughout, but this seems a very serious overestimate. Three 50-ton shipments to Salt Lake smelter returned 16.5 to 17.3% copper, with small gold and silver values. The Tonopah Tidewater Railroad is now only 12 miles from Greenwater.

Equipment includes a 40-h. p. gasoline hoist and fan. An available smelter site has been selected, but the mine has not shown sufficient ore to warrant the building of even a small smelter. Working conditions are somewhat difficult, and development has proven decidedly disappointing. Predictions, April, 1907, that production would begin immediately, were utterly unwarranted, and the property, though by no means devoid of promise, has yet to prove that it is a mine. Management considered competent.

FURNACE CREEK EXTENSION COPPER MINING CO. CALIFORNIA.

Office: care of Hon. John MacGinnis, vice-president, Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. Geo. W. Irwin, president; R. B. Nuckols, treasurer; preceding officers, A. J. Campbell, Fayette Harrington, J. D. Slemons, John M. Kirk, W. W. Cheeley, Harry Cunningham, E. H. Wilson and W. E. Credon, directors; W. H. Teague, superintendent. Organized Sept. 20, 1906, under laws of Montana, with capitalization $5,000,000, shares $5 par. Lands, 13 claims, known as the Brady-Kempland group, adjoining the Furnace Creek Copper Co., which have shown a little ore assaying up to 9.5% copper. Idle at last accounts.

FURNACE CREEK GOLD & COPPER CO. CALIFORNIA.

Mine office: Greenwater, Inyo Co., Cal. Organized 1906, by residents of San Francisco and Goldfield. Lands, 5 claims, known as the Red Dog group, claimed to show a 20′ vein of copper ore.

FURNACE CREEK OXIDE COPPER CO. CALIFORNIA.

Office: care of W. J. Guthrie, president and treasurer, Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. Harry M. Bradhurst, vice-president; John E. Corette, secretary; preceding officers, Carl H. Hand and A. J. Huneke, directors. Organized circa October, 1906, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands, 6 claims, lying east of the Furnace Creek Copper Co., showing copper stains and having a shaft of circa 100′. Idle.

FURNACE CREEK SOUTH EXTENSION COPPER CO. CALIFORNIA.

Office: care of L. M. Sullivan Trust Co., Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. O. K. Kingsbury, vice-president; Larry M. Sullivan, second vice-president; J. L. Lindsay, secretary; J. P. Harvey, consulting engineer and director; A. J. Cleary manager. Capitalization $1,500,000, shares $1 par. Lands, 120 acres, including the Anxiety and Copper Shoe groups. On the Copper Shoe pinching, the Anxiety became manifest. Has secured selected samples of ore assaying 5 to 30% copper. Promotion, by Shanghai Larry Sullivan, was marked by peculiar methods, though such methods are by no means peculiar to Sullivan. Is not regarded favorably. Idle and apparently moribund.

FURNACE VALLEY COPPER CO. CALIFORNIA.

Office: Spokane, Wash. Mine office: Greenwater, Inyo Co., Cal. Patrick Clark, president; W. C. Meyer, vice-president; J. J. Stewart, secretary and treasurer; preceding officers, W. J. C. Meyer, Fred Birney and H. C. Wakefield, directors; A. August, assistant secretary; W. J. Casey, superintendent.

Organized July, 1906, under laws of Washington, with capitalization $6,250,000, shares $5 par. Trust Company of America, New York, transfer agent. Shares are listed on the Spokane, Butte and Los Angeles stock ex-

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changes. Company realized $52,525 from stock sales, 1907, and expended $30,816, ending the year with 133,750 shares of stock unissued.

Lands, 8 claims, unpatented, circa 2 miles west and south of the Furnace Creek Copper Co., showing 2 fissure veins, carrying carbonates assaying 4 to 15% copper in a gossan of 200′ claimed width, partly covered by alluvium. Has 2 shafts, deepest 209′. Idle.

FUROKURA MINE. **JAPAN.**

Owned by Furukawa Mining Co.

FURUKAWA MINING CO. **JAPAN.**

Office: 1, Yayesucho, Kojimachi-ku, Tokio, Japan. Smelter office: Yamamoto-gori, Akita-ken, Shimotsuke, Japan. Work offices: Kamitsuga-gori, Tochigiken, Japan, and Yanagiwaramachi, Honjyoku, Tokio, Japan. Mine offices of the various properties are as follows: Ashio Mine, Kamitsuga-gori, Tochigi-ken, Shimotsuke, Japan; Ani Mine, Kitaskita-gori, Akita-ken, Ugo, Japan; Kusakura Mine, Higashikanbara-gori, Niigata-ken, Echigo, Japan; Furokura Mine, Kazuno-gori, Akita-ken, Rikuchu, Japan; Nagamatsu Mine, Nishimurayama-gori, Yamagata-ken, Uzen, Japan; Mizusawa Mine, Waka-gori, Iwate-ken, Rikuchu, Japan; Otori Mine, Higashi-Tagawa-gori, Yamagata-ken, Japan; Kune Mine, Iwata-gori, Shizuoka-ken, Totomi, Japan; Innai Mine, Okachi-gori, Akita-ken, Ugo, Japan.

Junkiche Furukawa, president; R. Kondo, general manager; M. Otagawa, assistant manager; K. Asano, consulting engineer. Organized 1905, as successor of Ichibei Furukawa.

Property includes 8 copper mines, 1 silver mine, a smelter, 2 copper works, several collieries and an extensive coking plant. The various mines are described, in detail, in the following paragraphs:

The Ashio mine, in the province of Shimotsuke, about 100 miles northwest of Tokio, was discovered A. D. 1610, and developed by the Tokugawa government, reaching a productive capacity of 2,000,000 to 3,000,000 lbs. fine copper yearly, during the latter half of the Seventeenth Century, rendering it one of the largest, if not the largest copper mine, of that era, and as the output was in excess of domestic demand, the surplus was exported to Holland. The mine came into the possession of the late Ichibei Furukawa in 1877, in such poor condition that its yield was only about 400,000 lbs. of copper yearly, but, by good management and thorough development, coupled with the introduction of modern methods and machinery, was made the foremost copper mine of Japan.

The Ashio shows country rocks of Paleozoic clay-slate, sandstone and hornblende, with liparite intrusions, carrying literally hundreds of metalliferous veins that traverse the lipartite, but thin out in the Paleozoic rocks. About 30 veins are worked, these averaging 5′ to 6′ in width, with ore chutes of great length, averaging nearly or quite 1,000′. There are 7 main veins, of 6′ to 7′ average width, all with sharp dips, carrying a little melaconite and bornite, with galena, sphalerite, arsenopyrite and pyrite, having a quartz and alumina gangue, principal ore values being in the sulphides. Deepest workings are 1,250′, and ores range up to 10% in copper tenor, though giving average smelter returns of only about 4% copper, with small silver values.

The Ashio mine is 9 miles from Nikko, the nearest railroad station. Supplies are brought in tram-cars, hauled by bullocks, to the foot of the mountains, 5 miles from Nikko, and transported thence to the mine by 2 aerial trams, each about 19,500′ in length, having some very long and high spans, these crossing the crest of the mountains and descending on the other side to Ashio. Power for operating the trams is furnished by a plant with Pelton water-wheel, near Ashio. There also is a horse-tram connecting the different mines and smelters. The mine has steam, water and electric power, there being 5 electric plants,

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developing about 2,500-h. p., generated mainly from adjacent streams. The mine equipment is modern throughout, the machinery being mainly of American and German manufacture. The mine has electric underground haulage, and ore is broken mainly by power drills.

The reduction works at the Ashio include 3 concentrators, and a mill with 25 gravity stamps. The bulk of the ore mined is concentrated to an average tenor of 15% copper, though a little hand-selected ore of high grade goes direct to the smelters.

The Ashio smelter, of 750 tons daily capacity, completed 1904, has 3 water-jacket blast-furnaces. The converter department has a 40-ton traveling crane, 2 stands, 7 shells and a silica mill. The power plant has blowers for the blast-furnaces and air-compressors for the converters.

The Ashio mine alone employs about 12,000 people, including forces at the copper mines, flux quarries, charcoal kilns, smelters, offices, etc. The force includes men, women and children, the females and children being employed at light labor only. Wages, while low according to western standards, are much higher than the average in Japan, miners earning 40 cents to $1 per day, and smelter men about 30 cents per day, while engineers, carpenters, smiths and other craftsmen are paid 50 cents to $1 per day, and boys and girls in the mills earn 10 to 25 cents per day. There were very serious labor troubles in February, 1907, leading to the burning of buildings, and rioting that was put down by troops. Wages were raised in 1907. Production of the Ashio mine has shown little change for the past 5 years, having been 15,267,210 lbs. fine copper in 1903, 14,622,000 lbs. in 1904; 14,820,192 lbs. in 1906 and 13,972,498 lbs. in 1907.

The Ani mine, Shigeo Kasai, mine manager, is a group of ancient properties in the province of Ugo, modernized about the beginning of the century. The Ani carries auriferous and argentiferous copper sulphides, associated with argentiferous galena, considerable silver being secured as a by-product. Equipment includes steam, water and electric power, with a very good modern mining and reduction plant. The works have a 10-stamp mill and a 150-ton smelter, with about 2,500 employes. Production, 1903, was 2,089,279 lbs. fine copper, and 1907 was 2,737,011 lbs.

The Kusakura mine, S. Gamoh, manager, in the province of Echigo, opened in the Eighteenth Century, was bought by the predecessor of the present company in 1870. The property shows 4 nearly parallel main veins, of less than 12" average width, though occasionally widening to several feet, traversing porphyry and andesite, the upper workings showing cuprite and bornite, succeeded by chalcopyrite, associated with pyrite and galena, in the lower levels, principal values being in the sulphide ores. Equipment includes steam and electric power, and a small smelter, making blister copper of 98.5% average tenor. About 1,000 hands are employed. Production, 1903, was 1,244,723 lbs., and in 1907 was 1,012,048 lbs. fine copper.

The Furokura mine, in the province of Rikuchu, was discovered A. D. 1762, and operated 1765-1794, remaining idle until 1868, when reopened. This property has numerous veins traversing andesite, carrying chalcopyrite, associated with pyrite, hematite and occasional galena and sphalerite, with a clay gouge. Production was 601,199 lbs. in 1903; 746,605 lbs. in 1906, and 656,893 lbs. fine copper in 1907.

The Nagamatsu mine, in the province of Uzen, shows rocks of Tertiary tuff and shale, traversed by andesite dykes, carrying numerous veins, mainly parallel, with nearly north and south strike and steep dip to the east. The Okubi, which is the main vein, has an average width of 6" to 12" only, with maximum of 24", carrying chalcopyrite associated with pyrite and occasional

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sphalerite, with quartz gangue. Production, 1907, was 603,514 lbs. fine copper and 101,020 momme silver.

The Mizusawa mine, in the province of Rikuchu, has two 3′ veins, at the junction of granite and liparite, carrying chalcopyrite with quartz gangue. Production, 1907, was 490,047 lbs. fine copper.

The Kune mine, in the province of Totomi, opened A. D. 1726, has 3 beds of ore, the upper of 100′ thickness, the middle of 12′ and the lowest of about 6′ average thickness, latter split into two 2′ seams at the bottom. Ore is chalcopyrite, associated with pyrite, the richer portions averaging 6 to 7% in copper tenor. Production, 1898, was 137,686 lbs. fine copper, and for 1906 output was given by company as circa 37,000 tons of copper ore.

The Otori mine made, 1904, circa 187,000 lbs. fine copper, and in 1907 produced 261,902 lbs. fine copper and 66,791 momme silver.

The Innai mine, near the southern boundary of the province of Ugo, was discovered A. D. 1696, and about the beginning of the Nineteenth Century became important, silver production rising to about 100,000 momme monthly, circa 1840. The mine fell into the hands of Ichibei Furukawa in 1882. The property shows augite-andesite and propylite, having numerous veins ranging from 2′ to 20′ width, carrying chalcopyrite, pyrargyrite, argentite and stephanite, with quartz gangue. A second vein, of 1′ to 4′ width, carries similar ores in connection with galena, sphalerite and pyrite, while a third vein carries chalcopyrite, galena and sphalerite only. Property, while called a silver mine, is an important producer of copper, with considerable gold values, production, 1907, having been 568,480 lbs. fine copper, 1,206,846 momme silver and 20,193 momme gold.

In addition to its metalliferous mines, the company operates extensive coal mines, known as the Western Collieries, at Kaho-gori, Fukuoka-ken, producing about 350,000 tons of coal yearly, and operates coal mines also at Kazuno-gori, Rioshikasho, Echigo. The Fukagawa coke works, at Minimakatsushika-gori, Tokio, are of about 16,000 tons annual capacity.

The Shinonome smelter, at Yamamoto-gori, Akita-ken, has an annual capacity of about 2,000,000 lbs. ingot copper, and 225,000 lbs. pig lead, also turning out small quantities of gold and silver.

The Nikko copper works, at Kamitsuga-gori, Tochigi-ken, is a refinery, making about 8,000,000 lbs. of electrolytic copper yearly.

The Honjyo copper works, at Yanagiwaramachi, Honjyoku, Tokio, has an electrolytic refinery, but is devoted mainly to the manufacture of sheets and wires, having an annual capacity of about 9,000,000 lbs., and turning out about 4,600,000 lbs. yearly of copper wire, 550,000 lbs. of electrolytic copper, and circa 3,300 lbs. fine silver.

The management of the Furukawa Mining Co. is noted for its progressiveness, and responsible heads of departments are encouraged to travel, at the company's expense, through the principal mining and metallurgical centres of Europe and America, thus keeping the company fully abreast of international progress, in every branch of its business. Production, 1905, was 23,780,573 lbs. fine copper and 1907 was 20,302,378 lbs. fine copper.

FUTURITY MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Newett, Chaffee Co., Colo. Described Vol. VI.

COMPAÑIA GADITANA DE MINAS. **SPAIN.**

Office: Cadiz, Spain. Mine office: Aznalcóllar, Sevilla, Spain. Capitalization, 3,000,000 pesetas, shares 500 pesetas par; debentures, 2,000,000 pesetas authorized. Marquis de Fiel Pérez Calixto, president; Don José Luis Lacave, treasurer; Don Salvador Viniegra, secretary. Property is La Caridad group of mines, carrying large bodies of cupriferous pyrites, with considerable develop-

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ment. Company built and owns a 34-kilometer railroad, from Aznalcóllar to the Guadalquivir river. Management considered good and property promising.

GAGNON MINE. **MONTANA.**

Owned by Trenton Mining & Development Co.

GALENA BAY MINING CO. **ALASKA.**

Office: 402 Railway Exchange Bldg., Chicago, Ills. Mine office: Valdez, Prince William Sound, Alaska. Benj. F. Millard, president; C. A. Hay, vice-president; L. J. Rusk, treasurer; Albert Barge, secretary; John S. Jury, assistant secretary. Organized under laws of Washington, with capitalization 500,000, shares $1 par. Lands, on Galena Bay, 3 miles from tidewater and about 35 miles from Valdez, include the Vesuvius group of 25 claims, held under bond and lease, having a 1,000′ tunnel, the Mullen group of 6 claims, and 12 miscellaneous claims in the Kotsina Valley, the Mullen group being on Copper Creek, also a 1,300-acre townsite. Company plans a hydro-electric power installation, to transmit energy 2 miles to the Vesuvius mine, and is said to have ordered a 1,700′ Leschen aerial tram.

GALENA COPPER MINING CO. **WASHINGTON.**

Office: 115 Marion St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. L. E. Rader, president; H. M. Williams, vice-president; John M. Snook, secretary; Francis X. Waldron, treasurer; Judson C. Hubbart, manager. Organized Jan. 2, 1906, under laws of Washington, with capitalization $1,000,000, shares $1 par.

Lands, 16 claims, in the Silver Creek district, showing mainly chalcopyrite, in veins of 3′ to 18′ width, said to have given assays of 18.5% copper, 2.9 oz. silver and $4 gold per ton. Development is said to be by tunnel, and a shipment of ore to the Tacoma smelter is said to have given net returns of $30 per ton. Management is said to expect a railroad within one-half mile of the mine. Presumably idle.

GALENA MINE. **BRITISH COLUMBIA.**

Mine office: Howe Sound, New Westminster district, B. C. J. H. Scott, manager, at last accounts. Lands, sundry claims about 6 miles south of the Britannia mine, located one-half mile from tidewater, on Howe Sound, opened by a 100′ tunnel on a 5′ vein of copper ore. Idle.

GALENA RIDGE MINING CO. **WYOMING.**

Mine office: Meteetse, Big Horn Co., Wyo. Lands, circa 1,200 acres, patented, also timber lands and water-rights, showing 5 veins of good width, on one of which the 450′ Oregon tunnel shows ores carrying copper, lead, silver and gold values, with quartz gangue. Small sample shipments to Denver are said to have given good returns. Development is by a 1,400′ crosscut tunnel, planned to be driven about 5,000′. Has a Pelton water-wheel and 10-drill air-compressor. Idle.

GALICE CONSOLIDATED MINING CO. **OREGON.**

Dead. Formerly at Galice, Josephine Co., Ore.

GALIZURSKI WORKS. **RUSSIA.**

Mine office: Galizursk, Elizabethopol, Russia. S. Varavov, owner. Latest recorded production, 1899, was 1,390,095 lbs. fine copper. Presumably idle.

GALLAHER MINING & MILLING CO. **WASHINGTON.**

Office: 705 First Ave., Seattle, Wash. Mine office: Cle Elum, Kittitas Co., Wash. Edward Peterson, managing agent. Organized under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, 10 claims, area 200 acres, showing copper ledges, also a vein of cinnabar of about 1% tenor in mercury. Development is by a 70′ shaft on the Copper King claim, and by tunnels of 380′ on the Last Chance, 310′ on the Copper Prince, 128′ on the Navidad and 120′ on the Dolphin. Company claims a 3′ vein of bornite in the

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Legal Tender, a 4′ vein on the Last Chance, and a 3′ vein on the Copper King. About $15,000 has been expended on development. Idle.

GALLATIN COUNTY BASIN COPPER MINING CO. **MONTANA.**

Office and mine: Bozeman, Gallatin Co., Mont. Organized January, 1906, under laws of Montana, with capitalization $100,000. Presumably idle.

GALLATIN MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

GAMNES COPPER CO., LTD. **NORWAY.**

Office: 1 Gresham House, London, E. C., Eng. Mine office: Karlsö, Tromsö, Norway. H. Godber, secretary; Blackmore, Howard and Tazewell, mine managers. Organized Oct. 12, 1901, under laws of Great Britain, with capitalization £25,000, shares £1 par. Property is mining claims and rights on Gamnes Farm.

GAP MINE. **PENNSYLVANIA.**

Mine office: Gap, Lancaster Co., Pa. Has nickeliferous and cupriferous pyorhotite, somewhat similar to the ore of the Sudbury district of Ontario, and was the principal American nickel producer for two decades. Idle since 1893.

TIBURCIO GARCÍA. **MEXICO.**

Mine office: Galeana, Chihuahua, Mex. Jesús Ontiveros, manager. Property is La Gloria mine, carrying auriferous and argentiferous copper ores. Has water power and a 20-ton mill with 1 Blake crusher. Employed circa 50 men at last accounts.

GARDINER, WORTHEN & GOSS CO. **ARIZONA.**

Office and works: Tucson, Pima Co., Ariz. B. L. Worthen, general manager. Has a smelter with 30-ton experimental water-jacket blast-furnace, burning crude California petroleum, tests of which were said to be satisfactory. Idle.

GARDNER HILL MINE. **NORTH CAROLINA.**

Letter returned unclaimed from former mine office, Jamestown, Guilford Co., N. C. Mine is opened by a 110′ shaft, showing cupriferous iron pyrites in 3 veins, ranging from a few inches to 3′ in width. Idle for many years.

COMPAÑIA MINERA GARDUÑO y ANEXAS. **MEXICO.**

Office: Puente Alvarado 21, Mexico, D. F. Mine office: Placeres del Oro, Mina, Guerrero, Mex. Lawrence F. Bedford, president; A. H. Stockdale, manager. Mine, opened for gold, has silver-lead and auriferous copper ores. Has water power and employed circa 100 men at last accounts.

GARFIELD MINING CO. **UTAH.**

Dead. Formerly at Brigham, Box Elder Co., Utah.

GARFIELD-SALVADOR MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. J. S. Baer, president; J. C. Stettheimer, treasurer and general manager. Organized June 5, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, near the St. Lawrence mine and adjoining the Raven on the west. Has a 180′ two-compartment shaft. Idle and apparently moribund.

GARLAND COPPER MINING CO. **WYOMING.**

Office: 232 West Cedar St., Kalamazoo, Mich. Mine office: Encampment, Carbon Co., Wyo. Dr. C. K. LaHuis, president; T. J. Upjohn, vice-president; Edwin Gillis, secretary and treasurer; preceding officers, E. S. Drury, O. F. Wickham and T. H. Palmer, directors. Organized July 10, 1902, under laws of Wyoming, with capitalization $1,500,000, shares $1 par; issued, $700,000. Lands, 4 claims, area 80 acres, in the Battle Lake district, having a 40′ shaft and a 100′ tunnel, on a vein of 50′ estimated average and 300′ maximum width,

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carrying a hematite gossan, supposed to be a continuation of the Itmay vein. Idle.

GARNET GOLD MINING CO. **MONTANA.**

Mine office: Pony, Madison Co., Mont. E. L. Ballou, manager. Has auriferous and argentiferous lead and copper ores with water power and 20-stamp mill, copper values being secured as a by-product. Employs about 40 men.

GARRETSON-SAHUARIPA CO. **MEXICO.**

Office: Ellicott Square Bldg., Buffalo, N. Y. Mine office: Sahuaripa, Sonora, Mex. Samuel E. Garretson, manager. Mine, opened by shaft, is said to have a fair showing of high grade auriferous and argentiferous copper ore. Has a steam plant, 50-ton mill and 50-ton Garretson pyritic furnace. Presumably idle.

GARRISON GOLD & COPPER MINING CO. **UTAH.**

Dead. Merged, 1907, in Garrison Monster Mining Co. Formerly at Ibapah, Tooele Co., Utah.

GARRISON-MONSTER MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Ibapah, Tooele Co., Utah. J. P. Gardner, president; J. S. Garrison, vice-president; S. W. Morrison, treasurer; H. B. Windsor, secretary. Organized under laws of Nevada, with capitalization 1,000,000 shares, presumably $1 par, as a merger of the Garrison Gold & Copper Mining Co. and Monster Mining Co. Lands, on Dutch Mountain, in the Clifton district, circa 40 miles from Wendover, the nearest railroad station, have about 3,500′ of workings, said to show considerable bodies of silver-lead ore.

GARVANZA MINING & MILLING CO. **CALIFORNIA.**

Mine office: Cima, San Bernardino Co., Cal. J. M. Banfield, superintendent. Lands, on the western side of New York Mountain, near Bryant station, on the Salt Lake Railroad, have about a quarter mile of workings, showing considerable auriferous and argentiferous copper and lead ore. Plans a 100-ton mill and reduction plant, with four 10-ton tanks to use the hyposulphite leaching process.

COMPAÑIA DE MINAS I FUNDICIONES DE GATICO. **CHILE.**

Dead. Succeeded, March 10, 1905, by Compañía Minera de Gatico. Formerly at Gatico, Cobija, Antofagasta, Chile.

COMPAÑIA MINERA DE GATICO. **CHILE.**

Office: Casilla 627, Santiago de Chile. Mine and works office: Gatico, Cobija, Antofagasta, Chile. Geo. W. Waters, manager. Organized March 10, 1905, under laws of Chile, with capitalization 6,000,000 pesos, shares 100 pesos par. Property includes El Toldo, Michilla and Gatico mines, latter opened 1891. La Michilla group, 6 kilometers north of Michilla Cove, at an elevation of 3,000 meters above sea-level, has bedded veins with pockets of oxidized ores carrying 5 to 6% copper, though tenor of ore can be brought up to nearly 10% by selection. El Toldo mine, 4 kilometers northeast of the smelter, has a nearly vertical fissure vein of about 1 meter width, opened to depth of 170 meters, carrying 7% chalcopyrite with quartz gangue. Production of El Toldo, 1904, was circa 10,000 metric tons of selected ore averaging 10.5% copper tenor. El Toldo mine is connected with the smelter by a Ropeways Syndicate aerial tram, 3,700 meters long, with drop of 200 meters, permitting operation by gravity, and reducing cost of ore transportation to smelter from former cost of 4.5 pesos to one-half peso per metric ton, effecting a saving of about 75,000 pesos yearly. Also has a 5½-kilometer Bleichert aerial tram from Michilla mines to Michilla Cove, operated by gravity, whence ores are shipped to smelter.

Smelter, at the port of Gatico, 30 miles south of Tocopilla, and 83 miles

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north of Antofagasta, has reverberatory furnaces and a 38x144" Allis-Chalmers blast-furnace. Converter department has pneumatic stands and 5 cylindrical shells, with an Allis-Chalmers duplex air-compressor and a 110-h. p. electric motor. Power plant includes two 200-h. p. boilers, Green fuel economizer and dynamo with capacity of 13 arc and 150 incandescent lamps. Water is re-used, works having a reservoir of 50,000 cubic meters capacity. Fuel is imported coke, slags averaging 0.5% copper. Smelter costs at old plant were 21.5 pesos per metric ton, and in the remodeled plant are 12.61 pesos per ton. Company also has an old smelter at Michilla Cove, running intermittently, this having a 36x84" water-jacket blast-furnace, 2 reverberatories and a converter plant. Production, 1903, was 2,565,503 lbs. fine copper, and for 1907 should have been nearly or quite 4,500,000 lbs. fine copper.

GAVILANES MINING & MILLING CO. **MEXICO.**

Office: 819 Chamber of Commerce, Chicago, Ills. Letter returned unclaimed from former mine office, Gavilanes, Durango, Mex. C. A. Wightman, president; John A. Boland, secretary and treasurer; James E. Boland, manager. Organized Sept. 1, 1904, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 500 acres, 30,000 acres of timber and grazing lands, and water-rights to 10 miles of the Piaxtla and Pilar rivers. Lands include the old Gavilanes silver mine, a property said to have produced, according to official records, 80,000,000 oz. silver, also sundry undeveloped copper veins. Idle.

SUCESIÓN FRANCISCO GEISSE. **CHILE.**

Office and mines: El Espino, Combarbalá, Coquimbo, Chile. Property includes El Espino mine, opened 1896, which made about 100,000 lbs. fine copper yearly when working, and the Fundición El Pupio, a small smelter. Idle.

GEISSE HERMANOS. **CHILE.**

Office and works: Illapel, Coquimbo, Chile. Mine office: Mineral de Bella Vista, Illapel, Coquimbo, Chile. Property includes Los Trabos, Bella Vista and Tongo mines. The Bella Vista mine is about 150 meters deep, with workings for about 150 meters in horizontal length. The Tongo mine, at Mineral de Tongo, Illapel, has a vein of 2 to 3 meters width, opened to depth of 160 meters, and, 1903, employing 90 men, produced 900 metric tons of ore averaging 9% copper and 25 grams gold per ton. The Trabos mine in the same year produced 720 metric tons of ore of 20% copper tenor. Has a smelter with blast and reverberatory furnaces, producing ejes of circa 50% copper tenor and bars of 97% tenor. Production, 1903, was 603,919 lbs. fine copper.

GEM CONSOLIDATED MINES CO. **COLORADO.**

Office: 341 Sixth Ave., Pittsburg, Pa. Mine office: Idaho Springs, Clear Creek Co., Colo. Col. J. M. Guffey, president; John H. Galey, vice-president; W. S. Watson, secretary; Henry B. Clifford, resident director; W. E. Renshaw, general manager; J. Kaughman, mill superintendent. Organized Jan. 1, 1907, under laws of Colorado, with capitalization $5,000,000, shares $1 par. Lands, 10 claims, patented, also a millsite, showing a vein of 20′ to 50′ width, traceable circa 3 miles, carrying sulphide ores assaying up to 37% copper, 10 oz. silver and $18 gold per ton. Mine has about 5 miles of workings, estimated to show 1,000,000 tons of ore, with 300,000 tons blocked out for stoping. Has a 550-h. p. hydro-electric plant, using 350 h. p. at the mine and 200 h. p. at the mill. Has 4 hoists, good for 3,000′ depth, and an 18-drill Ingersoll-Rand air-compressor. Buildings include a 40x50′ machine shop, carpenter shop, smithy, etc., and a 100-ton stamp mill. Production, 1907, estimated by company at circa $150,000 in value.

GEMINI-GODIVA CONSOLIDATED MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John Q. Packard, president; Jackson C. McChrystal, general superintendent. Was a

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merger of the Gemini and Godiva mining companies, the Gemini having paid about $300,000 in dividends. Mine, opened to depth of 1,600', has a vein of 15' to 20' width, carrying auriferous and argentiferous lead and copper ores, the silver-lead ores averaging 12% lead and 40 oz. silver per ton, while the bottom level shows argentiferous copper ore of about 3% copper tenor. Production averages circa 1,500 tons of ore monthly, mainly silver-lead ores, sold under a long-term contract to the United States Smelting & Refining Co. Has steam and water power, employing circa 75 men.

GEMINI MINING CO. **UTAH.**

Dead. Merged, circa 1906, in Gemini-Godiva Consolidated Mining Co. Formerly at Eureka, Juab Co., Utah.

GEM MINE. **MONTANA.**

Owned by North Butte Mining Co.

GEM TURQUOISE & COPPER CO. **NEW MEXICO.**

Office: 37 Maiden Lane, New York, N. Y. Mine office: Silver City, Grant Co., N. M. Property is a turquoise mine, in the Burro Mountains. Idle.

GENERAL COMPANY OF SPANISH MINES, LTD. **SPAIN.**

Office: 70 Queen Victoria St., London, E. C., Eng. Mine office: Cortegana, Huelva, Spain. T. Greenhill, secretary. Organized March 9, 1904, under laws of Great Britain, as Telesforo Copper Co., Ltd., with capitalization £50,000, shares £1 par; issued, £10,750; name changed, June, 1907, to present title. Lands are El Telesforo and La Segura mines. Presumably idle.

GENERAL DEVELOPMENT CO. **U. S. A.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Adolph Lewisohn, president; J. H. Susmann, secretary and treasurer; J. Parke Channing, engineer; preceding officers, A. Ruhlender, W. H. Nichols, J. Langeloth, Samuel Untermeyer, A. Lehman, Herman Sielcken, D. M. Hyman and H. M. Davis, directors.

Organized 1906, under laws of Delaware, with capitalization $2,000,000, shares $100 par. Is controlled by the Lewisohn interests and operated as a close corporation. Controls, through stock ownership, the Montana Consolidated Mining Co., Colorado Gold Dredging Co. and Miami Copper Co., with interests in Montana, Colorado, Arizona, Canada and Mexico. Is supposed to hold the Keystone property, at Globe, Arizona, under option. The copper properties are described separately, under their respective titles.

GENERAL DEVELOPMENT CO. OF ARIZONA. **ARIZONA.**

Office: P. O. Box 1052, Globe, Gila Co., Ariz. H. E. Kelly, president; Jas. A. Bordeaux, vice-president and general manager; J. H. Connell, secretary. Organized June 8, 1907, under laws of Arizona, with capitalization $1,000,000, shares $10 par, to do a general mining, development and promotion business.

GENERAL GRANT MINING CO. **COLORADO.**

Dead. Formerly at West Creek, Douglas Co., Colo.

GENERAL MINES CO. **MONTANA.**

Office: 23 Broad St., New York, N. Y. Letter returned unclaimed from former mine office, Helena, Lewis & Clark Co., Mont. Geo. Hyatt Robinson, president; Walter B. Tipton, vice-president; F. J. Chipman, secretary and treasurer; B. Frank Johnston, manager. Lands, in Avalanche Gulch, across the Missouri river from Helena, have a 28' vein, opened by a 500' crosscut tunnel, showing auriferous and argentiferous copper sulphides.

GENESEE COPPER CO. **CALIFORNIA.**

Mine office: Genesee, Plumas Co., Cal. Lands, 33 claims. Idle since circa April, 1906.

GEORGE A. TREADWELL MINING CO. **ARIZONA.**

Office: 27 William St., New York, N. Y. Mine office: Mayer, Yavapai Co., Ariz. F. W. Wood, president and general manager; Miss Myra B. Martin,

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secretary; Frank W. Giroux, superintendent. Organized February, 1900, under laws of West Virginia, with capitalization $3,000,000, increased, Jan. 21, 1905, to $3,500,000, shares $10 par. Was organized by "Gen." Walter S. Logan, "Prof." Geo. A. Treadwell and others. First act of company was illegal, being the purchase, from directors, who voted for such purchase, of sundry mining claims. Controls the Brookshire Mining Co., through ownership of 80% of stock. Has upwards of 2,000 shareholders, of whom 1,410, in August, 1907, were holders of 50 shares or less, more than half being women, duped by this gang of thieves. Annual meeting, first Wednesday in February.

Lands, formerly reported as 102 claims, patented, area 1,861 acres, were reported by the company, Apr. 10, 1906, as 60 claims, patented, area 1,200 acres, with 180 acres of mill and smelter sites, in the Jerome, Big Bug, Peck and Agua Fria districts. These lands were reported to include the Brookshire, Hackberry, Boggs, Iron Queen and Cliff mines, and previously included also the Badger, Pastime, Crystal, Wallace and Agua Fria groups. Country rocks are Yavapai schists and slate, with rhyolite intrusions, ore bodies occurring mainly as replacements in slate, following the rhyolitic intrusions. Five ore bodies have been developed, to various extents, these, of about 5′ average width, formerly having been claimed by the company to give average assays of 5% copper, 5 oz. silver and $5 to $50 gold per ton, from chalcopyrite, but claimed, 1906, by the company, to give average assays, from bornite and chalcopyrite, of 3% copper, 10% zinc, 5 oz. silver and $2 gold per ton, which ores, by reason of low contents in copper, gold and silver, and excess of zinc, are of small value.

Various mines are developed by shafts of 485′, 350′, 375′ and 100′, and by tunnels and drifts of circa 7,700′ aggregate length, with numerous shallow shafts and short tunnels.

The Brookshire group, which has the principal development, has upwards of one-half mile of workings, showing considerable concentrating ore of 4 to 5% copper tenor, with fair gold and silver values. Work was abandoned on this property in 1902. The Hackberry mine, opened to 500′ depth, has nearly one-half mile of workings, on 2 parallel veins of 7′ and 9′ claimed width, former claimed to carry ore averaging 10% copper and $10 gold per ton, which is untrue. The Boggs and Iron Queen mines have considerable development, as also has the Cliff, on which work was abandoned in 1902. Mines, as a whole, are estimated by the company to show 80,000 tons of ore, with 40,000 tons blocked out for stoping, which, although a considerable decrease from former claims, is a gross exaggeration. Practically all of the company's statements regarding rich ores and large ore bodies are fairy tales. The Boggs mine, which is idle, is held subject to a mortgage of $150,150.40, which never will be paid.

Mine equipment includes a 240-h. p. steam plant, with four 40-h. p. 12x14" hoists and a 2-drill Knowles air-compressor. Buildings include a 40x65′ wooden machine-shop, 20x30′ smithy, boarding-house, bunk-house and dwellings, with a total of about 40 buildings, including an office building put up on lands not owned, and not even leased, which is a fair sample of the business methods of the company.

A 75x100′ wooden concentrator has two 24" Dodge crushers, 3 centrifugal crushers and 2 tables, and is rated by company at 200 tons daily capacity, which, like all its other claims, is untrue.

The company controls, or is supposed to control, a private narrow-gauge railway, known as the Hackberry & Iron Queen railroad, of circa 5 miles length, touching the Hackberry, Boggs and Queen mines and connecting with the Santa Fé line at Arizona City. Equipment includes 2 locomotives and 9 cars, unless the rolling stock has been stolen recently by some of the officers.

An 8-mile pipe-line, of 4" diameter, costing $32,118.21, was suposed to

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bring water from Crystal Springs, under a head of 1,150', but is out of commission.

The company has three smelters, two worthless and one unnecessary. The old Boggs or Commercial smelter, on the narrow-gauge line, having a calciner and two 40-ton water-jacket blast-furnaces, hopelessly antiquated in design and equipment, was inherited from former owners. A hydrocarbon smelter, designed to burn petroleum and turn out blister copper from ore by a single fusion, was built at Arizona City, on the advice of "Prof." Geo. A. Treadwell, a doddering old "scientist" who was used as a stalking-horse by the company, and proved a ridiculous failure, though the company sold considerable stock on the strength of its alleged "revolution" of existing processes. The hydrocarbon "smelter" is fully described in Vol. IV.

The third smelter, at Mayer, seems properly planned and constructed, but apparently is a failure also, as the company's last ore shipments were made to the Humboldt smelter. This smelter is fully described in Vol. VI. The company claims a capacity, between the concentrator and smelter, of 500 to 600 tons of ore daily, which, of course, is an exaggeration. The company's various smelters cost $158,893.12, according to the company's books, but the accounts were kept so crookedly and by such unmitigated scoundrels that it is impossible to say what is to be believed.

The George A. Treadwell Mining Co. is a deliberate and intentional fraud, conceived in iniquity and born in sin, promoted by the late "Gen." Walter S. Logan, a notorious shyster lawyer of New York, who is said to have left an estate of $500,000, accumulated by all sorts of rascalities. Everybody connected with the company in an executive capacity in its palmy days of swindling was either a fool or a rascal. The management has not hesitated at any lie that seemed convenient or likely to prove profitable, and its financial statements were deliberately false, while the advertisements, put out over the name of Myra Martin, were colossal lies. A complete exposition of the rottenness of the company would require several pages, which can be devoted to better use, and the property is dismissed with the statement that the company is a swindle of the first magnitude, without a single redeeming feature. Idle and should be wound up, after the principals are imprisoned.

GEORGE THIRD MINING, MILLING & SMELTING CO. **COLORADO.**

Dead. Formerly at Carson, Hinsdale Co., Colo.

GEORGETOWN GOLD MINING CO. **COLORADO.**

Mine office: Georgetown, Clear Creek Co., Colo. Frank B. Branham, superintendent. Ores carry gold, silver, lead and copper. Presumably idle.

GEORGIA & TENNESSEE COPPER CO. **GEORGIA & FLORIDA.**

Office: care of H. G. Brooks, 35 Congress St., Boston, Mass. Letter returned unclaimed from former mine office, Temple, Haralson Co., Ga. Theo. Sutro, president; Otis Kimball, vice-president; Wm. Tudor, treasurer; preceding officers, L. V. Briggs and John T. Coolidge, Jr., directors; H. M. Mansfield, superintendent. Organized Jan. 24, 1905, as successor of Tallapoosa Copper Mines and Georgia Pyrites Co., with capitalization $1,000,000, shares $5 par. Lands, 447 acres of copper lands, in Georgia, and 800 acres of phosphate lands, in Marion and Levy counties, Florida, latter estimated to carry 800,000 tons of phosphate. Copper lands show country rocks of Laurentian schists, with 2 contact veins of 4' to 19' width, between slate and sandstone, opened by a 300' shaft. Has 1,250' of workings, estimated to show 85,000 tons of ore, with 45,000 tons blocked out for stoping, giving average assays of 3% copper, 2.7 oz. silver and $2 gold per ton. Ore is chalcopyrite, disseminated in pyrite, averaging 41% sulphur. Company planned installing an acid plant and manufacturing superphosphate for fertilizer. Idle.

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COMPAGNIE DES MINES DE CUIVRE ET DE PLOMB DE GERONA. **SPAIN.**

Dead. Dissolved 1906. Formerly at Susqueda, Gerona, Spain.

GERONA COPPER CO., LTD. **SPAIN.**

Dead. Voluntarily wound up, February, 1903. Formerly at Hostalrich, Gerona, Spain.

GERONA COPPER & LEAD MINES, LTD. **SPAIN.**

Dead. Dissolved, Feb. 20, 1906. Formerly at Susqueda, Gerona, Spain. Described Vol. VI.

GERONIMO COPPER MINING CO. **NEW MEXICO.**

Dead. Former officers were W. A. Sanders, president; Geo. R. Funke, vice-president; W. F. McQuarrie, secretary. Was organized March 22, 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands were 5 claims, area 100 acres, 8 miles northwest of Silver City. Was a swindle, put out by the notorious Financial Security & Trust Co., of Denver, which promoted the Spanish Lost Bullion and several other downright swindles. Formerly at Silver City, Grant Co., N. M.

GERTRUDE MINE. **ONTARIO.**

Owned by Lake Superior Power Co.

GERTRUDE MINING CO. **WYOMING.**

Dead. Succeeded by Eagle Copper Co. Formerly at Battle, Carbon Co., Wyo.

MINA GERTRUDIS. **PERÚ.**

Mine office: San Tadeo, Yauli, Junín, Perú. Mine, opened 1897, having lenses in limestone carrying chalcopyrite and tetrahedrite, is opened by adit from the level of Lake Morococha, mining through winzes sunk from short crosscuts in the hanging, ore being hand-cobbed at the adit entrance. Ore produced, to and including 1903, averaged 15.64% copper and 1,206 grams silver per ton, total production to end of 1903 being 2,189,400 kilograms fine copper and 1,689 kilograms fine silver. Production, 1906, estimated at 750,000 lbs. fine copper.

GEYMAN MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Lands are a small tract northeast of the Parrot smelter, having a shallow shaft. In 1906 Butte & Boston Consolidated Mining Co. secured a verdict giving damages of $72,541 for trespass and value of ore extracted. Idle some years.

GIANT CALIFORNIA MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Rossland, Trail district, B. C. Jay P. Graves, president; A. L. White, vice-president; Chas. H. Wolf, secretary; Geo. Wooster, treasurer; Wm. Yolen Williams, general manager. Organized circa 1907, with capitalization $5,000,000, shares $100 par. Lands, apparently one claim, a short distance west of Le Roi. The Giant mine shipped 4,344 tons of ore, before suspending, 1903. Property considered promising and management good.

GIANT CHIEF MINING CO. **UTAH.**

Dead. Lands sold, circa April, 1906, to Willard F. Snyder, et al. Formerly at Bingham Canyon, Salt Lake Co., Utah.

GIANT LEDGE GOLD & COPPER CO. **CALIFORNIA.**

Office: 500 Frost Bldg., Los Angeles, Cal. Mine office: Manvel, San Bernardino Co., Cal. L. M. Gregory, president and general manager; H. G. Stoddard, secretary; R. W. Kenny, treasurer; Edward Brough, mine superintendent. Organized July, 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 30 claims, a 40-acre millsite and miscellaneous lands, giving total area of upwards of 800 acres, in the New York district, showing 4 veins, of which 2 are under development, one being a fissure in granite, the other a

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contact deposit between limestone and granite, with average width of 100', giving average assays of 5% copper, 5% lead, 10 oz. silver and circa $4.50 gold per ton, from carbonate and oxide ores near surface and sulphides at depth. Has 1 shallow shaft and 2 tunnels, with about 4,000' of underground workings, developing a considerable amount of ore. Presumably idle.

GIANT MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Succeeded, circa 1906, by Giant-California Mining Co., Ltd. Formerly at Rossland, Trail district, B. C.

GIBB COPPER MINES, LTD. **AUSTRALIA.**

Mine office: Boolboonda, Queensland, Australia. Lands, circa 10 miles northeast of Mt. Perry, show 2 parallel veins, of about 12" average width, carrying high grade auriferous and argentiferous copper ore. Property has a small concentrator and was producing, in a small way, early 1908.

COMPAÑIA MINERA LA GIBOSA y ANEXAS. **MEXICO.**

Dead. Lands sold to American Smelters Securities Co. Formerly at Jiménez, Chihuahua, Mex.

GIBRALTAR COPPER MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Wm. L. Sill, president; Chas. E. Winter, secretary. Has a 4' vein, opened by a 75' shaft, showing ore giving assays up to 20% copper, with good gold and silver values. Has steam power. Idle several years and apparently moribund.

GIBSON COPPER CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. S. L. Gibson, president, treasurer and general manager; Wm. Henderson, vice-president; Delos Copeland, secretary. Organized 1906, under laws of Arizona, with capitalization $2,500,000, shares $25 par; issued, $2,000,000.

Lands, 19 claims, 5 surveyed for patents, area 380 acres, circa 15 miles from Globe, showing Pinal schist, with occasional trachyte, diorite and quartzite, carrying 20 or more veins or lenses, occurring as fissures in schists and as contact deposits between schists and porphyritic rocks. The main vein, of 4' to 7' width, has been traced 2 miles. Ores are exclusively sulphide, mainly massive bornite and chalcopyrite, of extremely high grade, frequently ranging 20 to 40% in copper tenor, ore occurring massive and frequently being coated with chalcocite. Apparently the two main veins unite, or cross, at depth.

The mine has tunnels of 120', 578', 650', 680' and 730', and 3 shafts, including a 3-compartment vertical shaft, begun 1907, and the main incline shaft, sinking below the sixth level. The fifth level tunnel, 1,000' long, is to connect with the present workings at length of 1,100', and the sixth level tunnel is 900' long.

Equipment includes two 280-h. p. boilers, a 60-h. p. engine, air-compressor and 2 hoists, one with double drum, good for 1,000' depth.

The Gibson mine was opened by its former owners, who remain in control of the company, on a capital of $90 cash and a team of horses, and has paid its way, and earned good profits, from grass roots, which is what very few copper mines have done. Ore is shipped to the Old Dominion smelter, by 10-horse teams, and about 60 men are employed. Production, 1907, was 3,340,777 lbs. fine copper. Mine considered valuable.

GILA COPPER CO. **ARIZONA.**

Office: 1107-408 South Spring St., Los Angeles, Cal. Mine office: Ray, Pinal Co., Ariz. Philip Wiseman, superintendent. Organized 1907, under laws of Maine, with capitalization $10,000,000. Is a twin of the Ray Consolidated Copper Co., and is controlled by men prominent in the Utah Copper Co. Property has monzonite ore bodies, somewhat similar to those of the Utah Copper Co. Property considered promising and management good.

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GILA COUNTY MINING CO. **ARIZONA.**

Dead. Once owned the Emeline mine. Formerly at Globe, Gila Co., Ariz.

GILA MONSTER COPPER CO. **ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Lands, known as the Confidence mine, with circa 1,000′ of underground openings, show auriferous and argentiferous bornite, chalcocite and sundry oxidized ores. Property considered promising. Idle for several years and apparently moribund.

GILA VALLEY COPPER CO. **ARIZONA.**

Office: 1930-42 Broadway, New York, N. Y. Mine office: Safford, Graham Co., Ariz. Floyd H. Wilson, president; John F. Webber, manager; C. S. Gilpin, mill superintendent. Organized 1905, as successor of Federal Mining Co., which succeeded the old Gila Valley Copper Co., and name changed back to original title, and former officers put in the penitentiary, to remove the stench of the Qualey management.

Lands, 24 claims, area 470 acres, also a 5-acre millsite, including the San Juan and Great Eastern groups, in the Lone Star district of the Gila Mountains, claimed by old management to have 3 ore bodies of about 9′ average width, but present management disclaims this statement. Development is by tunnels of 90′, 100′ and 300′, and by shafts of 130′, 325′ and 425′, with oxidized zone of about 300′ depth. Mine is said to show a 28′ ore body at depth of 230′.

A 50-ton concentrator, built 1906, shipped, 1907, some concentrates to the Old Dominion smelter, one carload returning 29.95% copper, circa 2 oz. silver and 80 cents gold per ton. Production, 1907, was 110,858 lbs. fine copper, 223 oz. silver and 6 oz. gold.

GIRILAMBONE COPPER MINING CO., LTD. **AUSTRALIA.**

Dead. Succeeded by Girilambone Mining Co., N. L. Formerly at Girilambone, Canbelego Co., N. S. W., Australia.

GIRILAMBONE COPPER MINING CO., LTD. **AUSTRALIA.**

Office: Sydney, Australia. Mine office: Girilambone, Canbelego Co., N. S. W., Australia. G. A. Richards, manager; W. Blakemore, mine manager. Debentures, £12,400.

Mine, opened 1880, carries numerous quartz veins and intrusions, ore occurring mainly as disseminations and replacements, lacking clearly defined walls, in arenaceous slate and sandstone having occasional hard bands of quartzite, ore being mainly sulphide, with quartz gangue, though the mine carries considerable carbonate ore of high grade in the oxidized zone, of about 200′ depth. Deepest shaft is 520′. Ores are divided into 3 classes for treatment, the first comprising carbonates and cuprite of about 4.6% average tenor, second class ore being composed of oxides from the transition zone, while sulphides from the lower workings constitute the third class, each being smelted separately. Average of all grades, 1900, was 3.85% copper.

The smelter has 2 reverberatory furnaces and a refining furnace, turning out blister copper of the remarkable purity of 99.95%. Ores are difficult of reduction, owing to their deficiency in sulphur and iron, and excess of silica. Water is very scarce, the property having a dam and filtering and reusing the water repeatedly. The reduction plant includes lixiviation works, where tailings and certain low grade oxidized ores are leached.

The property was reopened, 1906, when 6,035 long tons of ore were smelted, yielding 293,440 lbs. fine copper. Employed about 60 men in 1906, but presumably is idle.

GIRILAMBONE MINING CO., N. L. **AUSTRALIA.**

Dead. Was succeeded, circa 1907, by Girilambone Copper Mining Co., Ltd. Formerly at Girilambone, Canbelego Co., N. S. W., Australia. Fully described Vol. VI.

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GIROUX CONSOLIDATED MINES CO. NEVADA AND MEXICO.

Office: 1606-42 Broadway, New York, N. Y. Mine offices: Kimberly, White Pine Co., Nev., and Carbó, Ures, Sonora, Mex. Jos. L. Giroux, president; Eugene L. Giroux, vice-president; G. E. Giroux, secretary; J. C. Kennedy, treasurer; Jas. Angus Snedaker, consulting engineer; Loren M. Hart, counsel; preceding officers, Isidore Hernsheim, Hoffman Richardson, C. E. McCarty, I. W. Bernheim, G. F. Piper and Ralph Lupton, directors; E. W. Walter, general manager; Gideon L. Giroux, superintendent Mexican mine; Louis Fraser, superintendent Nevada mine.

Organized April, 1903, under laws of Delaware, with capitalization $5,000,000, shares $5 par, increased, Feb. 25, 1908, to $6,500,000, shares $5 par; issued, $4,639,975. Authorized, March 1, 1908, a 10-year bond issue of $1,500,000, in denominations of $100, $500 and $1,000, at 6%, redeemable at option of company in 5 years, at 105, and convertible into common stock at par, March 1, 1910, or at any previous date in the event of sale of property or dissolution of company. Increase in capitalization was provided for conversion of bonds. On Jan. 1, 1908, had cash in bank, $32,768.64, with bills payable of $320,233.13. Empire Trust Co., New York, registrar.

The Mexican property, of 96 pertenencias, area 237 acres, includes the Sultana and San José mines, commonly known as the Sultana group, about a mile west of the Copete, in the Sierra de Oro Mountains, circa 25 miles east of Carbó and about 35 miles from Hermosillo. Property shows a contact vein of 50′ to 100′ width, between limestone and porphyry, opened by 3 shafts. Sultana No. 1 is circa 200′ deep, Sultana No. 2, the main working shaft, sunk on an incline, is 1,200′ deep, and the San José shaft is circa 500′ deep. The San José mine shows in the bottom level a vein of circa 40′ width, carrying oxidized ores for shallow depth, succeeded by sulphides. About 15% of the ore hoisted from the San José is of smelting grade, balance, of 6% estimated copper tenor, being stocked. The Mexican property as a whole shows ore of 3 to 4% copper tenor, with variable gold values, latter ranging from very small to very large, with a fair proportion of high grade ore. Shipments of Sultana ore to El Paso smelter have returned combined gold and silver values ranging from 92 cents to $734.36 per ton.

The Sultana mill, apparently of 100 tons daily capacity, planned as the first unit of a 200-ton concentrator, has Huntington mills, an amalgamation plant and a cyanide plant.

The Nevada property, which is much the more important, is 52 claims, patented, area 1,050 acres, also 1,800 acres of miscellaneous lands carrying valuable water-rights, and the townsite of Kimberly, shortly west of Copper Flat, 7 to 9 miles from Ely. This group is about 2 miles in length, and from 2,000′ to 5,000′ in width, lying immediately west of the Nevada Consolidated.

The ore bodies of the Giroux are of vast extent and of considerable variety. The first series of ore measures, on the contact between plutonic and sedimentary rocks, shows enormous areas of replacement in the latter, ore having a gangue of quartz, talc and clay. In places these series have been proven to a width of fully 1,000′, though not workable throughout, fair ore to the width of 100′ or more having been found at points.

The second series of ore measures is in the Giroux shaft, immediately above the water level, where there apparently is a bed of 30′ to 40′ thickness, carrying oxidized ores said to average 7% or upwards, which probably is a serious overestimate.

A third ore series consists of cupriferous monzonite, which is a highly altered acid quartzose andesite, carrying upwards of 60% silica. The exposed surface has been leached to a considerable extent, but below a depth of 30′ to 40′ the monzonite carries melaconite and chalcocite, and, at depth, chalcopyrite,

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principal values being in chalcocite. The porphyry ores are estimated by the company to average 4% copper, which is much too high. The monzonite ore body of the Giroux was estimated at 1,500′ by 2,400′ in area, with prospects of further extension of the limits of mineralization, in addition to which another body of cupriferous porphyry, estimated by President Giroux as 600′ wide and 1,400′ long, extends along Old Glory Hill, from the western end of the property, in a course between the Alpha and Giroux shafts. This has been explored only by shallow workings, but may prove profitable at depth.

The monzonite ore body shows fissure veins of 3′ to 20′ width, giving little evidence of faulting, and supposed to have been mineralized from solutions coursing along the lines of least resistance. Present developments are mainly on fissure veins, but the quantity of porphyritic ore is so vast that apparently it forms the chief asset of the company. The porphyritic ore is comparatively friable and readily amenable to concentration.

The Ely mines have 11 shafts, with upwards of 3 miles of workings, including 6 main working shafts having heavy gallows-frames and ore-bins. The leached zone at surface is followed by a zone of secondary enrichment to a depth of circa 375′, succeeded by unaltered sulphides. The secondary zone shows considerable native copper, in addition to the usual oxidized ores and secondary sulphides. Porphyry ores have been developed in the Alpha, Brooks, Morris and Bunker Hill shafts, and Mr. Walter states that the block of milling ore opened therein is 2,000′ long, 150′ wide and 160′ thick, containing approximately 4,000,000 tons of ore averaging circa 2.25% copper and 20 cents gold per ton, while the Giroux, Taylor and Alpha shafts are estimated to show about 350,000 tons of ore averaging 6.5% copper. The mine, as a whole, is said to have $30,000,000 worth of ore blocked out, which statement requires explanation. The amount of ore actually blocked out is not phenomenally great, but geological conditions are such that it seems reasonably safe to claim 4,000,000 tons of ore in sight, with prospects of a much larger amount. There is no doubt about the immense resources of the property in porphyritic ore, the principal question being the average percentage of copper contained in these low grade ores.

The 3-compartment 1,200′ Alpha shaft, to which operations are confined practically, is said to have cut 5 veins, and is claimed to have a 50′ ore body on the 1,200′ level, but apparently the ores above the 1,000′ level are mainly leached. A winze from the bottom shows high grade ore, with some native copper, and the company claims that, by means of diamond drill borings, the ore bodies have been found to be continuous below the 1,000′ level, averaging 12 to 15% copper on that level, and increasing in value with depth, which statement is considered a first-class exaggeration, though, without question, the Alpha shaft has ore bodies of considerable size and of high average tenor, as 210 tons shipped, 1907, to the Garfield smelter, returned 12.2 to 13.66% copper. It is not believed, however, that there is a 50′ vein of this sort of ore, especially as the management has been guilty, in the past, of gross exaggerations regarding the size of its ore bodies, and their values.

In December, 1907, the Alpha shaft caved badly, for reasons not readily apparent, but presumably through indifferent timbering. Several miners were caught in the cave, three of whom, A. D. Bailey, Fred McDonald and P. J. Brown, were entombed. The story of their rescue is one of the most romantic in the history of mining, so filled with horrible accidents and hairbreadth escapes. The imprisoned miners succeeded in signaling to surface, by tapping on the air-pipe, and the signals were answered. A letter, well weighted, was lowered by a half-inch rope, from a windlass, through the air-pipe, but could not reach the miners, because of a bend in the pipe column 6 feet from the pump, the miners being imprisoned in a small pump station. They were equal to the

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emergency, however, and by means of a hook, made from a piece of wire and a bit of pipe, fished the letter from the pipe-column. Acting under instructions, the miners succeeded in repairing the telephone, after which communication from surface was uninterrupted. Food and water were lowered through the pipe, in trains of 2" nipples, each 6" long, with caps, connected by flexible links, and even reading matter was supplied in the same manner. The three miners were rescued Jan. 19, 1908, after an imprisonment of 46 days.

The work of reopening and retimbering the Alpha shaft was completed May, 1908, requiring nearly 6 months. Equipment at the Alpha includes an electric pumping plant, of 250,000 gallons claimed daily capacity. The surface plant includes three 150-h. p. boilers and a first-motion double-drum hoist, 100' steel gallows-frame, and a 200-h. p. Corliss engine driving a 150-kw. generator that actuates the electric pumps.

The 2-compartment Giroux shaft, 800' deep, is said to show, on the 300' level, a large ore body of 7 to 15% average copper tenor, which is considered a serious overestimate.

The Morris shaft, with 2 compartments and circa 275' in depth, is idle.

The 2-compartment Brooks shaft, 1,200' from the Morris, and 455' deep, also is idle.

The 2-compartment Bunker Hill shaft, east of the Brooks, circa 500' in depth, has a hoist operating 3-ton self-dumping skips.

The 2-compartment Taylor shaft, circa 300' deep, is idle. The 2-compartment Pilot Knob shaft, of about 300' depth, also is idle.

Surface equipment at the mine includes hoists for the principal shafts, air-compressors, timber framing mill, and necessary shops.

Transportation is provided by a 2-mile 36" gauge railway connecting the Bunker Hill, Morris and Brooks shafts with the mill and smelter, grades averaging 1.5%. Equipment includes a Porter engine, of 660 tons tractive power, and ore-cars.

The mill, located at the mine, of wood, stone and concrete, with all machinery mounted on concrete foundations, of about 400 tons daily capacity, was completed September, 1907, at a cost of circa $160,000. The mill is planned to handle ore automatically throughout, and has 600-ton receiving bins, from which ore goes to a 10x24" crusher, with belt-conveyor and 40" trommel. Equipment includes 6 Frue vanners and 42 Wilfley tables. Power is furnished by 125-h. p. and 200-h. p. Corliss engines, with three 100-h. p. boilers, and the mill is heated by steam and lighted by electricity.

The mill has eight 8,000-gallon storage tanks for water, and two 90,000-gallon reservoirs, of cement and concrete, one at the Alpha shaft and one directly back of the mill, connected by 2,050' of 6" steel pipe. It is estimated that settling tanks will save about 80% of the wash-water for further use. The mill requires about 125,000 gallons of water daily, and the management plans securing water therefor from the Alpha shaft, which would seem a precarious supply, though the flow of the shaft is increasing with depth, and was claimed, September, 1908, to be circa 125,000 gallons daily. The shaft, however, did not furnish enough water to run the mill when the latter was completed, despite promises to that effect, and an alternative and apparently reliable supply is being developed.

Work was begun, circa July, 1908, by digging ditches, for a pipe-line from Steptoe Creek, of about 9 miles length. Water must be pumped through a 12" pipe-line, of 1,125,000 gallons nominal daily capacity, against an actual head of 967', with static and frictional head of 1,105'. Cost of the pipe-line and station-pump is estimated at circa $250,000. Apparently the mill should have been built near the water, instead of near the ore.

The company also has rights to a portion of the waters of Cleveland

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Creek, 27 miles distant, said to be capable of developing 1,200 h. p. electrically, which may be improved later, and power utilized for pumping the water to the mill and operating the mine.

The smelter, between the mine and mill, with rail connections to both, was built under a contract calling for completion July, 1905, but actually was not completed until circa March, 1907. The smelter, variously reported as costing $50,000 to $125,000, has a 250-ton Colorado Iron Works 42x180" water-jacket blast-furnace, with 16 tuyeres, and was planned to have a converter with 1 stand and 3 shells, which apparently are not in place. Smelter has a 6' stack of 80' height. Limestone and iron ore of good grade for fluxing are available in the district. Despite repeated promises as to date of blowing in the smelter, it was idle October, 1908, and seems a poor investment.

Production from the Mexican mines was about $540,000 in values to end of 1907. Production from the Nevada mines has been postponed, from time to time, under various pretexts, but apparently the property is not yet developed to a point where production can be made advantageously on a considerable scale. The first carload of ore from the Ely mines, shipped August, 1907, to the Salt Lake smelter, is said to have returned about 9.2% copper. The mill was claimed, November, 1907, to be saving better than 80% of assay values. The porphyritic ore carries mainly chalcocite, with specific gravity more than double that of the monzonite, affording good material for concentration. The gangue is friable, without talc, and the ores do not slime excessively. The company is said to have closed a 5-year contract with the American Metal Co., Ltd., for selling its copper, in consideration of a loan.

The Nevada property of the Giroux Consolidated Mines Co. is considered valuable, but many exaggerated claims have been made in its behalf. Promises as to date of beginning production have failed in keeping, most lamentably, and the caving of the Alpha shaft, miscalculation of water supply for the mill, and building of a smelter before the mine was ready to begin production, lead to the suspicion that the management is not all that it might be.

GIROUX-ELY EXTENSION COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized circa 1907, with capitalization $1,000,000, shares $1 par.

GLADHAUGH MINE. **ALASKA.**

Owned by Ellamar Mining Co.

GLADSTONE DEVELOPMENT CO. **ONTARIO.**

Office: care of N. J. Morrisey, superintendent, Pickering, Ont. Mine office: Iron Bridge, Algoma, Ont. Lands, circa 3 miles from Iron Bridge, are opened by several shallow shafts showing copper ore. Presumably idle.

GLADSTONE-GREENWATER COPPER DEVELOPMENT CO. **CALIFORNIA.**

Office: 45 West Broadway, Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. A. H. Wethey, managing director; R. E. Tally, superintendent. Organized Oct. 1, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Has a 300' tunnel. Idle.

GLADSTONE MINE. **AUSTRALIA.**

Mine office: Wrightville, Robinson Co., N. S. W., Australia. Lands, 2 miles south of the Great Cobar mine, are supposed to carry the extension of the vein of that property. Development is by a 186' shaft, on a 6" vein carrying gray copper ore assaying up to 40% in tenor.

GLADYS MINING CO. **BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Isld., B. C. Property, opposite the Monitor mine and across the Alberni Canal therefrom, apparently has the extension of the Monitor vein, showing high grade chalcopyrite. Idle.

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GLASDIR COPPER MINES, LTD. **WALES.**

Dead. Voluntarily liquidated, October, 1903.

GLASDIR COPPER MINES (1903), LTD. **WALES.**

Offices: 4 Broad Street Place, London, E. C., Eng. Organized Oct. 17, 1903, with capitalization £1,000, shares £1 par, apparently as a tentative reorganization of the Gladsir Copper Mines, Ltd. Moribund.

GLASGOW COPPER SYNDICATE, LTD. **CALIFORNIA.**

Offices: 149 St. Vincent St., Glasgow, Scotland. T. & G. B. McKim & Cook, secretaries. Organized Dec. 14, 1904, with capitalization £8,000, shares £1 par, to deal with copper claims in Fresno county, California. Presumably related to Fresno Copper Co., Ltd.

GLASGOW & WESTERN EXPLORATION CO., LTD. **NEVADA.**

Offices: 33 Renfield St., Glasgow, Scotland, and 317 McCornick Bldg., Salt Lake City, Utah. Mine office: Golconda, Humboldt Co., Nev. Geo. Macfarlane Reid, chairman; Otto Stallman, general manager; D. Macpherson Boyd, secretary; Jos. Farren, superintendent; George Cuthbert, secretary. Organized Oct. 28, 1896, with capitalization £30,000, shares £1 par, fully issued. Manages and is the principal owner of the Adelaide Star Mines, Ltd.

GLASSFORD CREEK COPPER MINING CO., LTD. **AUSTRALIA.**

Office: William St., Rockhampton, Queensland, Australia. Mine and works office: Glassford Creek, via Miriam Vale, Queensland, Australia. R. G. Brown, chairman; A. A. Slack, secretary; Thos. Gibb, managing director; T. L. Bailey, general manager; D. W. Findlay, mine superintendent; preceding officers, G. C. Willcocks, Jas. Stewart and Robt. Macfarlane, directors. Increased capitalization, 1906, to £10,000, shares 1s. par, fully paid, with no provision for meeting future needs by assessments. Debentures, £12,500 issued, and an issue of similar size planned, at last accounts.

Lands are in the Dawes Range, 60 miles south of Gladstone, adjoining the Glassford Creek Copper Mines, Ltd., having a slate footwall and granite hanging, with contact veins of 30′ to 75′ width carrying self-fluxing sulphide ore giving average returns of 4.1% copper, 1.5 oz. silver and 1.95 dwts. gold per long ton. Mine, discovered 1897, was opened, in the Blue Bag open-cut, by underhand stoping, but this was discontinued at depth, and development begun by tunnel and shaft, the change of mining system necessitating closing the smelter.

The mill has a 300-ton Blake-Marsden crusher, and picking tables. The smelter, near the mine, has a 42x72″ rectangular water-jacket blast-furnace of about 100 tons daily capacity, installed 1906, and a Connersville blower, making matte of 40 to 45% copper tenor, slags running 0.3% copper. Nearest railroad point is Gladstone, 35 miles. Traction engines were used, but did poorly, on account of bad roads. Production, 1906, was 913,366 lbs. fine copper, 13,699 oz. silver and 94,314 dwts. gold, secured with an average force of 183 men. Suspended operation Sept. 7, 1907, on account of low price of copper.

GLEN-JENNINGS COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Idle some years.

GLOBE-AMALGAMATED COPPER CO. **ARIZONA.**

Dead. Was organized June 19, 1907, under laws of Arizona, by Pollard Pearson, J. R. Barnette and G. C. Gleason, with capitalization $1,000,000, shares $5 par. Formerly at Globe, Gila Co., Ariz.

GLOBE-ARIZONA COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Samuel L. Gibson, manager. Lands, lying southeast of the Old Dominion and Globe Consolidated, 3 miles east of Globe, are opened by a 115′ tunnel and 290′ shaft, showing a 5′ vein of ore averaging 6 to 7% copper, with small silver values. Began production May, 1907, and shipped about 15 tons of ore daily to Old Dominion smelter, for sev-

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eral months, employing circa 30 men. Production, 1907, was 57,231 lbs. fine copper and 430 oz. silver. Property considered promising.

GLOBE & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Lands sold, 1906, to Superior & Boston. Formerly at Globe, Gila Co., Ariz. Described Vol. VI.

GLOBE-BOSTON COPPER MINING CO. **ARIZONA.**

Dead. Lands sold, circa 1906, to Globe Consolidated Copper Co. Formerly at Globe, Gila Co., Ariz.

GLOBE CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 403 Lonsdale Bldg., Duluth, Minn. Mine office: Globe, Gila Co., Ariz. Henry B. Hovland, president; R. B. Whitesides, vice-president; John Uno Sebenius, secretary; preceding officers, Louis Rouchleau and Hoval A. Smith, directors; T. T. Hudson, treasurer; Michael M. McCarthy, manager. Organized June, 1906, under laws of Arizona, with capitalization $1,500,000, shares $10 par; issued, $1,000,000. Cash on hand, Jan. 1, 1908, was $173,085. There is supposed to be a balance of $367,966 due on lands, February, 1910.

Lands, circa 1,100 acres, bought for about $600,000, lying immediately north of the Old Dominion and west of the Arizona Commercial. Property includes the Globe-Boston group of 21 claims, bought for $130,000, the Mallory group, and other extensive holdings.

Principal work has been done on the Gem and Future veins, carrying a little chalcopyrite. The Globe-Boston or Mallory shaft, when worked on the 450′ level by former owners, showed a 4′ vein carrying mainly leached ore, with some low grade chalcopyrite and occasional bunches of bornite, both with fair silver values, but shows better ore in the deeper workings.

The 3-compartment Gem shaft, 1,225′ deep, has extensive crosscuts on the 1,100′ and 1,200′ levels. No. 3 crosscut, on the 1,100′ level, in August, 1908, cut the Future vein, showing 16′ of ore of 2 to 3% copper tenor. There also is a 3′ vein of 3% ore on the west drift of the 1,200′ level, and a 6″ vein of 8% ore. In addition to the veins previously named, the property carries the Taylor vein.

Equipment includes good hoists and air-compressors at both the Boston and Gem shafts, latter having a 12-drill compressor. Petroleum is used for fuel, and about 75 men are employed.

Results for the first two years of work were rather discouraging, but indications were much improved late in 1908. Property is considered promising, and management good.

GLOBE COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Lands, 6 claims, bought March, 1907.

GLOBE COPPER MINING CO. **ARIZONA.**

Dead. Property sold to Old Dominion Mining & Smelting Co. Formerly at Globe, Gila Co., Ariz.

GLOBE COPPER MINING CO. **WYOMING.**

Office: 24 Giddings Blk., Colorado Springs, Colo. Mine office: Hecla, Laramie Co., Wyo. A. C. Widdicombe, president; J. A. Morrison, vice-president and general manager; John H. House, secretary; Stewart Davis, treasurer; Prof. H. C. Beeler, consulting engineer. Organized 1901, under laws of Colorado, with capitalization $1,500,000, shares $1 par. Lands, 22 claims, area 438 acres, known as the Fairview group, in the Silver Crown district, showing sundry fissure veins, of which 3, of 7′ average width, are opened by 5 shafts, of 100′ average depth, and by tunnels of 90′ and 160′, giving estimated average values of 12% copper, 6 to 10 oz. silver and $5 gold per ton, from sulphide ores. Has steam power and an air-compressor. Did a little work, 1906. Presumably idle.

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GLOBE & LOST GULCH SILVER-COPPER MINES CO. **ARIZONA.**

Office: 21-1928 Grant Ave., Denver, Colo. Mine office: Black Warrior, Gila Co., Ariz. V. G. Hills, president; John A. Myrberg, vice-president and superintendent; M. E. Brooke, secretary and treasurer. Organized Apr. 1, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, area 200 acres, and a millsite, at the head of Lost Gulch, northwest of Globe, showing quartzite, granite and limestone, cut by porphyritic dykes. Mine, but slightly developed, shows auriferous and argentiferous lead and copper ores.

GLOBE MINE. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. F. W. Denton, general manager; Capt. John Jolly, superintendent. Property is owned by the estate of John Stanton, and held under an option, twice extended, expiring May, 1909, by the Copper Range Consolidated Co., latter having the privilege of paying therefor in shares. During 1907 expenditures on the property were $191,580.92, with total expenditures, to Jan. 1, 1908, of circa $400,000.

Lands, 1,280 acres, being Sections 1 and 2, Town 53 North, Range 35 West, lying next south of the Champion and immediately north of the Challenge mine, carrying about 6,000′ of the strike of the Baltic and parallel amygdaloidal beds.

Work was begun by diamond drill borings, which located the Baltic bed and gave some cores carrying excellent copper values. The borings disclosed the existence of a heavy overburden of sand and boulders, hence it was necessary to reach the solid rock by a vertical shaft, which was sunk in the hanging wall. This shaft is located about 700′ south of the Champion boundary line, and was put down under most discouraging circumstances, but by persistence and the hardest kind of hard work was bottomed successfully, despite predictions, from many experienced miners, that its sinking was impossible. The shaft is telescopic, inside measurements of timbers at the collar being 13′ 3″ x 23′ 3″, with a second section below of 9′ x 19′ 6″, and a third section of still smaller size, this plan permitting new inside timbering and whatever realignment was necessary when the shaft was bottomed. The drop-shaft was started October, 1905, and reached the ledge May 15, 1907, at a depth of 228′, after 19 months of extremely difficult and trying work, 3 months additional being required in getting the shaft into the ledge and stopping out the sand, making a total of nearly two years for the work, which was most creditable to all concerned, this being the deepest sand-shaft ever sunk. The shaft was sunk by weight to 150′ depth, and for the balance of the distance was forced down by hydraulic jacks, with the aid of 64 steel shoes, each built with a water-jet having an opening of 1 square inch and a pressure of 300 lbs. Weight of the shoes was 37,000 lbs., and these were punched down by 6 hydraulic jacks, each exerting a pressure of 100 tons. The shaft was wet, making 800 gallons of water per minute, and there was much trouble with the quicksand, while the terrific pressure of the hydraulic jacks caused occasional trouble from buckling.

Plats have been cut at intervals of 100′ from the first level, which is 356′ from surface, leaving a 128′ back of solid rock. The mine is to have heavy permanent pumps on the 1,000′ level, and will use Kimberley skips for hoisting. The Baltic lode was intercepted at 860′ depth, but was reached previously by crosscuts from a level above. The bed shows a little copper, in drifts on the 1,000′ level, but, on the whole, is decidedly low in grade. This, however, is no criterion of the future, as the Baltic amygdaloid, in common with all other copper-bearing beds of the Lake Superior district, is bunchy, rich ground alternating with lean, and only extensive development can give a correct idea

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of the probable average value of the lode on this property. In view of the rich drill-cores secured by borings, and the fine stopes opened in the Champion, a short distance north of the Globe, it would seem reasonable to expect the Globe to make a paying mine, with development. If this should be the case, it is probable that the mine will be opened permanently by incline shafts, driven as upraises, though, in view of the tremendous overburden, vertical shafts may be used throughout, or vertical shafts may be sunk through the bed and deflected, in the footwall, to parallel the dip of the bed.

GLOBE MINING CO. **ARIZONA.**

Office: 506-171 Washington St., Chicago, Ill. Mine office: Globe, Gila Co., Ariz. J. F. Hechtman, president and general manager; M. A. Patterson, vice-president; Geo. L. Beach, treasurer; Walter M. DeKalb, secretary. Organized Feb. 19, 1903, under laws of Arizona, with capitalization $2,500,000, shares $1 par.

Lands, 27 claims, area 540 acres, nearest circa 2½ miles north of Globe. Lands show granite-porphyry, syenite, quartzite and diorite, carrying fissure veins in diorite of 2′ to 100′ width, with gossans giving assays of 2 to 6% copper, 4 to 30 oz. silver and $2 to $28 gold per ton. The Mineral Farm group of 21 claims, 3 fractional, includes the Vacey-Constance mine, worked circa 1886 for silver, and said to have produced upwards of $100,000 worth of ore under former ownership, this group having upwards of 20 old pits and shafts, of 10′ to 165′ depth. The Mineral Farm group shows altered sedimentary and igneous rocks, with iron dykes, and a complex fissure system. The Mineral Farm vein, of about 4′ width, gives assays of 4.8% copper and up to 132 oz. silver and $7.44 gold per ton, and the group also shows a 20′ vein, said to sample 22% copper, 9% zinc, 2 oz. silver and $4.96 gold per ton, which seems excessive. Property also includes the Eagle Pass group. Development is by a 2-compartment 215′ shaft, between two iron outcrops, planned to be sunk to 500′.

Equipment includes a 60-h. p. boiler, 8x10″ hoist and an air-compressor. Property is considered promising.

GLOBE & PINTO MINING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. T. Trevillian, president; J. M. McPherson, secretary and treasurer. Capitalization $750,000, shares $1 par. Lands, 11 claims, 16 miles from Globe, north of and adjoining the Five Points, having a 90′ shaft in a 4′ vein showing streaks of ore, on footwall and hanging, that have given assays up to 22% copper, 3.4 oz. silver and $8 gold per ton. Mine does not show several thousand tons of ore of 4 to 12% copper tenor, as has been claimed in the press.

GLOBE STANDARD MINING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Chas. Miller, superintendent. Lands, 4 claims, in Powers Gulch, having a 50′ shaft showing a 3′ vein of auriferous silver-lead ore, assaying up to 63% lead, 13 oz. silver and $6 gold per ton; also 15 claims near the Arizona National Mining Co.

GLOBE SULPHIDE COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Organized Nov. 26, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par, by Eugene Barrows and D. G. McDonald.

GLOBE TRACT. **MICHIGAN.**

Office: care of John Stanton Estate, owner, 15 William St., New York, N. Y. Mine office: Atlantic Mine, Houghton Co., Mich. Lands, 1,920 acres, being Sections 3, 4 and 5, Town 53 North, Range 35 West. Property included two other sections, area 1,280 acres, now under option to the Copper Range Consolidated Co., which are described separately under title of Globe Mine.

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GLOBE WESTERN COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. N. C. Cottee, vice-president; D. James, treasurer; J. Weinberger, secretary; preceding officers and C. Jerome Clark, directors. Capitalization $2,000,000, shares $10 par. Lands, 40 claims, area 800 acres, in 3 groups, known as the Cole & Goodwin, Robertson & Westbrook and Clark & Stewart, circa 20 miles southwest of Globe. The Clark & Stewart group has a 250′ shaft, bottomed in sulphide ore assaying 10 to 15% copper, and some shipments were made therefrom, 1906, to Old Dominion smelter. The Cole & Goodwin group has a 310′ shaft and a 480′ crosscut tunnel. The Robertson & Westbrook group has tunnels of 100′ and 130′ and a 225′ crosscut tunnel cutting 2 small streaks of high grade ore. Property, as a whole, has mainly ore of concentrating grade, and deposits are somewhat bunchy. Has gasoline power. Property considered promising.

GLOBE-WHEATFIELDS MINING CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. J. Thornton Price, president; M. G. Nehms, secretary; preceding officers, Fred C. Boothe and Claude W. Lightfoot, directors. Organized Oct. 25, 1906, under laws of Arizona, with capitalization $1,000,000, increased Jan. 2, 1907, to $1,500,000, shares $1 par. Lands, near the Arizona National and Globe & Calumet, held under $30,000 bond and lease, have shown ores assaying 4.32 to 24.38% copper.

GLORIA COPPER MINES (SPAIN), LTD. **SPAIN.**

Office: 75 Coleman St., London, E. C., Eng. Organized Feb. 27, 1908, under laws of Great Britain, with capitalization £1,700, shares £1 par. Property is a lease on La Gloria mines, in the province of Huelva, Spain.

COMPAÑIA MINERA GLORIA DEL INCA. **CHILE.**

Office: Iquique, Chile. Mine offices: Chañaral, Atacama, Chile, and Copiapó, Atacama, Chile.

GEWERKSCHAFT VEREIN GLÜCKAUF-NEVIGES. **GERMANY.**

Mine office: Neviges, Rheinprovinz, Germany. Has lead and copper ores, developed by 2 shafts, and employed about 100 men, producing circa 12,000 tons of ore yearly, at last accounts, product being mainly lead.

GEWERKSCHAFT GLÜCKSBRUNN. **GERMANY.**

Dead. Merged, 1903, in the Eisfelder Kupfergewerkschaft. Formerly at Glücksbrunn, Saxe-Meiningen, Germany.

GOAT CREEK MINING CO. **WASHINGTON.**

Mine office: Methow, Okanogan Co., Wash. Ores carry gold, silver and copper. Idle.

GODIVA MINING CO. **UTAH.**

Dead. Merged, circa 1906, in Gemini-Godiva Consolidated Mining Co. Formerly at Eureka, Juab Co., Utah.

GOLCONDA CONSOLIDATED CO., LTD. **NEVADA.**

Office: Suffolk House, London, E. C., Eng. Mine office: Golconda, Humboldt Co., Nev. W. P. Taylor, chairman; E. T. McCarthy, consulting engineer; William Smith, secretary; E. L. Labadie, superintendent; Hans Loesch, metallurgist. Organized Dec. 27, 1906, under laws of Great Britain, with capitalization £250,000, shares £1 par; issued, £21,967. Lands, in the Kennedy and Battle Mountain districts, show mainly lead ores. Early 1908 planned building a 200-ton smelter, in Golconda Cañon, 3 miles from Golconda.

GOLCONDA-NEVADA COPPER CO. **NEVADA.**

Mine office: Golconda, Humboldt Co., Nev. J. H. Playter, superintendent. Lands, known as the Honolulu group, are opened by a short tunnel, shallow shaft and several open-cuts.

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GOLD ANCHOR MINING CO. **COLORADO.**

Mine office: Alice, Clear Creek Co., Colo. Thos. I. Slater, manager. Ores carry gold, silver and copper. Has gasoline power. Presumably idle.

GOLD BELT DEVELOPMENT & REDUCTION CO. **ARIZONA.**

Office and mine: Morenci, Graham Co., Ariz. E. U. Beauchamp, manager; Lee Dunn, superintendent. Capitalization, $750,000. Lands, 25 claims, circa 4 miles northwest of Morenci, showing free milling gold ore, mainly in quartzite, and copper ore, largely chrysocolla associated with pyrolusite, with occasional malachite and chalcocite, and some sphalerite. Has 8 shafts, 2 deepest 200′ each, and a tunnel, showing a 3′ vein of carbonate ore assaying 12% copper. Has 3 gasoline hoists. Shipped some ore, 1907, to Shannon smelter, and has circa 15,000 tons of ore on dumps. Employed 20 men at last accounts.

GOLD BELT MINING CO. **MONTANA.**

Mine office: Empire, Lewis & Clark Co., Mont. Owen Byrnes, superintendent. Property includes the Empire mine, carrying gold, silver, lead and copper ores. Has steam power, 60-stamp mill and cyanide plant. Presumably idle.

GOLD BUG CONSOLIDATED MINING CO. **WASHINGTON.**

Dead. Formerly at Bossburg, Stevens Co., Wash.

GOLD & COPPER COMPANY OF BINGHAM. **UTAH.**

Dead. Succeeded, 1901, by Bingham Consolidated Mining & Smelting Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

GOLD & COPPER CONSOLIDATED MINING & MILLING CO. **ARIZONA.**

Dead. Succeeded, circa 1907, by Hasayampa Copper Co. Formerly at Groom Creek, Yavapai Co., Ariz. Fully described Vol. VI.

GOLD & COPPER DEEP TUNNEL MINING & MILLING CO. **NEW MEXICO.**

Office: 780 E. Madison Ave., Cleveland, Ohio. Mine office: Elizabethtown, Colfax Co., N. M. A. T. McIntyre, president; John Pearson, vice-president; A. Down, secretary and treasurer; W. P. McIntyre, mine superintendent. Organized October, 1900, under laws of New Mexico, with capitalization $2,000,000, shares $1 par.

Lands, 10 claims, area circa 100 acres, also a 2½-acre millsite, on the western slope of Baldy Mountain, in the Moreno district, carrying fissure and contact veins in and between quartzite and slate. Has 2 shallow shafts and a 2,300′ crosscut tunnel, planned to penetrate the mountain, with a length of 3,500′, opening 2 bodies of low-grade auriferous copper ore. Has gasoline power and electric drills, with a 20-ton stamp-mill of lumber and logs, size 40x80′, equipped with a 5′ Huntington mill and gravity stamps. Nearest railroad, 3 miles. Company plans continuing development steadily. Property considered promising.

GOLD & COPPER FIELDS SYNDICATE, LTD. **AUSTRALIA.**

Dead. Voluntarily liquidated, March, 1902. Formerly at Byng, County Bathurst, N. S. W., Australia.

GOLD-COPPER MINING CO. **ARIZONA.**

Office and mine: Prescott, Yavapai Co., Ariz. Chas. F. Motz, president; Col. Emil Rautman, secretary, treasurer and general manager. Lands, in the Hassayampa district, include the Peacock, Mountain View and Iron Duke claims, opened by a 600′ tunnel, cutting a vein carrying auriferous and argentiferous copper ore, yielding assay values up to $30 per ton.

GOLD-COPPER MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Rocklin, Cal. Mine office: Lincoln, Placer Co., Cal. Capitalization $1,000,000, shares $1 par. Lands, 160 acres, supposedly carrying the extension of the Dairy Farm ore body, slightly developed by shaft. Idle.

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GOLD & COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Rociada, San Miguel Co., N. M.

GOLD-COPPER MINING & DEVELOPMENT CO. **SOUTH DAKOTA.**

Dead. Formerly at Deadwood, Lawrence Co., S. D.

GOLD CROSS MINING & MILLING CO. **COLORADO.**

Mine office: Pitkin, Gunnison Co., Colo. R. L. McKnight, superintendent. Property is the Camp Bird mine, showing gold and copper ores. Has a 10-stamp mill.

GOLDEN COVE MINING CO. **NEW MEXICO.**

Mine office: Hachita, Grant Co., N. M. W. H. Hare, president; W. T. Stewart, vice-president; Fred E. Emery, secretary and treasurer. Has several pits and shafts of 10′ to 85′ depth, showing a vein claimed to give average assays of 18% copper and 20% lead, with gold and silver values. Presumably idle.

GOLDEN DESERT MINING & MILLING CO. **ARIZONA.**

Dead. Formerly at Quartzite, Yuma Co., Nev.

GOLDEN EAGLE GOLD MINING CO. **CALIFORNIA.**

Office: 54 First St., Portland, Ore. Mine office: Copley, Shasta Co., Cal. R. J. Jennings, president and general manager; R. A. Martin, vice-president; Jas. E. Isaacs, secretary; C. C. Bush, Jr., treasurer; preceding officers, A. Newlands and I. Theodore Jennings, directors. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 8 claims, area 160 acres, held under bond and lease expiring 1910, known as the Keystone group, on the eastern side of the Sacramento river, circa 10 miles northeast of the Iron Mountain mine. Property, developed by tunnel, is said to show 5 gold-bearing quartz veins, of 2′ to 20′ width, assaying $5 to $20 gold per ton, and a copper vein, claimed to be 6′ to 50′ wide and traceable 2,200′, carrying ore of 5 to 22% copper tenor, with $1.50 to $7.80 gold per ton.

GOLDEN EDGE MINING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo.

GOLDEN GATE GROUP. **COLORADO.**

Mine office: Tarryall, Park Co., Colo. Property, near the foot of Badger Mountain, is said to show a vein of 10′ to 30′ width, giving assays of 12 to 62% copper, and $10 and upwards gold per ton. Idle.

GOLDEN GATE MINING & DEVELOPMENT CO. **WASHINGTON.**

Office: care of Gen. C. E. Buel, Seattle, Wash. Mine office: Cle Elum, Kittitas Co., Wash. Lands are 3 claims in Josephine county, Oregon, circa 1,000 acres of coal lands, and 22 claims in vicinity of Cle Elum, showing some galena of good grade, but mainly low grade ore assaying 1 to 4% copper and $4 to $7 per ton in combined gold and silver values.

GOLDEN MARGUERITE SILVER & COPPER MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Organized 1908, with capitalization $1,500,000. Lands, 10 claims, in the Hunter district. Idle.

GOLDEN MINT MINES, LTD. **NORWAY.**

Dead. Voluntarily liquidated, October, 1903. Formerly at Lyngenfjord, Norway.

GOLDEN RULE COPPER MINING & SMELTING CO. **ARIZONA.**

Dead. Was a swindle. Formerly at Vail, Pima Co., Ariz. Fully described Vol. VI.

GOLDEN SHOWER COPPER CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Chas. F. Hoff, president and general manager. Capitalization $3,000,000, shares $1 par. Lands, 4 claims, area

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80 acres, 14 miles northwest of Tucson and 6 miles from Rillito Station on the Southern Pacific railway. Has a 20′ shaft. Idle.

GOLDEN STAR MINING CO. **IDAHO.**

Dead. Formerly at Doniphan, Blaine Co., Idaho.

GOLDEN STATES MINES, LTD. **ARIZONA.**

Office: 20 Lawrence Lane, London, E. C., Eng. Mine office: Dragoon, Cochise Co., Ariz. Chas. F. Branton, chairman; George Thompson, secretary. Organized June 25, 1897, as reconstruction of Geldfontein Estates & Gold Mining Co., Ltd., with capitalization £100,000, shares 5s. par; issued, £61,254. Lands, 120 acres, with questionable title, on Copper Creek, in the Dragoon Mountains. Has a small smelter. Idle some years.

GOLDFIELD COPPER-GOLD MINING CO. **NEVADA.**

Dead. Was organized March, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Officers were W. W. Talbot, president; T. E. Davis, vice-president; E. A. Jenkins, secretary; D. L. Hopkins, treasurer. Lands were 2 claims and a millsite, circa 5 miles from Hawthorne. Formerly at Hawthorne, Esmeralda Co., Nev.

GOLDFIELD COPPEROPOLIS MINING CO. **NEVADA.**

Office: 1130-11 Broadway, New York, N. Y. Letter returned unclaimed from former mine office, P. O. Box 198, Goldfield, Esmeralda Co., Nev. J. P. Marshall, president and treasurer; R. Tidwell, vice-president; Robt. Blei, secretary; preceding officers, G. H. Phillips and G. A. Phillips, directors. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 6 claims, known as the Comstock group, at Copperopolis, just north of Lone Mountain, and 3 claims at Phillipsburg, circa 20 miles northwest of Goldfield, showing an outcrop carrying argentiferous copper ore and auriferous lead ore, opened by a 250′ tunnel.

GOLDFIELD ELY FAIRVIEW WONDER MINING CO. **NEVADA.**

Dead. Was promoted by Arthur Levan, one of the swindlers who put out the Lost Spanish Bullion Mines Co. Was a mere bit of stock-jobbery. Formerly at Ely, White Pine Co., Nev.

GOLD FLINT MINING CO. **MONTANA.**

Dead. Was succeeded, circa 1907, by Lion Gulch Development Co. Formerly at Homestake, Jefferson Co., Mont.

GOLD HILL COPPER CO. **NORTH CAROLINA.**

Office: 82 Broadway, New York, N. Y. Mine office: Gold Hill, Rowan Co., N. C. Leonard D. Baldwin, president; Wm. M. Richardson, secretary and treasurer; J. C. Kemp Van Ee, managing director; preceding officers, C. Strader Batt, E. N. Howell and W. E. Murdock, directors; B. B. Miller, receiver. Organized Feb. 21, 1900, under laws of New Jersey, with capitalization $5,000,000, shares $100 par.

Lands, 1,050 acres, in Rowan and Stanley counties, well watered and timbered, including the Gold Hill mine, where gold was discovered in 1799. Gold-bearing quartz veins were discovered in 1831, and circa 1845 this mine was the largest gold producer in the United States. Property is served by the Southern railroad, and the Yadkin river has 7,500-h. p. available, 17 miles distant.

Development is by shafts of 105′, 150′, 615′ and 830′, estimated to show ore reserves of 60,000 tons, carrying 2.75 to 3% copper, and 60 cents to $1.60 gold per ton. A carload of ore, shipped early 1908 to the Perth Amboy smelter, returned 1.5% copper and circa $30 gold per ton, with small silver values.

Equipment includes ten 100-h. p. boilers and a 40-stamp mill. About 75 men were employed, February, 1908.

The company has had a decidedly checkered career. Operations were conducted on a considerable scale, 1901-1903, employing 250 men, but financial

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difficulties resulted, 1903, in the appointment of C. M. Miller as receiver. This receivership was ended circa 1906, but in August, 1906, B. B. Miller was appointed receiver on the application of Walter George Newman, formerly president of the company, on claims aggregating circa $352,000. The property is considered valuable, if adequately financed and well managed.

GOLD HILL QUARTZ MINING CO. **OREGON.**

Office: 111 Fifth Ave., New York, N. Y. Mine office: Gold Hill, Jackson Co., Ore. C. R. Ray, superintendent, at last accounts. Property includes the Braden, Conger and Elk Creek mines, having argentiferous and auriferous copper and lead ores. Has steam power and a 10-stamp mill.

GOLD KING CONSOLIDATED MINES CO. **COLORADO.**

Office: 45 Milk St., Boston, Mass. Mine office: Silverton, San Juan Co., Colo. Mark Gallert, president; John R. Judd, general manager; D. M. Haynes, general superintendent. Has auriferous and argentiferous copper ores, carrying mainly gold values. Mine has steam, electric and gasoline power, and an 80-stamp mill.

GOLD LION MINES CO. **COLORADO.**

Mine office: Red Mountain, Ouray Co., Colo. H. Y. Russell, superintendent. Has auriferous and argentiferous ores of lead and copper. Has steam power. Employed circa 20 men at last accounts.

GOLD MOUNTAIN MINING CO. **WASHINGTON.**

Mine office: Berlin, King Co., Wash. F. Karl, superintendent. Lands, 18 claims, well watered and timbered, on Money Creek, opened by tunnels of 2,200′ aggregate length, showing antimonial gold copper ores, carrying values mainly in antimony. Has hydro-electric power and planned, 1907, a reduction plant.

GOLD QUARTZ MINING CO. **NEVADA.**

Office: care of W. W. McDowell, president, Butte, Mont. Mine office: Bullion, Elko Co., Nev. Has secured ores assaying up to 10.2% copper.

GOLD ROSE MINING & MILLING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Helena, Lewis & Clark Co., Mont. Lands, in the Fort Harrison district, shortly west of Helena, show copper ore.

GOLDSMITH COPPER CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Howe Sound, New Westminster district, B. C.

GOLDSMITH MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. C. W. Ellingwood, general manager. Organized 1906, with capitalization $3,000,000, shares $10 par. Lands, 4 claims, area 80 acres, adjoining the Alice mine on the west. Mine, opened by a 600′ shaft, formerly was a considerable producer of silver, but shows, on the 400′ level, a 3′ vein assaying up to 3.5% copper, and has a little ore assaying up to 235 oz. silver per ton. Leasers shipped, 1906-1907, some argentiferous copper ore. Idle and apparently moribund.

GOLD STAR MINING CO. **WASHINGTON.**

Office: 2107 E. Madison St., Seattle, Wash. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. Aden Fraser, president; John Edmond Praul, secretary, treasurer and general manager. Organized 1903, under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, area 120 acres, well timbered, in the Index district, 4 miles from Great Northern railway, showing a 6′ fissure vein in syenite, giving assays of 7% copper and $1.20 gold per ton, from bornite, and $25 gold per ton from an oxidized quartz capping. Idle at last accounts.

GOLD TUNNEL & RAILWAY CO. **COLORADO.**

Mine office: Howardsville, San Juan Co., Colo. Wm. D. Cole, manager.

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Ore carries up to $100 per ton in copper, lead and silver values. Has water power. Employed circa 75 men at last accounts.

GOLETA CONSOLIDATED MINES. **CALIFORNIA.**

Dead. Formerly at Jordan, Mono Co., Cal. Described Vol. VII.

SUCESIÓN P. GONZALEZ. **CHILE.**

Office and works: Labrar, Freirina, Atacama, Chile. Property is a matting furnace, turning out the equivalent of 1,250,000 lbs. fine copper yearly. Presumably idle.

GOOD HOPE MINING & REDUCTION CO. **COLORADO.**

Office: Del Norte, Colo. Mine office: Vulcan, Saguache Co., Colo. Has auriferous and argentiferous copper ores. Idle several years.

GOODRICH PROPRIETARY. **AUSTRALIA.**

Mine office: Yeoval, N. S. W., Australia. F. Pearce, manager, at last accounts. An old property, once a considerable producer of gold and copper, reopened, 1902, by a new shaft, planned to be sunk 450′, but which apparently got down only 200′, sunk to get beneath the former workings, said to have been reached by a crosscut. Ore assaying up to 18% copper and 4 oz. gold per long ton, occurs in a pipe-vein about 300′ in diameter. Mine has given much trouble, in the past, from caving. Employed a small force, in development work, during 1907.

GOODLANDER MINING & MILLING CO. **MEXICO.**

Dead. Succeeded by Sonora Development Co. Formerly at Moctezuma, Sonora, Mex.

GOODSPRINGS CONSOLIDATED MINING & SMELTING CO. **NEVADA.**

Office: Los Angeles, Cal. Mine office: Goodsprings, Lincoln Co., Nev. Jos. Dedrichs, president; Warren W. Porter, secretary. Organized circa 1907, apparently as successor fo Goodsprings Smelting & Development Co. Former company planned laying out a townsite, building water works, an electric railway and a 500-ton smelter, but came to grief. Lands, 6 claims.

GOODSPRINGS SMELTING & DEVELOPMENT CO. **NEVADA.**

Dead. Formerly at Goodsprings, Lincoln Co., Nev. Described Vol. VI.

GOOD VENTURE COPPER MINING CO. **NEW HAMPSHIRE.**

Dead. Formerly at Woodsville, Grafton Co., N. H.

GOODVENTURE MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Hecla, Laramie Co., Wyo.

GOOSE LAKE COPPER CO. **MONTANA.**

Office: care of Reynolds & McDowell, Butte, Mont. Mine office: Cooke, Park Co., Mont. Organized 1907, with capitalization $5,000,000. Lands, 15 miles northeast of Cooke and just north of the Yellowstone National Park, at an elevation of about 10,000′, show a fissure vein in granite, of 50′ estimated width, carrying sulphide ores assaying 5 to 12% copper, with fair gold and silver values and a trace of platinum. District lacks adequate transportation facilities. Company said to plan building an electric line to Columbus, on the Northern Pacific, and erecting a smelter. Property considered promising.

GOTHIC MILLING, MINING & POWER CO. **COLORADO.**

Dead. Formerly at Crested Butte, Gunnison Co., Colo. Described Vol. VI.

BERGWERK GOTTLICHE HÜLFE STOLLN. **GERMANY.**

Mine office: Tannenbachstal bei Brunndöbra-Georgenthal, Saxony, Germany. Idle.

GOULAIS BAY MINING CO. **ONTARIO.**

Office and mine: Sault Ste. Marie, Algoma, Ont. Capitalization $3,000,000. Lands, 1,300 acres, on Goulais Bay, Lake Superior, 25 miles north of Sault Ste. Marie, on which a little exploratory work was done, circa 1902, but property since idle, and company apparently moribund.

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GOULBURN COPPER DEVELOPMENT CO. **AUSTRALIA.**

Mine office: Breadalbane, N. S. W., Australia. Development is on an iron ore body of some promise.

GOULD COPPER MINING CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. S. H. Gould, president and general manager; C. E. Hutchison, vice-president; W. H. Daily, secretary; Dr. W. V. Whitmore, treasurer. Capitalization $1,000,000, shares $1 par. Lands, 19 claims, in the Tucson Mountains, 18 miles from Tucson, nearest railroad point. Lands cover nearly 1 mile of the east and west strike of a mineral zone circa 2,000′ wide and 5 miles long. Country rocks are limestone, granite and quartzite. Has shafts of 50′, 125′ and 365′, with 2 short tunnels, showing chalcopyrite with quartz gangue, averaging about 3 to 4% copper, 3 oz. silver and $1.50 gold per ton, with sufficient iron to be self-fluxing. Has about 2,000 tons of ore on the dump. Equipment includes gasoline hoist and air-compressor. Property considered promising.

GOULD ISLAND MINE. **ALASKA.**

Mine office: Sulzer, Prince of Wales Island, Alaska. H. R. Gould, owner and manager. Lands, 1 claim, area 20 acres, showing a lenticular ore body, between hornblende-schist and limestone, up to 40′ in width, giving assays of about 6% copper, 1 to 20% lead, 3% zinc, 1 oz. silver and $4 gold per ton, from chalcopyrite, galena and sphalerite. Has tunnels of 60′ and 70′.

GOULD MINING CO. **WYOMING.**

Dead. Formerly at Centennial, Albany Co., Wyo. Described Vol. VII.

GOVERNOR GREENWATER COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Is controlled, through ownership of entire stock issue, by Greenwater Copper Mines & Smelters Co. Presumably idle.

GRAFTER MINE. **YUKON.**

Mine office: White Horse, Yukon, Canada. Robt. Lowe, manager. Shipped, 1905, circa 450 tons of ore, of 19 to 30% copper tenor, to various British Columbia smelters, and, for several months, 1907, shipped 25 to 30 tons daily to Tyee smelter. Was reached, 1907, by White Pass & Yukon railroad. Employs circa 20 men. Production, 1907, estimated at 650,000 lbs. fine copper.

GRAFTON COPPER MINING CO. **AUSTRALIA.**

Mine office: Grafton, N. S. W., Australia. Samuel Lee, chairman; W. J. Mulligan, mine manager. Net earnings, 1907, were £14,251, and £11,000 dividends were paid. Mine, known as the Cangai, has 2 veins, the south lode of 3′ to 10′ width carrying up to 6′ of massive copper sulphides containing fair gold and silver values. Ore reserves, 1908, estimated at 112,177 long tons, of which 17,000 tons were estimated to carry 10% copper; 23,000 tons to carry 6% copper, and 70,000 tons to carry 3.5% copper. Smelter has 4 reverberatory furnaces, producing matte, and management plans changing production to blister copper, in the form of anode bars. Trouble is had in securing fuel, and water supply is precarious. Company plans building a concentrator and installing electric power. Production, 1907, was 7,665 long tons of ore, of which 3,535 tons were smelted to matte, containing 790,340 lbs. fine copper, 2,816 oz. silver and 176 oz. gold. Company apparently lacks financial strength, but property is of considerable promise.

GRAHAM COUNTY MINING CO. **ARIZONA.**

Office: 1509-20 Broad St., New York, N. Y. Mine office: Fort Grant, Graham Co., Ariz. John W. Manning, president; Schuyler S. Moore, secretary and treasurer; "Prof." Geo. A. Treadwell, consulting engineer. Capitalization $250,000, shares $10 par. Lands are gold-copper claims in the Clark district,

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on which the company claims to have expended upwards of $100,000 in development work. Idle for several years and apparently moribund.

GRAHAM COUNTY MINING & SMELTING CO. ARIZONA.

Mine office: Safford, Graham Co., Ariz. H. N. Chlarson, president. Lands, 13 claims, west of the Rex Cobre. Idle.

GRANADEÑA MINING CO. MEXICO.

Mine office: Santa Barbara, Hidalgo, Chihuahua, Mex. Lands, 3 miles northeast of Santa Barbara, show argentiferous and auriferous chalcopyrite, galena, sphalerite and pyrite.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO., LTD. BRITISH COLUMBIA.

Office: 733-52 Broadway, New York, N. Y. Mine office: Phœnix, Boundary district, B. C. Works office: Grand Forks, Boundary district, B. C. Employs about 900 men, of whom approximately 500 are at the mine, and 400 at the smelter. Jacob Langeloth, president; Jay P. Graves, vice-president and general manager; Geo. Martin Luther, second vice-president; Geo. Crawford Clark, Jr., third vice-president; preceding officers, Geo. Crawford Clark, Henry Lee Higginson, B. Hochschild, Wm. H. Nichols, W. H. Robinson, Sanford H. Steele, Edwin Thorne, A. L. White, Payne Whitney and Wm. A. Nash, *directors*; Northrup Fowler, secretary; G. W. Wooster, treasurer; A. B. W. Hodges, local manager; Wm. Yolen Williams, consulting engineer; O. B. Smith, Jr., mine superintendent; W. A. Williams, smelter superintendent; J. C. McDonald, master mechanic; C. M. Campbell, engineer.

Organized March 29, 1901, under special act of the Provincial Parliament of British Columbia, with capitalization $15,000,000, shares $10 par, changed, 1906, to $15,000,000, shares $100 par, 1 share of new stock being issued for 10 of old. Issued, $13,500,000. Stock is listed on the Boston stock exchange. Fiscal year ends June 30. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., Boston, and Title Guaranty & Trust Co., New York, transfer agents. Annual meeting, first Tuesday in October.

Regular dividend rate is 8%, or $2 quarterly. First dividend, 1%, was paid Dec 16, 1903, and dividends have been as follows: $133,630.30 in 1903; none in 1904; $399,991 in 1905; $1,620,000 in 1906, and $1,215,000 in 1907. Dividends were resumed June, 1908, with a declaration of $2.

Lands, 43 claims, area 1,100 acres, crown-granted, also 500 acres of mill and smelter sites, and 500 acres miscellaneous lands, principal properties being in the Osoyoos mining field, Boundary division, Yale district of British Columbia, very near the United States line. Lands include the Old Ironsides, Knob Hill, Victoria, Grey Eagle, Banner, Tip Top, Triangle, Gold Drop, Curlew, Monarch, Tamarack, Monte, No. 13 and other claims and groups, forming a compact tract of about 8,000′ by 9,000′, giving nearly 2 miles of the strike of the mineralized zone. Miscellaneous landed holdings include a 61-acre limestone quarry, for flux, several hundred town lots, at Grand Forks and Phœnix, and 500 acres of land at Carson, British Columbia.

The property shows diabase and tuffs carrying two wide ore bodies in quartz-diorite, which apparently are altered volcanic tuffs, main ore body having an approximately north and south strike, with a surface dip of 60° to the eastward, and somewhat flatter dip at depth. The main ore body is estimated by company as of 80′ average width, which is an ultra-conservative figure, as actual figures of width are 100′ to 400′, with an average of nearly or quite 200′. The main ore body has been developed for about 4,000′ in length, and opened to depth of 900′, while its continuity has been proven, by diamond drill borings, to depth of 1,100′. To May 1, 1908, the company had bored 29,117′ of holes. Ore is exclusively chalcopyrite, averaging about 1.7% copper only, with an average of 0.4 oz. silver and $1.50 gold per ton. The ore

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carries 35 to 40% silica, 14 to 17% iron, 18 to 20% calcium carbonate, 3 to 4% sulphur and circa 7% alumina and 7% magnesia, constituting an almost ideal self-fluxing ore.

The mine is opened by shafts of 200′, 400′, 350′, 500′ and 100′, the Victoria, Ætna and Monarch being the more important, and by tunnels of 1,500′, 3,000′, 3,000′, 2,500′, 900′, 500′ and 800′, with about 11 miles of underground workings. Principal extraction, however, is from immense open-pits, or glory-holes, the great width of the ore body rendering open-cast extraction advisable. New underground openings, 1907, were 9,701′. The largest pit is 400x1,000′ in area, and the plans of the company practically call for the mining off of an entire mountain. Ores stoped on the various tunnel levels are milled, through chutes, to lower levels, with electric haulage on the 200′, 300′ and 400′ levels, which are double-tracked and have 75-h. p. motors drawing 10-ton ore cars. These tunnels are equipped, at their portals, with ore-crushers and bins of 2,000 to 3,000 tons capacity each, there being 3 crushers of 150 tons hourly capacity each. No. 3 tunnel has a 22x55′ crusher-house, with a 30x42″ Farrel-Bacon crusher driven by a 100-h. p. electric motor, capable of breaking masses of nearly a cubic yard in size to chunks not larger than 7″ to 8″. The 3 large crushers weigh 113,000 lbs. each, and have frames of semi-steel, with a tensile strength of 32,000 lbs. to the square inch.

No. 1 shaft is being broken into an open pit, and the shafthouse has been demolished.

No. 2 shaft has a 12x16″ double cylinder hoist.

The 3-compartment Victoria shaft, 400′ deep, is the main working shaft of the mine. Ore is raised by a 250-h. p. electric hoist, operating 7-ton skips in counterbalance, and the shaft has a daily productive capacity of 3,000 tons. Equipment at the Victoria includes a 250-h. p. Rand double-conical-drum hoist, good for 1,000′ depth, driven by a Westinghouse 3-phase variable speed induction motor, and an air-compressor. The Victoria equipment includes a crusher of 150 tons hourly capacity, conveyor and 3,000-ton bins, connected with the Canadian Pacific and Great Northern railways.

The Gold Drop-Curlew group has been developed extensively, showing good ore bodies, and is being equipped very substantially for a large production.

The Independence group, at the head of Bear Creek, in the Similkameen district, held under a $100,000 bond, has a vein in schist and granite, traced 1,000′, carrying mainly low grade ore, with some chutes of ore of higher grade in copper, with fair gold and silver values. The ore of the Independence is much similar to that of the main group of the Granby.

Ore reserves of the Granby were estimated, 1904, by the company, at 20,000,000 tons, but actually were much larger, and since have been added to greatly. Ore is handled automatically, from the time of blasting until the blister copper is ready for shipment at the smelter, without being touched by human hands.

Electric power is used throughout the mine and works, about 2,000 h. p. being required at the mine, and 3,000 h. p. at the smelter. Commercial current is taken from the West Kootenay Power & Light Co., which has a hydro-electric installation at Kettle Falls, on the Columbia river, in Washington.

Equipment at the mine, from the plan of operations, which provides for extraction mainly from open-cast workings and through tunnels, is adequate, but by no means comparable to most large copper mines, which are under the necessity of hoisting practically all of their ore through shafts. Equipment includes two 200-h. p. and two 250-h. p. hoists, good for 1,000′ depth each. The compressor-house, 60x121′ in size, has 2 electric air-compressors, the larger of 60-drills capacity, both machines being driven electrically, by rope trans-

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mission, from two 700-h. p. Westinghouse type C induction motors. The principal compressor is a 60-drill Rand tandem-compound engine, with 16x30" high-pressure cylinders and 28x36" low-pressure cylinders, with piston efficiency of 6,000 cubic feet of free air per minute, at 70 lbs. pressure.

Mine buildings include a 40x80' machine shop, 40x50' smithy and a 40x40' carpenter shop, all of wood. The company owns 20 dwellings and 2 hotels at Phœnix, the Granby hotel being a 3-story structure with electric light and steam heat, costing $25,000.

The mine is connected with the smelter, 24 miles distant, by 2 railways, the Canadian Pacific and the Great Northern. By means of extensive ore-bins at the Victoria shaft and various tunnels, a train of 35 thirty-ton cars can be loaded in 25 minutes, or less.

The smelter is much the largest and best in Canada, and among the reduction plants of the world is second only to the great Washoe works of the Anaconda, being of about the same size as the smelters of the Copper Queen and Boston & Montana. The plant is of 5,000 tons daily capacity, and has been enlarged repeatedly, with every prospect that eventually it will reach a capacity of not less than 10,000 tons daily. The smelter works 8-hour shifts.

The works have steel bins with storage capacity for 8,000 tons of coke and 13,000 tons of ore. Charging is by 4 electric locomotives, each drawing two 2-ton cars, constituting a single charge. The ore is practically self-fluxing, and with the addition of a little limestone and necessary fuel is charged as it comes from the mines, without concentration or assortment.

The steel blast-burnace building, rebuilt 1907, had six 44x160" furnaces, of 300 tons daily capacity each, and two 48x208" furnaces, latter added in 1905. The 6 old furnaces were rebuilt first to size of 44x212", and in 1908 were rebuilt again, with an addition of 4' 4" in length, rendering them 44x264" in length, and the 2 larger furnaces were rebuilt to size of 48x264", giving an average daily capacity of 625 tons for each of the 8 furnaces.

The furnace building has a brick dust-flue, 10x11x800', and a steel dust-chamber was added, 1907. This sets 22' above the feed floor, on foundations of steel columns, masonry and concrete, and is 13' wide, 15' high and 313' long, with a floor of 28 hoppers, having a conveyor underneath for flue-dust. Slags, formerly granulated, are now dumped hot, by 8x14" locomotives traversing a 36" slag-line.

The first fusion product is a 40% matte, which is taken, in ladles, by a 40-ton electric traveling crane, to the converter building, of steel, 68x240' in size, which stands 100' from the cupola building. The old converter department had 3 stands, with shells 70x100", which have been replaced by 4 stands, each operated electrically by a 25-h. p. motor, and ten 96x132" shells. There are 3 mould carriers under each stand, and product is a blister copper of 99% metallic tenor, including an average of 40 oz. silver and 7 oz. gold per ton, which is sent to the Laurel Hill works of the Nichols Copper Co. for electrolytic refining and parting of gold and silver values. The lining department, in the converter building, has a crusher and 2 silica mills.

The power house at the smelter, remodeled 1907, has brick walls and a steel roof. Electric power is used throughout, equipment including 9 small blowers and 2 Connersville Jumbo blowers, with capacity of 190,000 cubic feet of free air per minute, driven by two 300-h. p. motors. Converter blast is furnished by an Allis-Chalmers double-cylinder air-compressor, with capacity to reduce 10,000 cubic feet of free air per minute to pressure of 15 lbs. per square inch, driven by a 500-h. p. direct-connected electric motor. Old blast-mains have been replaced by new pipes of much greater capacity.

Miscellaneous buildings at the smelter include a warehouse, roundhouse

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and shops, of steel frame. There also is a 100,000-gallon steel storage tank for water.

One of the principal disadvantages under which the Granby has labored, almost from the start, has been an inadequate coke supply. To obviate this trouble the International Coal & Coke Co. was organized, 1903, with a capitalization of $3,000,000, by practically the same shareholders as those of the Granby, though the corporations are distinct. This company has extensive deposits of high grade coking coal, at Blairmore, Alberta, assuring the Granby a fairly regular supply of coke, barring labor troubles and accidents, though fuel shortages continue a disturbing factor in the operation of the smelter.

For fiscal years, ending June 30, net profits have been as follows: $712,649 in 1905; $1,823,617 in 1906; $1,924,937 in 1907; $606,522 in 1908. The expenditures for the fiscal year 1908 included $242,574.50 for construction and equipment, at the mines and smelters, and $23,742.65 for purchase of lands. The company's net surplus, 1908, was $2,455,180.77, including $421,625.01 cash and copper, and $1,008,012.68 in stocks, bonds and bills receivable.

Production, for fiscal years ending June 30, has been as follows: 14,237,622 lbs. fine copper, 212,180 oz. silver and 42,884 oz. gold in 1905; 19,939,004 lbs. copper, 316,947 oz. silver and 50,020 oz. gold in 1906; 16,410,576 lbs. copper, 257,378 oz. silver and 35,083 oz. gold in 1907; 21,162,926 lbs. copper, 300,593 oz. silver and 40,139 oz. gold in 1908. The production for fiscal year 1908 was secured from 854,432 dry tons of Granby ore, and 24,179 tons of custom ore smelted. Production for calendar year 1907 was 15,514,000 lbs. fine copper, compared with 19,563,949 lbs. fine copper for calendar year 1906. Net cost of copper, after deduction of gold and silver values, was 8.35 cents per pound for fiscal year 1906; 10.14 cents per pound for fiscal year 1907, and 10.24 cents per pound for fiscal year 1908. The Granby has by no means reached its productive limit, and while it may take some years to reach an output of 50,000,000 lbs. fine copper, this figure would seem reasonably safe to predict. The property, while very low in grade, has remarkably cheap costs for mining and smelting, due partly to nature and partly to good management, and the ore reserves are among the greatest in the world. The management is thoroughly efficient and capable in all departments.

GRAND ARIZONA COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Douglas, Cochise Co., Ariz. Lands, near Douglas, are said to be extensive, and, 1907, were being explored for copper.

GRAND CANYON COPPER CO. **ARIZONA.**

Dead. Formerly at Grand View, Coconino Co., Ariz. Described Vol. VII.

GRAND CENTRAL MINING CO. **ARIZONA.**

Office: 43 Exchange Place, New York, N. Y. Mine office: Tucson, Pima Co., Ariz. Geo. H. Daily, president; Chas. Peck, secretary; Frederick Kopper, Jr., treasurer. Capitalization $1,000,000, shares $1 par. Lands, 8 claims, 14 miles northwest of Tucson, in the Tucson Mountains, having a 75' shaft, with about 300' of workings, showing auriferous and argentiferous copper and lead ores.

GRAND CENTRAL MINING CO. **UTAH.**

Provo, Utah. Mine office: Robinson, Juab Co., Utah. Lafayette Holbrook, president; C. E. Loose, manager; Patrick Donnelly, superintendent. Organized under laws of Colorado, with capitalization $250,000, shares $1 par, and paid dividends, to end of 1905, of $986,250. Mine carries mainly silver lead ore, with appreciable values in copper, and is an old property, extensively developed, and a considerable producer. Output, 1907, was 284 carloads of ore.

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GRAND CONSOLIDATED DEVELOPMENT CO. **ARIZONA.**

Office: care of Col. John T. Firch, secretary, Oakland, Cal. Mine office: Kingman, Mohave Co., Ariz. Geo. W. Brown, president and treasurer; Dr. John T. Davis, vice-president and manager. Mine has veins of 3′ to 60′ width, carrying gold, silver and copper ores, with quartz gangue, and has secured assays up to 34% copper, 9 oz. silver and $12 gold per ton. Also has claims near Cerbat, opened by tunnel, giving ore assaying 70% lead, 12 oz. silver and $11 gold per ton.

GRAND DEPOSIT COPPER CO. **NEVADA.**

Mine office: Cherry Creek, White Pine Co., Nev. John Stanton, president; J. S. Page, secretary; Pierre de P. Ricketts, treasurer. Organized 1903. Lands, known as the Grand Deposit group, are said to show considerable ore bodies, giving assays of 7 to 12% copper. Idle.

GRAND GULCH COPPER MINING CO. **ARIZONA.**

Office: care of Messrs. Schirmer, Chapin & Emmons, 79 Milk St., Boston, Mass. Mine office: St. George, Washington Co., Utah. Samuel Newhouse, general manager; Isaac Jennings, superintendent. Property, in Coconino county, in the extreme northern part of Arizona, is more accessible from Utah than from southern or central Arizona. Mine has auriferous and argentiferous copper ores, with a 370′ main shaft. Shipment of 1,000 tons of ore to Salt Lake smelters gave average returns of 48% copper, netting $99,970. Ore was carefully selected, and hauled 140 miles by wagon. Equipment includes gasoline power and a small and antiquated smelter.

GRAND GULCH MINING CO. **ARIZONA.**

Dead. Succeeded by Grand Gulch Copper Mining Co. Formerly at St. George, Washington Co., Utah.

GRAND JUNCTION SMELTING CO. **COLORADO.**

Letter returned unclaimed from former office, 79 Milk St., Boston, Mass. Works office: Grand Junction, Mesa Co., Colo. I. N. Patterson, president; J. V. Howard, secretary; Thos. Osborne, superintendent. Property is a 125-ton smelter, incomplete, which it was planned to blow in, 1905. Is closely related to Western Slope Copper Mining & Smelting Co. Management apparently inexperienced and reckless. Property mortgaged, and company's affairs apparently hopelessly involved.

GRAND LA SAL MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Castleton, Grand Co., N. M. Jacob Evans, president; J. W. Beasley, vice-president; J. F. Van Wagenen, secretary and treasurer. Organized circa December, 1906, with capitalization $50,000. Lands, in the La Sal Mountains, have circa 250′ of workings, showing auriferous and argentiferous lead and copper ores.

GRAND MARAIS COPPER MINING CO. **MINNESOTA.**

Dead. Formerly at Grand Marais, Cook Co., Minn.

GRAND MOUNT LYELL COPPER CO., LTD. **TASMANIA.**

Mine office: Mt. Lyell, Montagu Co., Tasmania. Lands, sundry claims, in Sections 682, 789 and 1674, slightly prospected. Idle several years and apparently moribund.

GRAND NATIONAL SMELTING CO. **MEXICO.**

Mine office: San Juan de Allende, Rio Grande, Coahuila, Mex. The mine, known as La Reforma, carries auriferous copper ore.

GRAND PRIZE COPPER MINING CO. **ARIZONA.**

Dead. Lost lands, 1902. Formerly at Payson, Gila Co., Ariz.

GRAND RAPIDS COPPER CO. **WYOMING.**

Dead. Sold lands to Saginaw Valley Copper Mining Co. Formerly at Encampment, Carbon Co., Wyo.

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GRAND REEF COPPER MINING CO. **ARIZONA.**

Office: care of Clarence H. Mackay, 253 Broadway, New York, N. Y. Mine office: Aravaipa, Graham Co., Ariz. Large sums were expended in development and equipment, latter including a 3-stamp mill and 90-ton smelter. Idle for some years.

GRAND REPUBLIC COPPER MINING CO. **COLORADO.**

Office: 52-240 La Salle St., Chicago, Ills. Letter returned unclaimed from former mine office, Pearl, Larimer Co., Colo. W. A. McGuire, president; E. V. Boisot, secretary and treasurer. Organized 1902, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. Is controlled by Standard Development Co. Lands, 7 claims, area 70 acres, in the Big Horn district, 7 miles south of Pearl, showing a 3′ paystreak, carrying some native copper, in a schistose vein, cut at depth of 130′ by a 200′ shaft. Also has a sulphide ore body. Idle several years and is not regarded favorably.

GRAND TRAVERSE & ARIZONA MINING CO. **ARIZONA.**

Office: 129 East Front St., Traverse City, Mich. Letter returned unclaimed from former mine office, Cave Creek, Maricopa Co., Ariz. Thos. Smurthwaite, president; Geo. R. Ray, vice-president; Herbert Montague, secretary and treasurer; preceding officers, Wm. Newman and Walter E. Greilick, directors; Chas. F. Smurthwaite, general manager; A. Scharingron, mine superintendent. Organized May 6, 1903, under laws of Arizona, with capitalization $2,000,000, shares $2 par; issued, $1,670,000. Annual meeting, second Tuesday in January.

Lands, 33 claims, area circa 660 acres, showing talcose and mica schists, the northern portion carrying a number of stringers and small veins, the southerly portion showing one vein of 12′ to 15′ width, with a number of parallel stringers, in diorite, carrying oxidized ores and sulphides, with some cuprite on the northern part of the property, and native copper in the New Hope mine. Development is by shafts of 70′, 392′ and 167′, with 105′ and 50′ tunnels, estimated to show 17,000 tons of ore, with 2,000 tons blocked out, of which the bulk is leached ore, running 1 to 4% copper, with about 2,000 tons estimated by company to average 6 to 30% copper, circa 37.5 oz. silver and $30 gold per ton. Has a small steam plant, with 2 hoists, and several small mine buildings. Nearest railroad is 35 miles. Company plans continuing development.

GRAND VIEW MINING CO. **WASHINGTON.**

Dead. Lands sold, early 1907, to Night Hawk Mining Co. Formerly at Loomis, Okanogan Co., Wash.

GRANDVIEW MINING & MILLING CO. **UTAH.**

Office: care of L. W. Dutro, Memphis, Tenn. Is said to have lands in Utah, near the Colorado line, from which ore giving good assay values in gold, silver and copper has been secured. Idle.

GRANITE CREEK SMELTING & REDUCTION CO. **NEVADA.**

Dead. Formerly at Golconda, Humboldt Co., Nev.

GRANITE WELLS MINING CO. **CALIFORNIA.**

Office: 716 Lankershim Bldg., Los Angeles, Cal. Mine office: Daggett, San Bernardino Co., Cal. Lands show a stained quartzite capping, of circa 60′ width, standing about 30′ above surface for 200′, underlaid by what the company terms a pipe vein, of 2″ to 2′ width, between quartzite and syenite, carrying very rich ores, mainly cuprite, assaying 17 to 30% copper in the upper levels, turning to sulphide ore at depth of 250′. Company claims to have 200 tons of very rich ore on the dump. Presumably idle.

LA GRAN PROVEEDORA DE COBRE, S. A. **MEXICO.**

Is the Mexican incorporation of the Arizona-Mexican Copper Co.

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GRANT CONSOLIDATED COPPER MINING CO. **WASHINGTON.**

Office: care of Geo. A. McLeod, Spokane, Wash. Mine office: Chesaw, Okanogan Co., Wash. A. D. McPhee, superintendent. Organized 1907, under laws of Washington, with capitalization $1,650,000. Is said to have expended about $90,000 on the property. Lands, 14 claims, on Copper Mountain, near Chesaw, opened by tunnel planned to be driven 1,500′, cutting 2 strong veins of medium grade chalcopyrite, showing considerable ore. Shipped some ore, 1907, to Granby smelter, running about 6% copper and $4 gold per ton. Property considered promising.

GRANT COPPER MINING CO. **COLORADO.**

Dead. Formerly at Pearl, Larimer Co., Colo. Described Vol. VI.

GRAPHIC MINE. **NEW MEXICO.**

Office: care of Sherwin-Williams Paint Co., owner, Cleveland, Ohio. Mine office: Magdalena, Socorro Co., N. M. Jos. Brown, superintendent. Mine is opened by tunnel, showing a 65′ vein with a 12′ paystreak claimed to average 13% copper, which obviously is erroneous, ores being mainly smithsonite and sphalerite, with some cerussite and argentiferous galena, and occasional cuprite and native copper. Ores are mainly low in grade, requiring concentration. Property, worked for zinc, has an ore chute, of about 400′ length, on the seventh, eighth and ninth levels, which is fully 100′ wide on the ninth level. Shipped, 1907, a considerable tonnage of lead and zinc carbonates, lead ores going to the Luna Lead Co., at Deming, N. M., and zinc to the company's works, at Joplin, Mo.

GRASLITZER KUPFERBERGBAU. **AUSTRIA.**

Mine office: Eilenberg, Bohemia, Austria. Mines, which are very ancient, and were one of the principal sources of European copper supply during the Middle Ages, show a vein of 12′ to 15′ width, in clay-slate. Mines were reopened on a considerable scale, and a new smelter built, 1901, but have been idle for several years.

GRATIOT MINING CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Operating office: Calumet, Mich. Mine office: Mohawk, Keweenaw Co., Mich. Quincy A. Shaw, Jr., president; Rudolph Agassiz, vice-president; Geo. A. Flagg, secretary and treasurer; Jas. MacNaughton, general manager; preceding officers, Alexander Agassiz, Francis L. Higginson and Francis W. Hunnewell, directors. Organized Feb. 16, 1906, under laws of Maine, with capitalization $300,000, shares $3 par, fully paid. Is controlled, through ownership of stock, by Calumet & Hecla Mining Co. Ended fiscal year Apr. 30, 1908, with $12,213 cash and accounts receivable, with a debit to profit and loss of $68,654.

Lands, 600 acres, being the NW. ¼ of Section 26, NW. ¼ of Section 27, SW. ¼ of Section 23, and SE. ¼ of Section 22 except the NW. ¼ of the NW. ¼. Property lies south and east of the Seneca, and north and east of the Mohawk. Extensive diamond drill borings were made before shafts were started, and the property was found to carry the northern extension of the Kearsarge amygdaloid.

Development is by two 3-compartment shafts, exact duplicates, 9x22′ inside of timbers, with ladderways in the middle, sunk at an angle of 36° on the Kearsarge bed, two shafts being sufficient to develop the entire tract. Levels are opened at 100′ intervals.

No. 1 shaft is circa 620′ deep, at the fifth level, and has a half-mile or more of drifts.

No. 2 shaft, 1,475′ southwest of No. 1 and circa 2,000′ north of the Mohawk boundary, is 720′ deep, at the sixth level, with a fair showing of copper on the fifth level.

Shafts have duplicate equipment, including duplex-cylinder Lidgerwood

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hoists, with 5′ drums, good for one-half mile each, and 15-drill air-compressors. Each shaft has a single-compartment shaft-rockhouse, which can be enlarged later, and stamp rock broken in development is put through crushers and stocked. Buildings include a 30x40′ power-house, smithy, boarding-house, etc. Property considered promising, and management excellent.

GRAY COPPER MINING CO., LTD. IDAHO.

Mine office: Osburn, Shoshone Co., Idaho. W. H. Herrick, manager. Lands, on McFarren Gulch, 12 miles south of Osburn, show an ore body up to 12′ in width, carrying mainly argentiferous gray copper, and a 12″ vein carrying high grade auriferous and argentiferous copper ore. Company plans shipping ore.

GREAT AUSTRALIAN MINE. AUSTRALIA.

Mine and works office: Cloncurry, Beaconsfield Co., Queensland, Australia. Lands, west of Cloncurry, show a vein up to 15′ width, carrying a 3′ paystreak of silicious sulphides ranging in copper tenor from 3 to 15%. Equipment includes a 6-drill Schram air-compressor.

The smelter, built 1907, has 25-ton reverberatory furnace, and a blast-furnace, blown in circa July, 1908, has 2 Connersville blowers, product being matte of about 70% copper tenor. Production, 1907, was circa 100,000 lbs. fine copper, and for May, 1908, was about 80,000 lbs. fine copper.

GREAT BELCHER OF ARIZONA CO. ARIZONA.

Office: 519-10 Wall St., New York, N. Y. Mine office: Providence, Yavapai Co., Ariz. Isaac W. Mason, president and treasurer; Henry B. Clifford, vice-president; P. H. Noel, secretary; T. S. Henderson & Co., fiscal agents; Geo. Rehpeter, superintendent. Organized under laws of Arizona, with capitalization $5,000,000, shares $1 par, as a merger of the Great Belcher Gold & Copper Co., Bullwhacker Mining Co., Empress Mining Co., Sunlight Mining Co. and Queen of Arizona Copper Co. Lands, 2 claims, in the Big Bug district, including the Great Belcher mine, 1 patented claim, said to have produced $700,000 worth of ore in the past, having a 700′ three-compartment main shaft and a 700′ tunnel, with about 4,000′ of workings, tunnel, on the 500′ level, crosscutting 9′ of low grade auriferous copper ore, claimed to carry an average of $12 per ton, mainly in gold.

GREAT BELCHER-BULLWHACKER GOLD CO. ARIZONA.

Dead. An abortive merger of properties later merged as the Great Belcher of Arizona Co. Formerly at Providence, Yavapai Co., Ariz.

GREAT BELCHER GOLD & COPPER CO. ARIZONA.

Dead. Merged in Great Belcher of Arizona Co. Formerly at Providence, Yavapai Co., Ariz.

GREAT BEN HUR COPPER MINING & DEVELOPMENT CO., N. L. AUSTRALIA.

Mine office: Condobolin, Cunningham Co., N. S. W., Australia. Organized circa March, 1908, under laws of New South Wales, with capitalization £1,920, shares £15 par. Lands are at Burra Burra, near Condobolin.

GREAT CENTRAL MINE. AUSTRALIA.

Mine office: Mt. Hope, Blaxland Co., N. S. W., Australia. Lands, 939 acres, at South Mt. Hope, showing large bodies of low grade ores, which are oxides and carbonates to about 200′ depth, succeeded by chalcopyrite. Oxidized ores have a decomposed porphyry gangue, sulphide ores occurring in brecciated porphyry. Has steam power and a small smelter, but in operation was hampered by a precarious water supply. Production, 1898, was 246,400 lbs. fine copper. Idle since 1903.

GREAT CENTRAL FREEHOLD MINES, LTD. AUSTRALIA.

Dead. Voluntarily liquidated, 1903. Formerly at Mt. Hope, Blaxland Co., N. S. W., Australia.

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GREAT COBAR COPPER MINING SYNDICATE. **AUSTRALIA.**

Dead. Property was sold, 1906, to Great Cobar, Ltd. Formerly at Cobar, Robinson Co., N. S. W., Australia. Very fully described Vol. VI.

GREAT COBAR, LTD. **AUSTRALIA.**

Office: 65 New Broad St., London, E. C., Eng. Mine office: Cobar, Robinson Co., N. S. W., Australia. Works office: Lithgow, N. S. W., Australia. Employs 1,300 men. Andrew Haes, chairman; John D. Kendall, consulting engineer; preceding officers, Wm. Rich, R. H. Henning, W. A. Horn, T. M. Joseph-Watkin, Gerard B. Elkington, J. P., and G. E. Baker, directors; Alexander Johnston, secretary; Geo. H. Blakemore, general manager; V. Farrier, mine superintendent; O. E. Iaeger, smelter superintendent.

Organized May 22, 1906, under laws of Great Britain, with capitalization £750,000, shares £5 par, fully issued. Debentures authorized, £750,000, first mortgage, at 6%, in denominations of £20, £50 and £100, redeemable by drawings at 5% premium, but repurchasable by means of a sinking fund, created 1908, by setting aside £100,000 annually from profits; issued, £550,000. A 15% dividend, amounting to £112,500, was paid Sept. 16, 1907. Net profits for first year were £238,431.

Property was bought May, 1906, of the Great Cobar Copper Mining Syndicate, but not taken over until September, 1906, for £1,006,000, of which £800,000, cash, was paid for the property, the promoters taking £206,000 in cash, shares and debentures.

Lands, 577 acres, freehold, including the Great Cobar mine, 208 acres leasehold, including the Cobar Chesney mine, and a 12-acre smelter site, with total holdings of 1,263 acres. Property includes the Great Cobar, Cobar Chesney and Great Peak mines, latter a gold property at Cobar. The company also owns and operates the Rix's Creek colliery, producing good coking coal, and smelting and refining works at Lithgow. There was some trouble, 1906, over a block of 40 acres of ground, in the main tract, said to have been lost through oversight, though formerly part of the Great Cobar property.

The Great Cobar, which is the most important copper mine of New South Wales, was opened 1869, and closed 1892, after failure to reduce sulphides in a reverberatory furnace. Production, 1869-1892, was 26,611 tons fine copper, made from rich oxides, ores averaging 11.07% in copper tenor, and considerable dividends were paid therefrom. Mine was reopened, 1892, by tributors, on a 10-year lease, and at the close of 1902 had produced, under their management, 730,669 tons of ore giving average returns of 3.27% copper. A long-standing dispute between the tributors and the fee-owners was settled, 1903, through the purchase of the property by the former, who sold to the present corporation.

Country rock, of Silurian clay-slate, shows 3 veins, of nearly vertical dip, known as the East, Middle and West lodes, principal workings being on the latter, which ranges 6" to 100' in width, carrying lenticular ore bodies. One of the principal parallel mineral zones is basic and the other acid, these lying about one-half mile apart. The principal ore bodies are 28', 38' and 52' in extreme width, with lengths of 135', 345' and 485', proven to depth of 1,000'. The oxidized zone extends to an average depth of about 250', below which the ore is mainly chalcopyrite, associated with pyrite and magnetite, with occasional pyrrhotite in the Great Cobar mine, ore being highly silicious and somewhat bismuthiferous, of about 3.5% average copper tenor in the Cobar and 2.81% in the Chesney, carrying an average of 0.5 oz. silver and 1.5 dwts. gold per long ton. The Cobar Chesney, now worked in connection with the Great Cobar, shows a lenticular chute of 36' width and about 105' length, opened to depth of 697', ore being chalcopyrite, with slate and quartz gangue.

Ore is won by overhand stoping, with 10' pillars left beside the shafts,

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and timbering is by bulkheads filled with waste, this being known locally as the "pigstye" system. Ore is first broken in immense masses, then reduced to smaller size by block-holes and pop-shots. No. 1 shaft of the Cobar, 15 x 7' 6" in size, is 1,000' deep, and the Barton shaft is of the same depth, these shafts being connected by a drift, on the 1,000' level, which shows a strong vein up to 5% in copper tenor. The mine has about 3 miles of workings.

The Cobar Chesney was opened as a gold mine, the outcrop carrying no copper, but carbonate ore was found at depth of 155', and at 250' there was chalcopyrite, coated with what was termed melaconite, but which probably was chalcocite. Main shaft, 697' in depth, shows ore carrying 2 to 8% copper, and up to 3 dwts. gold per ton, with an estimated average tenor for the entire Cobar Chesney mine of 2.81% copper.

Mr. Kendall estimates reserves of 1,500,000 long tons of ore blocked out in the Cobar, and 500,000 tons in the Cobar Chesney, besides 200,000 tons of ore near surface in the Great Cobar.

The Peak, or Great Peak, gold mine has a stamp-mill, and as the ore is siliceous and free from iron and sulphur, it would seem a highly suitable flux for the basic ores of the Cobar and Cobar Chesney mines.

Buildings at the mines include wooden carpenter and machine shops, smithies, offices and other necessary mine structures.

The company uses about 3,000 h. p. at the mine and smelter, including steam and electric installations, and has a 500-h. p. first-motion hoist, good for 2,000' depth, at the "New" shaft, and two 25-drill air-compressors. The boiler plant has Green fuel economizers, and, the district being arid, causing much trouble in dry seasons from lack of water, a 100,000,000-gallon dam has been built, water costs averaging about 8s. per thousand gallons, and a second dam, of 80,000,000 gallons capacity, was begun, 1908.

The reduction plant, at the mine, begun 1907, is planned to cost circa £100,000, and eventually will include a 250-ton sampling mill, for custom ores.

The dressing plant has 2 centrifugal Heclon crushers, each of 120 tons hourly capacity, delivering ore to electrically driven belt-conveyors, which take it to a 1,500-ton ore-bin, whence it is loaded into 30-ton cars and drawn by electric locomotive to the main storage plant. The Cobar Chesney has a 10-stamp mill and 25-ton concentrator.

The smelter, of 1,000 tons daily capacity, has three 500-ton water-jacket blast-furnaces, one being held in reserve, as a spare. Fuel is coke and coal. The converter department has 2 stands, with 84x126" shells of the Copper Queen type. Blast is supplied by 3 Connersville blowers, and it is planned handling slags with electric locomotives. Product of the smelter is blister copper, sent to the company's refinery at Lithgow.

The Lithgow works have five 100-ton water-jacket blast-furnaces, also reverberatory furnaces. An electrolytic refinery, installed 1902, treats, in addition to the company's blister copper, material from other properties.

From 1876 to 1906, inclusive, the Great Cobar mine produced 1,592,895 long tons of ore, and made therefrom 61,872 long tons fine copper. Production, 1905, was 9,076,480 lbs. fine copper, and for 1906 was 9,027,200 lbs., and 1907 is said to have shown a slight increase. From May 6, 1906, to Dec. 31, 1907, production was 13,695,360 lbs. fine copper, 104,292 oz. silver and 17,166 oz. gold, secured at a net profit of £238,431. For month ending Nov. 20, 1907, the smelter treated 15,380 tons of ore, producing 365 long tons of copper, circa 5,600 oz. silver and circa 100 oz. gold, showing an average copper extraction of 2.37%. The company plans bringing its ultimate production to about 30,000,000 lbs. yearly. With ore secured under modern methods, and with good mining and smelting equipment, the property should earn substantial profits.

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GREAT COBAR NORTH, LTD. **AUSTRALIA.**

Offices: 26 Victoria St., London, S. W., Eng., and Equitable Bldgs., Sydney, N. S. W., Australia. Mine office: Cobar, Robinson Co., N. S. W., Australia. Maj.-Gen. Sir W. H. R. Green, K. C., chairman; D. A. Sutherland, manager; J. Delohery, mine manager; T. Carter, secretary. Organized Nov. 15, 1906, under laws of Great Britain, with capitalization £350,000, shares £1 par. Lands, 286 acres freehold, and 400 acres leasehold, adjoining the Great Cobar, Ltd., opened to depth of 500′, with crosscutting in progress at last accounts. Took over machinery of Australian Mining Estates, Ltd., also the 60-stamp mill of the Occidental gold mine, 3 miles from Cobar.

GREAT CONDURROW TIN & COPPER MINING CO., LTD. **ENGLAND.**

Dead. Dissolved, Jan. 13, 1905. Formerly at Camborne, Cornwall, Eng.

GREAT DIVIDE GOLD CO. **CALIFORNIA.**

Dead. Formerly at Redding, Shasta Co., Cal.

GREAT DIVIDE MINES CO. **UTAH.**

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Lincoln, Tooele Co., Utah. Henry A. McCornick, president; Walter A. Cooke, vice-president and manager; Joseph H. Hurd, secretary; Rodney T. Badger, treasurer; John B. Taylor, superintendent. Organized Aug. 15, 1903, under laws of Utah, with capitalization $2,000,000, shares $5 par. Lands, 40 claims, about half patented, area 560 acres, also a 10-acre millsite, fairly timbered, showing fissures in and contacts between limestone and Cambrian quartzite, of which the main vein is said to range 12′ to 50′ in width, carrying ores said by company to assay 6 to 20% copper, 2 to 100 oz. silver and from a trace to $150 gold per ton. Development is by a 1,300′ tunnel. Development was begun 1898. Property considered promising.

GREAT FITZROY GOLD & COPPER MINES, LTD. **AUSTRALIA.**

Mine office: Mt. Chalmers, Queensland, Australia. C. H. James, superintendent. Organized 1907, under laws of Queensland, with capitalization £500,000; issued, £375,000. Mine, formerly known as the Mount Chalmers, has 3-compartment shafts of 225′ and 240′. Vein on the 150′ level is 120′ wide and 330′ in known length, mine having estimated reserves of 600,000 long tons of ore averaging about 3 to 4% copper and 3 dwts. gold. Has a steam plant with 20-drill and 8-drill air-compressors.

The smelter has a 100-ton water-jacket blast-furnace, making matte, shipped to Mount Morgan for reduction. In May, 1908, the smelter treated 2,710 long tons of ore, yielding 73 long tons of copper and 378 oz. gold, costs being 8s. 11d. per long ton for mining, 9s. 11d. for smelting, and 11d. general expenses, or total costs, exclusive of development, of 31s. 6d. per ton of ore. Mine and works employ about 100 men. Production, 1907, is estimated at 1,650,000 lbs. fine copper. At last accounts company planned reconstruction, to raise additional capital.

GREAT HERMIDALE COPPER CO. **AUSTRALIA.**

Dead. Absorbed, circa January, 1908, by Great Hermidale South Copper Co. Formerly at Hermidale, N. S. W., Australia.

GREAT HERMIDALE SOUTH COPPER CO. **AUSTRALIA.**

Mine office: Hermidale, N. S. W., Australia. Absorbed, circa January, 1908, the Great Hermidale Copper Co. Has a 370′ main shaft.

GREAT HOPE MINING CO. **CALIFORNIA.**

Office: care of Geo. R. Whitcomb, secretary and manager, Los Angeles, Cal. Letter returned unclaimed from former mine office, Mojave, Kern Co., Cal. Chas. C. Davis, president; J. C. Cribb, vice-president; Z. L. Parmelee, treasurer; preceding officers and E. J. Peabody, directors. Is an unincorporated syndicate, organized circa 1905, with capitalization $10,000. Is developing by

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tunnel, and has secured assays up to 10% copper, 8% lead and 3 oz. silver per ton. Idle.

GREAT LAKES COPPER CO. ONTARIO.

Office: 51 East 44th St., New York, N. Y. Mine office: Sudbury, Algoma, Ont. John McKinley, president; Horace Williston, secretary; Robert Sloane Bickford, treasurer. Organized 1900, under laws of West Virginia, with capitalization $3,000,000, shares $5 par. Lands, upwards of 4,000 acres, near Sudbury, carrying nickeliferous chalcopyrite, associated with pyrite. Has several shafts, deepest 150', also an open-cut, with a considerable amount of ore in sight. The Graf smelting process was tried, but proved a failure. Property is mortgaged. Charter was forfeited, 1903, because of non-payment of corporation tax, and company seems hopelessly involved.

GREAT LAKES MINING & MILLING CO. WYOMING.

Dead. Formerly at Eucampment, Carbon Co., Wyo.

GREAT LAKES MINING & SMELTING CO. WYOMING.

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

GREAT LAXEY, LTD. ENGLAND.

Offices: 55 Cross St., Manchester, Eng. Mine office: Laxey, Isle of Man, Eng. F. J. Robertshaw, chairman; John Roberts, mine manager; J. Crossley, secretary. Organized March 3, 1903, as a reconstruction of the Great Laxey Mining Co., Ltd., with capitalization £30,000, shares 10s. par, in 45,000 cumulative 10% preferred and 15,000 ordinary shares. Lands, 1,103 acres, held under 31-year leases, expiring October, 1933, with royalty of one-eightieth to October, 1907, and one-fortieth thereafter. Lands carry lead, zinc and copper sulphides. Property had the largest water-wheel in the world, but this survived its usefulness and was displaced by a new power plant.

GREAT MAMMOTH COPPER MINING CO. WASHINGTON.

Dead. Formerly held 10 claims, under bond and lease. Promoters sold their own stock and pocketed the proceeds, company losing its lands. Formerly at Index, Snohomish Co., Wash.

GREAT MOUNT LYELL COPPER CO., LTD. TASMANIA.

Dead. Reorganized, Jan. 23, 1903, as Ballarat & Lyell Mines, Ltd. Formerly at Mt. Lyell, Montagu Co., Tasmania.

GREAT NORTHERN COPPER CO. MINNESOTA.

Office: 204 Globe Bldg., St. Paul, Minn. Mine office: Hinckley, Pine Co., Minn. J. B. Conger, vice-president and general manager; R. V. Peyton, secretary; H. C. Boyeson, treasurer; Wm. Kibbee, superintendent; preceding officers, S. O'Dea, Godfrey Dawe, G. O. Riggs, Dr. C. D. Snow and J. A. Fesscubeck, directors; August Zastrow, mine superintendent. Organized Sept. 16, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, circa $700,000.

Lands, 160 acres, freehold, 14 miles east of Hinckley, showing trap flows with 7 amygdaloidal beds carrying native copper, and occasional malachite, from weathering, property being on the western extension of the Keweenawan formation of Lake Superior. Two amygdaloids under development, of about 8' average width, traceable circa 1,500', are opened by shafts of 60', 100' and 60', giving rock assaying up to 4.8% copper, and estimated by company to carry an average of 3% copper and 6 oz. silver per ton.

Has a 90-h. p. steam plant, with an 8x10" double hoist, good for 1,000' depth, and 6 mine buildings, including a 20x30' wooden machine-shop. Company has secured some good-looking copper rock and plans continuing development.

GREAT NORTHERN COPPER CO. NEWFOUNDLAND.

Office: Corey & Braddock Aves., Braddock, Pa. Mine office: Twillingate, Newfoundland. Development is by a short tunnel. Presumably idle.

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GREAT NORTHERN COPPER & GOLD MINING COMPANY OF QUEENSLAND. AUSTRALIA.

Dead. Reorganized July 31, 1903, as Rosewood Creek Copper & Gold Mining Co., Ltd. Formerly at Rosewood Creek, Queensland, Australia.

GREAT NORTHERN COPPER MINING CO. UTAH.

Office: care of S. H. Browne, secretary and treasurer, Ogden, Utah. A. W. McGee, president; Daniel Covery, vice-president. Organized 1904, under laws of Utah, with capitalization $100,000, shares $1 par. Lands are in the Sierra Madre district of Box Elder county, Utah. Presumably idle.

GREAT NORTHERN DEVELOPMENT CO. ALASKA.

Office: 111 Broadway, New York, N. Y. Mine office: McCarthy Creek, Copper River district, Alaska. Jas. Phillips, Jr., director. Capitalization, said to be $1,000,000. Property is sundry copper claims, in the vicinity of the Bonanza group, slightly developed. Company is awaiting railroad transportation before doing permanent work.

GREAT NORTHERN GOLD & COPPER MINING & MILLING CO. OREGON.

Mine office: Lostine, Wallowa Co., Ore. E. T. Sluer, superintendent. Lands, 13 claims, south of Lostine, said to show high grade copper-silver ores.

GREAT NORTHERN MINING CO. WASHINGTON.

Dead. Formerly at Baring, King Co., Wash.

GREAT PECK MINE CO. ARIZONA.

Office: 519-10 Wall St., New York, N. Y. Mine office: Providence, Yavapai Co., Ariz. Hon. J. A. Beidler, president; Hon. James Tawney, secretary and treasurer; preceding officers, Hon. E. A. Minor, Hon. Herman G. Goebel, Hon. James H. Southard, Hon. Wm. E. Brown, Hon. Lucius N. Littauer, Hon. J. W. Babcock, Wm. E. Bixby and Melville Woodbury, directors; Peter Giroux, general manager. Knickerbocker Trust Co., New York, registrar. Organized 1902, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands, 2 claims, area 40 acres, patented. Mine, once a considerable silver producer, until closed by litigation, has about 5,000′ of workings, carrying gold, silver and copper values. The new Clifford shaft is 375′ deep. Past production is reported as about $3,000,000. Officers are principally representatives in the American Congress.

GREAT REPUBLIC COPPER & GOLD MINING CO. ARIZONA.

Office: New Philadelphia, Ohio. Mine office: Turkey, Yavapai Co., Ariz. Michael Siebold, president; L. E. Stegner, vice-president; Fred Graff, secretary; C. D. Grimes, treasurer; preceding officers, Wm. Bommell and S. S. Ballard, directors; Geo. Oakman, general manager. Organized May 1, 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par; issued, circa $2,300,000. Annual meeting, first Tuesday in September.

Lands, 33 claims, area 660 acres, and a 20-acre smelter site, in 3 groups, 2 miles from Turkey, in the Black Cañon district. Property shows chloritic schists and diorite, carrying fissure veins showing occasional native copper and malachite, but mainly azurite, chalcopyrite and bornite, estimated by company to average 4% copper, 3.5 oz. silver and from a trace to $6 gold per ton. Development is by shafts of 726′, 200′ and 200′, with various pits of 10′ to 40′ depth, and tunnels of 87′ and 314′. Has 15-h. p. and 40-h. p. gasoline hoists, with 7 mine buildings. Company plans installing a new hoist and air-compressor, and deepening the Sullivan shaft.

GREAT STANDARD COPPER MINING CO. WYOMING.

Office: care of Colonial Security Co., 161 Summer St., Boston, Mass. Letter returned unclaimed from former mine office, Granite Cañon, Laramie Co., Wyo. Dr. Walter H. Parker, president; John Laughrey, vice-president and general manager; Chas. B. Lamont, secretary. Organized Sept. 30, 1902, under

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laws of Arizona, with capitalization $1,000,000, shares 50 cents par. Lands, 17 claims, also miscellaneous lands giving total holdings of 640 acres, in the Silver Crown district, said to show 6 veins of about 8′ average width, opened by 18 shallow shafts and pits, claimed to give average assays of circa 7% copper, from oxides, carbonates, sulphides and chlorides, with occasional native copper. Idle since March, 1904, from lack of funds; has an overdue mortgage and seems not long for this world.

GREAT SULPHIDE COPPER CO. ARIZONA.

Mine office: Silver Bell, Pima Co., Ariz.

GREAT VERDE CONSOLIDATED MINE. CALIFORNIA.

Office and mine: Sisson, Shasta Co., Cal. Is a copartnership of 4 owners, capitalized at $20,000. Lands, 12 claims, unpatented, claimed to adjoin the Balaklala, but actually adjoining the Shasta King group of the Trinity Copper Co., claimed to show an ore body of 80′ width, claimed to be opened by 5 tunnels, longest 600′, claimed to carry chalcopyrite assaying 6% copper, 6 oz. silver and $7 gold per ton. Is not known ever to have produced any ore, statements to the contrary notwithstanding. Idle.

GREAT WESTERN COPPER CO. ARIZONA.

Office: Clinton, Ia. Mine office: Tombstone, Cochise Co., Ariz. Wm. J. Young, Jr., president; Edward Young, secretary. Capitalization $1,000,000. Lands, 23 claims, in the Dragoon Mountains, carrying argentiferous copper ores. Has steam and gasoline power. Is said to have resumed work, circa April, 1908, after several years' idleness.

GREAT WESTERN COPPER CO. ARIZONA.

Letter returned unclaimed from former office and mine, Globe, Gila Co., Ariz. Lands, near the head of Mineral Creek, show copper ore of fair tenor, and a little ore was shipped, 1906, to the Old Dominion smelter. Idle.

GREAT WESTERN COPPER CO. MONTANA.

Dead. Formerly at Butte, Silver Bow Co., Mont. Described Vol. VI.

GREAT WESTERN COPPER CO. NEVADA.

Dead. Was a stock-jobbing enterprise. Formerly at Reno, Washoe Co., Nev. Described Vol. VI.

GREAT WESTERN GOLD CO. CALIFORNIA.

Office: 401 Commercial Bldg., St. Louis, Mo. Mine and works office: Ingot, Shasta Co., Cal. T. S. Henderson, president; T. H. Adams, vice-president; M. E. Dittmar, managing director; C. J. Balmer, secretary and treasurer; S. E. Bretherton, general manager. Organized circa 1901, with capitalization $10,000,000, increased, circa 1905, to $12,000,000, shares $1 par. Management takes vigorous exception to criticisms in past issues of the Copper Handbook to the effect that it evades all inquiries as to capitalization and finances, and continues to evade these points, while professing the utmost willingness to furnish information.

Lands, circa 1,600 acres, patented, including the Afterthought group, area 459 acres, and the Liberty, Last Chance, Section 15, Bull and 10 other groups, and, at last accounts, a bond and lease was held on the Donkey mine. Lease on the Garcia mine, Arizona, was forfeited. Principal properties are the Afterthought, Copper Hill and Copper Grand. Ten of the Afterthought claims are patented, and the River group, 3 claims, is patented. Lands are on the east side belt, which extends from Ingot to DeLamar, and is entirely distinct from the copper belt on the western side of the Sacramento river.

The Afterthought mine, in the Furnaceville district, 20 miles east of Redding, is the principal property. Former developments included a 300′ shaft and 7 tunnels, of about 2,000′ aggregate length. Present main tunnel is circa 2,500′ long. Property shows a considerable body of low grade sulphide ore, with occasional occurrences of medium and high grade sulphides, ore being

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chalcopyrite, associated with sphalerite and pyrite. The main working tunnel cuts a 24′ ore body, in the Copper Hill mine, with a back of 500′. The Liberty group, near Redding, with title apparently in dispute, carries auriferous copper ore of undetermined value. The company's claims that the ore would average $30 per ton in value have been disproven by the results of actual smelting. In 1905 the ores smelted assayed 2.81% copper, 14.3% zinc, 11.6% iron, 20.25% sulphur, 5.3% alumina, 7.4% barium sulphate, 5.4% calcium carbonate and 18% silica. The property has considerable zinc ore assaying 25 to 40% in tenor.

The smelter, 1 mile north of Cow Creek and 1½ miles north of the mine, connected therewith by a tram-line of 30″ gauge, was blown in March 24, 1905. The works have 40x96″ and 42x150″ blast-furnaces, latter with Bretherton hot-blast furnace and 12 tuyeres on a side, blast being furnished by 2 Risdon hot-blast stoves. The larger furnace is rated at 500 tons' daily capacity. The smelter has 2 brick dust-chambers, and matte produced was shipped to Utah for conversion.

Much trouble was had with the first furnace, which worked badly, and it was said that the management planned building a bag-house to recover zinc oxide from the smelter fumes. Under the management of Mr. Bretherton, who took charge later, the blast-furnace was run with a low charge and an exceptionally hot top, on account of the excess of barium sulphate, and is said to have given satisfactory results.

Work was begun, circa August, 1907, on a 14-mile standard-gauge railroad, to be known as the Redding, Afterthought & Northeastern, to connect with the Southern Pacific at Bella Vista, and the smelter was idle, August, 1908, awaiting the completion of this road, which should greatly reduce operating costs.

The company was promoted by T. S. Henderson & Co., a St. Louis brokerage firm of dubious reputation, and the early financing of the Great Western Gold Co. was not of a nature to recommend the property to conservative investors. The company has evaded making any definite statements regarding its organization or finances, but a semi-official statement has been secured to the effect that to Aug. 1, 1908, the company had produced nearly $1,000,000 in copper, silver and gold. The local management seems good, and Mr. Henderson, notwithstanding the criticisms previously made, is entitled to the credit of sticking to the proposition, which is not devoid of merit, though it seems a question whether the Afterthought should be called a copper mine or a zinc mine.

GREAT WESTERN GOLD & COPPER CO. **UTAH.**

Office: Provo, Utah. Mine office: Park City, Summit Co., Utah. Jesse Knight, president; W. Lester Mangum, secretary; Rt. Rev. Robert Brighton, general manager. Lands, at the head of Big Cottonwood Cañon, adjoining the Daly Judge, show a ledge of about 100′ width, giving assays of 3 to 5% copper. Development is by tunnel, planned to cut the ledge at about 2,000′ depth.

GREAT WESTERN GOLD & COPPER MINING CO. **MONTANA.**

Office: care of W. J. Willingham, Equitable Bldg., New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Chas. G. Eckert, president. Organized under laws of South Dakota, with capitalization $500,000, shares $1 par. Lands, 1 claim, area 20 acres, near Butte. Formerly had a bond and lease on a gold claim at Cripple Creek, Colo. Idle and apparently moribund.

GREAT WESTERN GOLD & SILVER CO. **ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. Organized circa June, 1908, possibly as successor of Great Western Copper Co. Lands, in the Dragoon Mountains, show auriferous and argentiferous lead and copper ores.

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GREAT WESTERN MINING, MILLING & SMELTING CO., LTD. IDAHO.

Mine office: Pocatello, Bannock Co., Idaho. O. D. Hovey, superintendent. Has copper ores and was developing with a small force at last accounts.

GREAT WESTERN ORE PURCHASING & REDUCTION CO. CALIFORNIA.

Works office: Keeler, Inyo Co., Cal. Has a 150-ton smelter, built 1906, and is said to own old mines in the Cerro Gordo district.

GREENBACK COPPER CO. CALIFORNIA.

Mine office: Woody, Kern Co., Cal. Lands, 1,520 acres, 18 miles from Southern Pacific railroad. Country rock is grano-diorite, showing an ore chute carrying lenses of 20′ maximum width, with granite walls irregularly impregnated with chalcopyrite. Development is by a 185′ incline shaft, with 3 levels opened. Carbonate ores stoped from the upper levels have averaged 19.4% copper and 5.7 oz. silver per ton. Idle 1900-1905, and presumably again idle.

GREEN COPPER CO. MONTANA.

Dead. Was put out of business, 1906, by an injunction, secured by the Amalgamated Copper Co., restraining the Green from mining property claimed by the Amalgamated. Formerly at Butte, Silver Bow Co., Mont.

GREEN DRAGON COPPER CO. CALIFORNIA.

Dead. Was organized, early 1907, by Nevada Counties Brokerage Companies, of San Francisco, and merged, circa September, 1907, in Copper Mines & Smelters Corporation of America. Formerly at Greenwater, Inyo Co., Cal.

GREENE CANANEA COPPER CO. MEXICO.

Office: 511 Lyceum Bldg., Duluth, Minn. **Mine and works office:** La Cananea, Arizpe, Sonora, Mex. Thos. F. Cole, president; Chas. A. Duncan, vice-president and treasurer; Chas. D. Fraser and Jos. B. Cotton, vice-presidents; preceding officers, Myron M. Parker, Philip L. Foster, Chester A. Congdon, Chas. d'Autremont, Jr., Capt. Jas. Hoatson and John D. Ryan, directors; Frederic R. Kennedy, secretary; Jos. W. Allen and Daniel R. Smith, assistant secretaries; Wm. G. Hegardt, assistant treasurer; Arcadius L. Agatin, general solicitor; Dr. L. D. Ricketts, general manager; David Cole, assistant general manager; Jas. H. Kirk, mine superintendent; E. C. Cole, assistant smelter superintendent; Frank J. Strachan, mill superintendent; Geo. Young, mercantile superintendent; T. Evans, traffic manager; T. R. Lucas, purchasing agent; J. A. Campbell, public service superintendent.

Organized Dec. 26, 1906, under laws of Minnesota, with capitalization $60,000,000, shares $20 par; issued, $50,000,000. New York Trust Co. and City Trust Co., Boston, transfer agents. Bankers Trust Co., New York, and State Street Trust Co., Boston, registrars. Shares are listed on the Boston stock exchange.

The Greene Cananea Copper Co. is a securities holding corporation solely, controlling, through stock ownership, the Greene Consolidated Copper Co. and the Cananea Central Copper Co. The Greene Cananea exchanged its shares for the stock of the two subsidiary corporations on the basis of 1½ shares for each share of Greene Consolidated, and 1⅔ shares for each share of Cananea Central, this exchange calling for $50,000,000 of stock of the Green Cananea to completely absorb the shares of the Greene Consolidated and Cananea Central. On March 17, 1908, the Greene Cananea owned 925,038 shares of the issued capital stock of 1,000,000 shares of the Greene Consolidated, and 522,272 shares of the issued capital stock of 600,000 shares of the Cananea Central. Exchange of stocks is still in progress, and it is expected that eventually the entire capital stock of both the subsidiary corporations will be acquired.

The Greene Cananea Copper Co. was said to have begun business with $8,000,000 cash, part of which was to be used for payment of old debts of the

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Greene Consolidated, part for the purchase of supplies and about $3,000,000 for a new reduction plant and other improvements. Officers of the company were quoted, in the press, as stating that not one cent of promotion profits were taken by men interested in the company, and that the proposed plan provided $7,000,000 additional cash, and that the cash was safely in the hands of the treasurer. It was stated, in the press, as recently as October, 1907, that the company's treasury contained $7,000,000 in cash, and the same authority stated that the treasury contained between $6,000,000 and $7,000,000 at the time of suspension of operations, November, 1907. It was stated, in the press, Aug. 26, 1907, that the annual report, forthcoming in October, would show $8,000,000 cash in the treasury, with fuel, supplies and stocks valued at $3,000,000, with a total of cash and salable assets of $20,000,000. The company's first annual report, of date March 17, 1908, showed a cash balance on hand, Dec. 31, 1907, of $11,328.23, with total receipts of $125,000 borrowed from the Cananea Central Copper Co., and $12 received from sundry sources. It is quite obvious that the books of the Greene Cananea Copper Co. are so kept that the principal items of receipts and expenditures are distributed between the various subsidiary corporations. Inasmuch as the Greene Cananea is a securities holding corporation only, and its sole revenue is from dividends of subsidiary corporations, none of which are on the dividend list at present, it is evident that this system of bookkeeping is unavoidable, though most confusing to shareholders.

In the various articles descriptive of the Cananea Consolidated Copper Co., S. A., Cananea Central Copper Co. and Greene Consolidated Copper Co., the relations of these interlocking corporations are given in as much detail as possible, though much confusion has arisen through the disingenuous reports and statements of the Greene Consolidated Copper Co., which listed, among its assets, all the property of the Cananea Consolidated Copper Co., S. A. While the financial relations of the various corporations are explained in detail in the articles devoted to each, it has been thought best to consolidate the description of the respective properties under one head, as any other method would give merely fragmentary descriptions of what now, to all actual intents and purposes, constitutes a single property, and, inasmuch as the Greene Cananea Copper Co. is the controlling power, and operates all of the properties in question, and its shares are those that are held mainly by investors, only small minority interests remaining outstanding in the other corporations, it has been deemed advisable to give the description of the Cananea mines and works under this title.

The authentic history of the Cananea mines dates from A. D. 1568, but it is thought that the mines may have been opened by the Aztecs previous to the conquest.

There was much litigation over titles, but the lands were redenounced, 1902, and direct title taken from the Mexican government by the Cananea Consolidated Copper Co., S. A.

The mines are in the municipality of Ronquillo, and the principal administrative buildings are in that municipality, near the smelter. The company owns the townsite of La Cananea, on the mesa to the eastward of Ronquillo, and therein are located the best dwellings, hotels and public buildings. Franchises are held for electric light, water, ice, traction and telephone services.

Lands of the Greene Consolidated were 4,214 pertenencias of one hectare each, equivalent to 10,412 acres, the main mining tract having a boundary line of 32½ miles, and including about 40 old mines and prospects, located in the Cananea Mountains, in the free zone of northern Sonora, about 20 miles south of the Arizona border. The Greene Consolidated had mineral concessions for 184 square miles, in Sonora and Chihuahua, expiring May 7, 1906, only part

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of which were renewed. Including the Cananea Central holdings, the Greene Cananea has about 37,000 acres of mineral lands and circa 350,000 acres of surface rights. The Sierra Cananea is about 25 miles in length, and 6 to 10 miles in width, with a northwest and southeast strike, divided into two plainly marked and nearly equal sections by Puertecitos Pass, the properties of the Greene Cananea being in the southern half of the mountains on a mineral belt apparently having a strike practically parallel with that of the range.

The Cananea Mountains show marked evidence of strong volcanic action in the remote past. The Cananea mines are found in a succession of approximately parallel outcrops of altered limestone, alternating with porphyritic dikes, the ore deposits, often of monstrous size, occurring in shear-zones between the limestone and porphyry, and as replacements in the latter. The ore bodies are entirely distinct and vary greatly, affording practically all varieties of oxidized and sulphide ore, with considerable native copper. Many of the ore bodies are silicious, requiring concentration to eliminate the silica, which occurs as quartz and as aluminum silicate. None of the ore carries zinc or other refractory elements. There are large gossan outcrops, but appearances sometimes are deceptive, and much of what appears gossan at a distance proves, upon closer inspection, merely weathered conglomerate, showing reddish-brown stains closely simulating the iron colors.

The mines of the Cananea Consolidated Copper Co., S. A., are divided into 5 zones, known as the Cobre Grande, Veta Grande, Esperanza, Capote and Puertecitos, each zone including a number of different mines, principal development being on the Capote, Veta Grande and Esperanza zones. The Cananea Consolidated has 8 main shafts, with upwards of 40 miles of workings, development, for 17 months ending 1907, having aggregated about 13 miles of workings, with 2,332′ of diamond drill borings. Extraction is mainly by 8 working tunnels, double-tracked and electric-lighted, having electric motors pulling 10-ton cars. The mines consume yearly, for timbering, about 40,000,000′ of pine and fir, mainly from Oregon, though a limited supply is secured from the Sierra Madre Mountains. Considerable ore is mined by the slicing system, which is a modification of the caving plan. Some stopes have been lost, through poor timbering, but the mine, as a whole, is not in bad shape, notwithstanding reports to the contrary. Ores are decreasing in copper content with depth, but the sulphide ores show increased silver values in the lower workings. The ore bodies lie rather deep, as a rule, hence are unavailable for open-cast workings, except in one instance. The Cananea has considerable reserves of ore of 4% or better in copper tenor, and is said to have blocked out upwards of 3,000,000 tons of ore of about 3.5% average grade.

The Cobre Grande, which was the original mine of the Cananea Consolidated, was worked in a crude way by the Pesqueira family for several generations, but now is a minor property. This group shows ore of concentrating grade only, the mine having upwards of a mile of workings.

The Veta Grande has 2 enormous ore bodies, the Veta Grande proper having a pitch of 36°, with an average width of 216′, average length of 726′ and known depth of 1,000′, containing about 7,000,000 tons of ore of medium tenor, with some high grade ore. The Massey ore body, opened in 1904, has been developed for 750′ in width and 1,200′ in length, and is of unknown depth, some of the ore assaying up to 7% copper, with combined gold and silver values of about $2 per ton. There also is a 150′ ore body on the hanging wall, of 2 to 6% copper tenor, the silicious portions of which are used for converter linings. The Veta Grande ore is mainly soft chalcocite, carrying considerable quantities of native copper and occasional massive chalcocite, associated with a small amount of pyrite, gangue being talc and occasional quartz. Extraction is mainly through Veta Grande tunnel No. 9, of 6,236′ length, which serves

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both the Veta Grande and Oversight mines, connecting also with the Capote tunnel. Owing to soft ground about 200′ of this tunnel has been concreted. The Veta Grande is timbered with square sets, and depleted stopes are filled with waste. The ore is mined in 100′ sections, leaving 100′ slices unmined, and as the worked-out stopes are filled in, it will be possible to mine out the untouched portions. The Veta Grande ore bodies are overlaid by a heavy felsite capping, estimated at 830,000 cubic yards, and the former management gave consideration to the advisability of stripping the surface. Veta Grande shaft No. 5, of 3 compartments, has a 115-h. p. double hoist good for 1,000′, operating 2 hoists in balance, and a 7-drill air-compressor, smithy, framing shop, etc.

The Oversight mine, which is practically a continuation of the Veta Grande, and is served by the Veta Grande tunnel No. 9, has a limited amount of ore ranging up to 25% copper, and has developed a new ore body of 2.5 to 3% average tenor.

The Capote zone, including a number of mines, is the principal property of the Cananea Consolidated, and has 4 main shafts, known as No. 2, 4, 6 and 8, and planned another 3-compartment shaft, circa 300′ west of No. 2, which replaced No. 10, but the ground proved too soft to stand well. Extraction is mainly by tunnel, the main working level having a double-track tunnel connecting with shafts 2, 4, 5 and 7, at an extreme distance of 2,900′. On the 1,050′ level the Capote shows a vein of about 75′ width, carrying mainly chalcopyrite, with some chalcocite, assaying 4 to 20% copper. The Capote was on fire, 1907-1908, for about 12 months, but the fire was quenched by drowning, after the mine suspended operations. The main ore body of the Capote consists essentially of pyrite, coated with a thin film of chalcocite, occurring in thin crystalline grains, scattered quite uniformly through immense bodies of talc, the ore being highly silicious. No. 2 shaft has a 110-h. p. hoist and No. 4 has a double hoist good for 3,000′ depth. The Capote equipment includes an air-compressor and a 50-kw. direct-connected generator furnishing light and power. No. 10 Capote shaft has a Prescott pump of 1,250,000 gallons daily capacity.

The Elisa mine, 1,500′ south of No. 2 Capote, shows a vein of about 20′ width, for a distance of 500′, on the second level, said to average 4 to 6% copper, with somewhat higher grade ore below, ore being silicious chalcopyrite carrying good gold and silver values. The main shaft of the Elisa is 540′ deep.

The Esperanza zone, but slightly developed, is known to carry good ore bodies, and probably will be developed through the Capote workings.

The Puertecitos zone, which is the westernmost, is about 4 miles northwest of the Elisa shaft, and has an ore body of immense size, with an outcrop up to 800′ in width. The oxidized zone, which is comparatively shallow, shows considerable malachite, azurite and occasional cuprite and native copper, but the main ore bodies are chalcopyrite, with occasional bornite, in a lime-garnet-alumina gangue. The ore was said, formerly, to average about 3.5% copper and 3.5 oz. silver, but these figures probably are too high. The workings of the Puertecitos zone are known as the Ventura on the east, having a 700′ shaft, the Juárez, 1,200′, next west, and the Elenita, 900′ west of the Juárez. Some rich ore has been exposed in grading for surface structures at the Elenita. The Puertecitos has enormous quantities of low grade ore, but is idle.

The Cananea Central properties, with several miles of workings, apparently have ore of somewhat higher average grade than the Cananea Consolidated, and were claimed, 1907, to have in sight 2,000,000 tons of ore of better than 5% average grade. Lands of the Cananea Central are 3,708 acres, com-

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prising holdings of various subsidiary companies, including the Duluth or Cananea-Duluth mine, Dos Naciones, American and Bonanza mines.

The Duluth mine has 2 shafts, with extensive openings on the 170', 270' and 370' levels, for circa 1,000' length, showing a vein of 20' to 150' width, carrying ore ranging up to 15% copper and 25 oz. silver, with fair gold values This mine is said to show, on the third level, ore averaging circa 4.5% copper, 8 to 10 oz. silver and 40 cents to $2 gold per ton.

The American mine has 6 shafts, all shallow, showing some very rich ore, and 2 additional shafts have been planned.

The Bonanza mine is said to have a proven ore body 1,000' in length and upwards of 100' in width, with first grade ore assaying 15 to 32% copper, and second grade ore said to assay 5 to 7% copper, 5 to 15 oz. silver and $2 gold per ton, but it is probable that the average of actual extraction will fall much below these figures.

The concentrator department includes a crushing plant, sampling mill, 2 concentrators, machine shop, smithy and 2 warehouses. The crushing plant, in a separate building has 8 ore bins of 20,000 tons storage capacity, to which ore is delivered from Ingoldsby side-dumping cars. From these bins ore is drawn onto a Robbins picking belt, 36" wide and 68' long, from which native copper and chalcocite are hand picked. The ore then goes to a Manhattan conveying belt, 30" wide and 275' long, of 200 tons hourly capacity, which leads to grizzlies, screened fines going to storage bins and ore going to five 10x20" crushers, which reduce the ore to 1½" size, each crusher discharging into a set of 16x36" rolls, which crush to ¾" size and discharge to belt-conveyor, which takes the crushed ore to the storage bins of the mills.

There are two concentrators, No. 1, the old mill, of wood, having 30-ton individual sections, covering 29,650 square feet. Concentrator No. 2, of steel, in four 500-ton sections, terraced throughout, covers 33,240 feet, and cost circa $250,000. Foundations of new mill are concrete on rock base, independent of wooden floors. A third concentrator seems needed, but the present water supply is insufficient for another mill. The mills put about 3.6 tons into 1, and save about 75% of the assay values, ores being difficult of concentration, owing to the gangue being highly silicious and aluminous.

From the 3,000-ton storage bins in each mill ore is drawn by automatic feed to 8 trommels having ⅝" holes. The tailings from the bull jigs are reground in rolls, and elevated to pass through 8 trommels with ⅜" holes. Tailings from the fine jigs are reground in ten 5' Bryan mills, and two 6' Chilean mills, sized in classifiers and distributed to 43 Wilfley tables. The overflow from the spitzkasten below the Bryan mills goes to pulp, thickens, and makes feed for 36 Frue vanners, while the bottom discharge from the spitzkasten goes to the classifiers for Wilfley tables. Equipment of the mills include eight ⅝" screens, eight ⅜" screens, eight 3/16" screens, sixteen 2mm. screens, 16 elevators, 16 hydraulic classifiers, 72 jigs, ten 5' Bryan mills, two 6' Chilean mills, 108 Wilfley tables, 144 Frue vanners, 16 shaking launders and 10 Cole drag belt conveyors.

Concentrates are conveyed by locomotives to bins, and loaded thence into narrow-gauge cars for the ore bedding plant. Tailings go to the coarse sand tanks, where coarse sand is settled out, overflow going to slime tanks, where fine slimes are settled, and the clear water pumped back for further use. There is a big dam for tailings. Owing to scant water supply, water from the coarse jigs is sent to the jig floor and used on middlings, and water from the middlings is used upon the sands, and thence back to the coarse jigs again. From the Wilfleys the water goes to thickeners, and from the tailings the water is recovered in settling tanks, the amount of water recovered by

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this ingenious combination of economies being 87.5% so every gallon does duty eight times over.

The power plant at the crushers and mills includes a separate boiler-house with six 250-h. p. Stirling boilers, and an engine-house for each mill, the power plant for No. 1 mill including a 400-h. p. 16x36" Murray tandem compound engine and a 325-h. p. 12x24x30" Minneapolis cross-compound engine. Mill No. 2 has a 400-h. p. Allis-Chalmers 16x32x36" cross-compound engine and two 600-kw. electric generating sets.

The ore bedding plant has 3 beds, each 50x450' and of 9,000 tons capacity, where charges are thoroughly mixed by traveling belts, distributing ore, fluxes, etc. Thoroughly fluxed charges are taken from these beds to the feeding-bins of the smelter.

In 1907 the company gave serious consideration to the building of a new smelting plant, but eventually decided to rebuild the old smelter. The sites under consideration were on the Sonora river, some miles below the present works, and to the eastward of La Mesa, several miles east of the old plant. Tentative plans for the new smelter called for a $3,000,000 plant, to have three 54' blast-furnaces. These plans, however, were abandoned, in favor of rebuilding the old smelter.

The cupola building is 33x296' in size, of steel frame with iron sides, with 4,200-ton ore-bins and 3,000-ton coke bins. There are 75-ton steel charging bins in front of each furnace, for feeding mixed charges, and material is handled by gravity. The charging bins have automatic gates, and dump charges direct into the furnaces, one man caring for two furnaces. The old plant had 8 furnaces, of 7 different types, all of which were remodeled or scrapped, and replaced by 8 practically uniform furnaces, of sizes 48x210" and 42x228" at the tuyeres, giving an average capacity of 400 tons for each furnace, with an aggregate capacity of 3,200 tons for the smelter. Seven small settlers formerly used have been replaced by 4 large clay-lined settlers, each serving 2 furnaces. Settlers skim continuously into self-dumping slag-cars, drawn by two 25-h. p. and two 40-h. p. electric locomotives, traversing a rebuilt slag-line. Over each furnace is a 20x20x20' steel dust-chamber, planned to collect flue-dust and return same to the smelting zone by gravity, which were installed by the old management, but failed to work according to theory. Leaving these primary individual dust-chambers, furnace gases go to a 10x13x400' dust-flue leading to a 250x250' brick dust-chamber. Smoke and gases are discharged from the main dust-chamber through a self-supporting steel stack 16' 6" in diameter and 190' feet high. The blast-furnace building has 2 McDougal calciners.

The converter building, 60x396', of steel frame with iron sides and roof, has 2 electric cranes with double auxiliary hoists of 40' and 50' span, each with a clear hoist of 40' to the main blocks. Three old stands with 24" cylinders, operated hydraulically under a pressure of 200 lbs. per square inch, have been reconstructed, and there are two new stands, operated electrically. There formerly were 22 shells of 132x156" size, which have been replaced by eight 96x138" shells of barrel type, and other shells of the same size will be added. The converters blow off into moveable hoods leading to primary and secondary dust-chambers. A railroad track runs under each stand, and the casting-cars are fitted with six 300-lb. ingot moulds each, there being 24 cars and 250 moulds. Ingots are carried in cars to the bullion floor, where the pigs are chipped, sampled by electric drills, weighed and loaded. The converter-slags are taken in ladles, by crane, to the forehearths, saving resmelting.

The lining department, at the eastern end of the converter building, has 600-ton silica bins, with material handled by gravity, one 10x20" Blake crusher, two 15x26" Argall rolls, one 8' automatic mixing-pan, conveyors and elevators,

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power being supplied by a 125-h. p. electric motor. Tamping is by pneumatic rammers. Low grade silicious ores are used for linings, instead of barren silica.

A 350-ton oil-burning reverberatory furnace was built, 1905, with dimensions of 27x120′ and hearth of 20x100′, being the second largest in the world. The result was not very satisfactory, and the furnace has been rebuilt to size 19x100′ and treats flue-dust, waste gases firing an adjoining boiler.

Much of the ore smelted being pulverulent, an excessive quantity of flue-dust is produced, which is briquetted before resmelting. The briquetting plant includes a 225-ton Mould plunger press and a 100-ton White press, briquettes being sent by belt-conveyors to the charging-floor of the smelter. A considerable number of men were employed formerly on hand-briquetting.

The central power plant, near the smelter, has a 65x245′ engine-house, of steel, with iron sides and roof. The plant includes a 325-h. p. 14x26x36″ Allis-Chalmers tandem compound condensing engine, two 300-kw. McIntosh engines, one 200-kw. Union Iron Works engine and three 100-kw. Union Iron Works engines, furnishing a 250-volt current for various uses around the works, also lighting the mine buildings and the towns of La Cananea and Ronquillo. Blast is furnished by one 750-h. p. Rand air-compressor, two 500-h. p. Allis-Chalmers air-compressors, one 225-h. p. Nordberg air-compressor, one 250-h. p. Murray tandem compound blowing engine, two 250-h. p. Murray blowing engines, one 250-h. p. Allis Corliss tandem blowing engine, one 125-h. p. Murray blowing engine, one 100-h. p. Allis blowing engine, one 100-h. p. Ayers blowing engine, three No. 10 Connersville blowers and three No. 8 Connersville blowers, the blowers having an aggregate capacity of 30,000 cubic feet of free air per minute. The 42″ crooked blast-pipes formerly in use have been replaced by two 96″ straight blast-pipes.

The boiler-house of the central power plant is 46x216′ in size, of steel, with iron sides and roof, and has 3,500-ton coal bunkers. There are 11 boilers, of 3,000-h. p. aggregate capacity, with a 12″ steam main from boiler-room to engine-house. Coal is fed by gravity from bins, and pulverizers were installed, 1907, but petroleum has been substituted for coal, as fuel for general purposes, at an estimated saving of about 25%, the Mexican government having consented, as an aid to the company, to remove the duty on petroleum. Fuel is mainly Texas oil, bought under a contract calling for 1,500,000 barrels in 2 years. There are three 100,000-gallon oil storage tanks, with 6″ pipe lines for loading from tank-cars, and oil is drawn from the tanks by pipe-lines leading to the boiler-room.

Shops at the mine and works include a steel machine-shop, well equipped and having a foundry with a 2-ton casting cupola. The carpenter-shop and planing mill have complete equipment for making sashes and doors. The smithies are numerous and fairly equipped. There also are large warehouses for mine, mill and smelter supplies.

Potable water is piped from Sawmill Cañon, and water for the concentrators, boilers and other uses, is secured from a pumping plant at Ojo de Agua, on the headwaters of the Sonora river, 9¾ miles from the mine. The pumps have capacity to force 1,750,000 gallons daily through a 10″ steel pipe-line, against a head of 967′, to a reservoir on the hills above Ronquillo, whence water is delivered to the mine, reduction plant and towns, under a substantial working pressure. The water system of the company has about 25 miles of mains, ranging in size from 2″ to 10″, and owing to the cost of securing water, it is clarified and re-used, wherever possible. The water storage tanks at the smelter have 596,000 gallons capacity, with 9,300′ of mains and 4,000′ of 2½″ fire-hose.

The company's private railroad, of 36″ gauge, laid with 35-lb. and 45-lb.

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steel rails, has about 30 miles of line, including branches, spurs and sidetracks, and an extension of 4.14 kilometers has been built from the smelter to the American and Duluth-Cananea mines. Equipment includes 12 locomotives and a number of 25-ton cars. The line has been double-tracked between the concentrator spur and the Capote mine. Rail connection with the outside world is over the Ferrocaril Cananea, Rio Yaqui y Pacifico, with which the company has a 25-year freight contract, made circa 1902, assuring favorable freight rates. The property has about 30 miles of wagon road, with maximum grades of 7%, and about 35 miles of trails.

The company's brick-yard has a daily capacity of 35,000 brick. There are 2 sawmills, with a combined daily capacity of 14,000', sawing timber cut from the company's lands.

The mercantile branch of the company does a very large business, having a large brick store, carrying an enormous stock, and a branch store at Chivatera, with warehouses having direct rail connection. The retail mercantile business amounts to nearly 4,000,000 pesos yearly, when full forces are employed.

The Banco de Cananea, organized January, 1902, with a capital of 200,000 pesos, Ignacio Macmanus, cashier, is owned and operated by the Greene Consolidated, and does a large and profitable business.

The company owns 5 office buildings, 11 dwellings for foremen, boarding houses with capacity to care for 900 men, 3 lodging houses of 10 rooms each, 1 of 16 rooms and 1 of 42 rooms, all of brick, a restaurant, bakery, meat-market and about 200 cabins for Mexican miners. A well-appointed club-house is maintained for the American employes.

The company maintains a 40x100' two-story brick hospital, having a detached kitchen and beds for 59 patients, also a 6-ward emergency hospital at Chivatera, with a full force of physicians, surgeons and nurses.

The company maintains a telephone system having about 200 miles of wire with circa 150 'phones, also an independent telephone system used for dispatching on the narrow-gauge railroad. A scavenger service is maintained in the municipality of Ronquillo.

The company owns upwards of 400 horses, mules and burros and has a large corral for their care.

A concession for a power plant on the Yaqui river is held from the Mexican government, and the installation of a large hydro-electric plant was under consideration by the former management.

Normal forces are about 5,000 men, including several hundred American skilled workmen and a few Chinese, but about 85% of the labor is native. All heads of departments and shift-bosses are American, but the miners and laborers are exclusively Mexicans. The suspension of operations, 1907, gave the company a chance to eliminate some very undesirable native labor, which had caused serious rioting in 1906. Only workmen of the better class were re-engaged when operations was resumed. Owing to the proximity of the property to the border, there is an unduly large proportion of undesirables of both nations in the district—Mexicans who stay near the line, in order to get across in a hurry, if necessary, and Americans who already have crossed the line, for good and sufficient reasons.

The new board has ignored the contract of the former management of the Greene Consolidated with the American Metal Co., Ltd., and is marketing its production through the United Metals Selling Co. Had the company continued to sell its copper under the old contract it would not have had to sell, in the last weeks of 1907, about 12,000,000 lbs. of copper at 13 to 14 cents, mainly for export, which could have been sold, in the first half of the year, at about 25 cents per pound.

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The dissatisfied shareholders of the Greene Consolidated have appointed a protective committee, and there is some possibility of litigation, though it is difficult to see what action the shareholders of the Greene Consolidated can take against the Greene Cananea, as their only recourse would seem to be against the former officials of the Greene Consolidated.

The mine was closed down, circa November, 1907, the letter of Dr. Ricketts to Gov. Torres, of Sonora, explaining the suspension, stating that the company had been unable to sell any copper for 8 months, and, at that time, owing to the panic, could neither sell nor borrow. If the company was unable to sell for 8 months preceding 1907, it was solely because of its affiliations with the Amalgamated Copper Co., as other producers had no difficulty, previous to June or July, 1907, in selling at nearly twice the price that was current in November. Operations were resumed on a small scale, early in 1908, when repairing and rebuilding was begun, and the smelter was blown in July 11, 1908, with 2 furnaces, 2 additional furnaces being blown in July 23, and the property is gradually getting back to a normal basis of production.

Production of the Cananea has shown steadily decreasing average ore values. Owing to lavish use of the high grade ores, the average extraction declined from 5.73% copper in 1903 to 4.45% in 1904, 3.65% in 1905 and 2.95% in 1906, while the average for 1907 was 2.329%. Production is about 25% smelting ore and 75% concentrating ore. In 1906 more than half of the production came from the Capote and Oversight mines, the Veta Grande being the next largest producer.

For fiscal years ending July 31, production of fine copper has been as follows: 64,211,895 lbs. in 1905; 55,943,478 lbs. in 1906, and circa 43,000,000 lbs. in 1907. For the calendar year 1907 production was circa 34,000,000 lbs. For 17 months ending Dec. 31, 1907, production was 1,347,054 wet tons of ore, yielding 58,180,856 lbs. fine copper, 766,422 oz. silver and 6,100 oz. gold, giving a recovery of 46.58 lbs. fine copper per ton, or 2.329%, with gold and silver values of 1.213 cents per pound of fine copper, or 56.5 cents per ton of ore.

Production July, 1908, was circa 1,000,000 lbs. fine copper, and in September, 1908, production was at the rate of about 3,000,000 lbs. monthly, treating circa 2,200 tons of ore daily. The cost of copper produced under the old management steadily increased, and costs, 1907, under the new management, were abnormally high, owing to a variety of unavoidable factors. The practical rebuilding of the plant and reconstruction of methods throughout have cut costs greatly, and it was stated, late 1908, that the labor cost was only 34 cents per ton for smelting, the smelter having been increased 50% in capacity, with a 50% decrease in forces required. Dr. Ricketts hopes to produce copper at a cost of 10 cents per pound, for all charges, as against former costs of 13 to 15 cents per pound. It was stated, unofficially, August, 1908, that costs were only 7.5 cents per pound, at the mine, or about 9 cents per pound for finished copper at the seaboard, but probably these estimates were unduly low, as 10 cents is about as cheaply as the Cananea mines can be expected to produce the metal. The capacity of the mine and works is about 5,000,000 lbs. monthly, or 60,000,000 lbs. per year, which should be increased, in a comparatively short time, to 75,000,000 lbs., and eventually to 100,000,000 lbs., or even more, as the property is of vast size and tremendous possibilities.

Col. Wm. C. Greene, who developed the Cananea mines from petty old workings to one of the greatest copper producers of the world, was too ambitious, and had too many irons in the fire, his operations, in addition to directing the Cananea mines, including the management of the Greene Gold-Silver Co., Greene Gold Co., a railroad company, some of the largest ranches in Mexico, extensive timber tracts and lumber operations, and a variety of other

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work, entirely too much for one man to direct properly, and requiring infinitely *more* money than Col. Greene could command. Because of his marked loyalty to friends, and many other fine characteristics, there is much sympathy for Col. Greene, but the shareholders of his companies also are deserving of sympathy, for the bog into which they were led. The present company has an exceedingly strong and capable management, those at the head of the corporation, Messrs. Cole and Ryan, being among the best mining executives to be found anywhere, while Dr. Ricketts has no superior as a metallurgist, and the work that he has done at the Cananea mines shows him to be also a manager of exceptional executive ability. Much remains to be done before the Cananea mines can be considered on a thoroughly satisfactory basis, but so much has been accomplished already that there seems no reason to question the ability of the management to perform the balance of the work.

GREENE CONSOLIDATED COPPER CO. **MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: La Cananea, Arizpe, Sonora, Mex. W. D. Thornton, president; C. D. Fraser, vice-president; J. W. Allen, secretary and treasurer; preceding officers, P. L. Foster, Alfred Romer, E. C. Rice and S. E. Searle, directors.

Organized Sept. 16, 1899, under the laws of West Virginia, and capitalization increased, 1904 and 1906, to $10,000,000, shares $10 par. Has paid total dividends of $7,450,580 to end of 1908. Annual meeting, second Tuesday in March.

The bi-monthly dividends of 1906 turned out to run only 5 to the year, and even fewer in 1907, dividend No. 21 declared, February, 1907, having been the only one for the year.

The only asset of the Greene Consolidated Copper Co. is the total stock issue of the Cananea Consolidated Copper Co., S. A., and the mines and smelters formerly described under title of the Greene Consolidated are listed, in this volume, under title of the Greene Cananea Copper Co. The Cananea Consolidated Copper Co. is controlled by the Greene Cananea Copper Co., through the ownership, October, 1907, of 923,698 shares. At the annual meeting, October, 1907, there remained 936 individual shareholders in the Greene Consolidated Copper Co. A shareholders' protective committee was organized, circa June, 1908, with Samuel Untermeyer, Louis A. Newkirk and W. A. McDonald as counsel.

The annual meeting that should have been held October, 1907, was postponed until March 10, 1908, at the request of the Greene Cananea Copper Co., the owner of about 93% of the total stock issue. Fiscal year was then changed from former ending of July 31 to the calendar year.

None of the annual reports of the Greene Consolidated to shareholders were fair, as the statements juggled the holdings of the Cananea Consolidated and Greene Consolidated companies in a most bewildering manner. Until October, 1907, the preceding annual reports of the Greene Consolidated had included accounts of both the Greene Consolidated and the Cananea Consolidated, without any explanation of the differences. All inquiries by shareholders were headed off, at the annual meeting, Oct. 12, 1907, as every question of importance at the meeting was ruled to belong properly to the Cananea Consolidated Copper Co., which owns all of the real property of the Greene Consolidated, or else to the Greene Cananea Copper Co., which owns upwards of 93% of the stock of the Greene Consolidated Copper Co., and neither of these corporations being present, the shareholders who wanted to know were left inquiring.

The Greene Consolidated Copper Co. was supposed to own a 51% stock interest in the Sierra Madre Land & Lumber Co., but it transpired that this was a myth, as the stock always was owned by the Cananea Consolidated

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Copper Co., S. A.—or at least that is what the shareholders are told now. On June 17, 1907, the company was said to have secured control, some time previously, of 51% of the Sierra Madre stock, for $1,250,000, and to have disposed of the same, previous to that date, to Col. Wm. C. Greene and associates, for a consideration not then stated, but afterwards said to have been about $2,000,000, part in cash, with the remainder to be paid at intervals. Apparently practically the entire payment was in the form of notes, and the Greene Consolidated apparently was obliged to pay 3 notes, aggregating $450,000, in order to protect its interests, these notes having been given by Col. Greene for advances made by the Greene Consolidated, when he was at the head of the latter company, in addition to a cash payment, said to have been $200,000. The Sierra Madre defaulted the interest on its bonds, Dec. 1, 1907, and is practically bankrupt. Apparently the notes given in payment for the 51% of Sierra Madre stock sold for $2,000,000, which notes are in default, are secured by 75% of the lumber company's stock, which apparently is owned again by the Greene Consolidated, owing to default in payments, but the relations of the Cananea Consolidated, Greene Consolidated and Greene Cananea are so intricate and obscure that nobody but the principals can say exactly who is who, what is what, or which is which.

The Greene Consolidated issued a circular, July 17, 1906, stating that stockholders of the Cananea Central Copper Co. would take over, and pay for, in cash, to the treasury of the Greene Consolidated Copper Co., the 200,000 shares of Cananea Central stock held by the Greene Consolidated Copper Co., but it transpired later that this circular was untrue, though issued officially, as the Greene Consolidated never owned the 200,000 shares of Cananea Central, this stock, which was fully paid and non-assessable, belonging to the Cananea Consolidated Copper Co., S. A. This is a sample of the "square deal" given its shareholders by the old management of the Greene Consolidated.

The company's annual report, for year ending 1907, gave items of $2,000,000 received from the sale of 200,000 shares of Cananea Central, and $1,350,000 received from the sale of 76,500 shares of Sierra Madre Land & Lumber Co. stock. It was asserted, in the press, February, 1907, that on Feb. 15, 1907, the sum of $4,000,000 was transferred to the treasury of the Greene Consolidated Copper Co., in payment at par for 200,000 shares of the Cananea Central.

The statement given at the company's annual meeting, October, 1906, as of date July 31 preceding, reported a surplus of $18,678,119, was altogether misleading, as the actual surplus, by the company's own figures, could not be figured as more than $1,575,222, even by including an indefinite amount of metal on hand, and practically there was no surplus whatever, as the company never, from its birth until its practical reorganization, had enough money to operate to advantage, and was chronically hard up, even when paying dividends.

On July 31, 1907, according to the statement of Treasurer Fraser, the Greene Consolidated had quick assets of about $7,000,000, but Mr. Fraser evidently forgot himself, as these assets belonged to the Cananea Consolidated. This was another sample of the "square deal" given its shareholders by the old management of the Greene Consolidated Copper Co.

Apparently the actual "profits" of the Greene Consolidated for 17 months, ending Dec. 31, 1907, were $3,220,247, including income, from various stock and land sales, of $3,352,500, showing, by an honest accounting, an actual loss of $132,253, made in 17 months, during the most prosperous period that the copper market has known for many years. These figures show why the Greene Consolidated was reorganized.

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On Dec. 31, 1907, the company reported a balance of assets over liabilities of $5,961,059. It all lies in the bookkeeping, and a clever accountant can "prove" anything desired, by going over the figures of the Greene Consolidated Copper Co. As a matter of fact, the company's accounts were so badly kept, apparently partly through ignorance, and partly through intent to deceive, that all figures given out were highly misleading. The company never produced copper so cheaply as claimed, and it is doubtful whether the old management ever knew just what the copper was costing, or just where the company was drifting.

The Greene Consolidated Copper Co. was practically wiped out, Dec. 23, 1906, by the organization of the Greene Cananea Copper Co. The company was in such shape financially, at the height of a remarkable boom in the metal market, that is was about to collapse. Messrs. Thos. F. Cole and John D. Ryan, strong men in the copper industry, were called in to save the company from bankruptcy. They drove a hard bargain with the Greene Consolidated, as was their right, of course, and in forming the Greene Cananea Copper Co., put in their own holdings, which are of much less value than those of the Greene Consolidated, at a very high price. The reason for this was found in the desperate financial condition of the Greene Consolidated, which was practically bankrupt, although the owner of a magnificent property, while the Cole and Ryan property in the merger, though of much less value physically, was backed by strong interests, able to pull the property through. The shareholders of the Greene Consolidated have good reason for bitter feelings, but their grievances lie against the old management, rather than against Messrs. Cole and Ryan, who were called in as medical experts, when the patient was at his last gasp, and saved his life, but charged a tremendous fee for so doing. That the fee was very large cannot be controverted, but the shareholders of the Greene Consolidated are better off, after paying the fee, not directly in cash, but through dilution of their holdings, than they could have been had the property been allowed to go by the board, when the salvage would have been trifling, and very possibly nil.

The property formerly controlled by the Greene Consolidated Copper Co. was fully described in Vol. VII, and is described, in connection with adjoining property, under title of Greene Cananea Copper Co., in this volume. The present status of the Greene Consolidated is merely that of a footbridge between the Cananea Consolidated, which holds direct title to all the property, and the Greene Cananea Copper Co., which controls the property through ownership of shares. The shareholders who insist on occupying the bridge are apt to be jostled. They had better walk ashore. They have been defrauded, but the people guilty of defrauding them can make no restitution, and those who are financially capable of making restitution are not responsible, legally or morally, for the loss.

GREENE GOLD-SILVER CO. **MEXICO.**

Office: 1210-24 Broad St., New York, N. Y. Mine office: Concheño, Rayón, Chihuahua, Mex. Col. Wm. C. Greene, president; Mark L. Sperry, vice-president; Richard A. Jones, secretary; E. J. Gates, treasurer; Clarence C. Chase, general manager; W. E. Pomeroy, superintendent.

Organized Nov. 10, 1902, under laws of West Virginia, with capitalization $15,000,000, increased March, 1906, to $25,000,000, shares $10 par, in $3,000,000 preferred cumulative 8% stock and $22,000,000 common shares. Trust Company of America, New York, transfer agent. New York Trust Co., registrar.

Dividends on the preferred 8% stock were supposed to be payable annually, but the first dividend, of 40 cents per share, declared September, 1906, was not paid until February, 1907, while the third semi-annual dividend, due September, 1907, was passed. The company offered 100,000 shares of new

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stock February, 1907, which issue was underwritten and placed, and again offered 100,000 shares April, 1907, of which only about 10,000 shares were taken. Col. Greene gave stock of the par value of nearly $8,000,000, October, 1907, to relieve the company's treasury, but there being no market for this stock, the gift was of little or no value. The company's balance sheet of July 31, 1907, showed current assets of $2,858,641, and current liabilities of $3,035,338, but, as a matter of fact, the assets were practically all suppositious, there being about $82 cash on hand, with an enormous floating indebtedness.

The company secured an extensive concession, Apr. 6, 1907, for the development of water power, telephone lines, milling plants, etc., in the districts of Bravos, Guerrero, Rayón and Galeana, in the state of Chihuahua, which concessions would be valuable, if the company were in a position to take advantage of them. The company previously secured concessions for utilizing the water power of the Aros and Yaqui rivers, and for various public utilities.

In 1906 the company claimed to own, in fee, 340,000 acres of land, including a large number of mines, with a government concession to locate mines in an area of upwards of 4,000 square miles, in the states of Chihuahua and Sonora, Mexico. The company claimed, 1907, to own 114 mines, but apparently really owned only 4, out of the entire number, balance being held under option and bond. These 114 properties were claimed to have produced upwards of $120,000,000 in ore values, and had 12 different reduction plants on as many different properties.

The most important mine of the company, and, in fact, the only mine that really can be called such, is the Concheño, area 398 hectares, bought, circa 1907, for $1,250,000, of Corrigan, McKinney & Co. Unfortunately this property was bought on a margin, like most of the others, and the balance owed the vendors, said to be nearly $1,000,000, probably will bring about the loss of the property. The plant at Concheño includes a 60-stamp mill, of 175 tons daily capacity, and a 500-ton slime plant was begun, late 1907. Production of the Concheño, September, 1907, was said to have been valued at $52,000. Holdings in the Jesús Maria district, Ocampo, Chihuahua, included the Santa Juliana, Balvanera, Guadalupe, Rincón and Ronquillo groups. The Santa Juliana is claimed to have produced, according to government records, upwards of $100,000,000, from a vein up to 15′ in width, opened to 900′ depth. This mine was reopened by a double track drainage tunnel, but apparently did not prove a success.

The Balvanera group, area 61 hectares, adjoining the Santa Juliana, has a 40-ton mill and concentrator, and is claimed to have produced upwards of $3,000,000 worth of ore, and to have numerous buildings and various surface improvements. This group was said to include 44,000 acres of pine and oak timber lands.

The Guaynopita group, area 113 hectares, in Guaynopita Cañon, Chihuahua, near the Sonora line, includes properties said to have been worked by the Aztecs before the conquest of Mexico, the mines showing ores assaying well in gold, silver and copper. It was planned, at one time, to erect a 500-ton smelter on this property.

The Mulatos group at Mulatos, Sahuaripa, Sonora, Mexico, is owned by El Rey del Oro Mining Co., which is controlled, through stock ownership, by the Greene Gold-Silver Co. This group includes 6,400 acres of mineral lands and miscellaneous holdings giving a total of 24,700 acres. The mine was said to have produced upwards of $18,000,000, mainly in gold, from arastras and an old 60-ton mill on the property. The veins are claimed to range up to 500′ in width, which seems doubtful, and the company planned the installation of a 2,500-ton mill, which was a chimerical project.

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The Matulera group, at Ocampo, Chihuahua, is said to have a 15' vein, carrying values mainly in gold, and the company was said to have begun a 100-ton cyanide plant.

Miscellaneous properties are many in number, all apparently held on options, or otherwise than by outright ownership, these including the following groups: Santa Brigida, in Chihuahua, area 95 hectares; Cerro Boluda group, in Chihuahua, area 152 hectares; Pinos Altos group, in Chihuahua, area 58 hectares; El Trigo group, in Sonora, area 16 hectares; La Trinidad group, in Sonora, area 130 hectares; El Colón mine, 32 hectares; San Ramón group, in Chihuahua, area 23 hectares; Mina Grande group, in Sonora, area 25 hectares; Cueva Santa mine, area 46 hectares; La Lamosa group, area 44 hectares; Belen group, in Chihuahua, area 70 hectares; El Refugio group, in Chihuahua, area 87 hectares; Santa Eduviges group, in Chihuahua, area 55 hectares.

The lands of the company, or rather the lands once supposed to be held by the company, were estimated, by Col. Greene, to carry 3,500,000,000' of standing timber, valued at $10 per thousand. The company also claimed to have coal properties at Pilares, and iron mines at Cedros. The coal mines were estimated to carry 200,000,000 tons of coal, and the iron mines were supposed to be comparable to the Mesaba iron range of Minnesota.

The Guaymas smelter, supposed to be owned by the Greene Gold-Silver Co., actually is owned by the Mexican-American Smelting Co.

The Federal smelter, at El Paso, located on a 40-acre tract, is said to have been bought by the Greene Gold-Silver Co. for $54,500, subject to a vendor's lien of $42,000, having been bought "on a shoestring," like all the other properties of the company.

In July, 1907, the company employed about 1,600 men at its various mines and works, and in August, 1907, reached a daily productive capacity of nearly 500 tons, but late in that month suspended operations, having reached the end of its resources. President Díaz, of Mexico, who has been a consistent friend of Col. Greene, is said to have loaned $250,000, personally, to help the company along, but this was merely a drop in the bucket, and complete collapse was inevitable, by reason of the utterly fallacious plan of operations followed. It is difficult to understand how Col. Greene, a man of undoubted ability in many fields, should have allowed his mania for buying mines to have mastered him so completely as to have conducted the company's affairs along such insane lines as were followed. Nothing was bought outright, if it could be secured on a part payment, and, in consequence, the company, at the first financial pinch, fell to pieces like a house of cards. In fact, it is doubtful if anyone living, except Col. Greene himself, and possibly not even he, knows exactly what the company owns. It is safe to infer, however, that the company holds direct title to very little.

Shortly before the collapse, a stockholder's committee, including 2 directors, endeavored to raise $25,000, through voluntary assessments, to make an examination of the company's property and business, but secured only $10,000, which was refunded. The directors are making enough noise at present, but the time for them to have spoken was before the smash. Had they taken some real part in managing the company's affairs, instead of permitting Col. Greene to be the entire direction, the company might not have found itself in its present lamentable situation.

The Greene Gold-Silver Co. holds title to its properties through a Mexican incorporation, and supposedly controls a number of subsidiary corporations as well. Stock in the Mexican company is said to have been hypothecated, which, if true, leaves the American company without other assets than its office furniture. The property is said to be in danger of being sold at auction, piecemeal, to satisfy loans to Mexican bankers. Gov. Enrique Creel, of

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Chihuahua, a thoroughly capable and trustworthy man, is acting as conservator. The Greene Gold-Silver Co. was a one-man enterprise, and the one man broke down. The company bought entirely too many properties, and wasted its funds on further purchases, instead of securing those already held under partial payments. Col. Greene has not profited personally, and is said to have broken down completely, apparently from nervous prostration, but the responsibility for the complete collapse of the company rests solely with him. The only possible chance for salvage lies in the reorganization of the company, in which case the old shareholders will be nearly or quite wiped out, but small as may be the salvage, there will be none without a drastic reorganization, if capital can be induced to go into the enterprise on any terms.

GREEN HOPE MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Guernsey, Laramie Co., Wyo. Described Vol. VI.

GREENHORN COPPER MINING CO. **COLORADO.**

Mine office: Cañon City, Frémont Co., Colo. Mrs. Wm. E. Johnson, administratrix, Metropole Hotel, Denver, Colo., principal shareholder, and practically manager. Lands, 12 miles from Cañon City, show low-grade copper ores, slightly developed. Idle and apparently moribund.

GREENLEAF MINE. **MONTANA.**

Owned by Boston & Montana Consolidated Copper & Silver Mining Co.

GREEN MONSTER MINE. **NEVADA.**

Office: care of Mrs. Phœbe Hearst, owner, San Francisco, Cal. Letter returned unclaimed from former mine office, Sandy, Lincoln Co., Nev. Mine is opened by a 325′ two-compartment vertical shaft, showing carbonate and sulphide ores, latter including argentiferous galena and chalcopyrite. Mine has been claimed to show about 5,000 tons of $40 ore. Idle some years.

GREEN MOUNTAIN COPPER CO. **CALIFORNIA.**

Mine office: Raymond, Madera Co., Cal. John V. Bohn, superintendent. Is controlled, through stock ownership, by American Smelters Securities Co. Has steam power. Presumably idle.

GREEN MOUNTAIN COPPER CO. **NEW MEXICO.**

Dead. Formerly at Rinconada, Rio Arriba Co., N. M. Fully described Vol. VII.

GREEN MOUNTAIN COPPER MINING CO. **WYOMING.**

Dead. Property sold, circa 1904, to Saginaw Valley Copper Mining Co. Formerly at Encampment, Carbon Co., Wyo.

GREEN MOUNTAIN MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

GREEN MOUNTAIN MINING & MILLING CO. **COLORADO.**

Office: 519 Frick Bldg., Pittsburg, Pa. Mine office: Silverton, San Juan Co., Colo. Wm. P. De Armit, president and receiver; S. J. Crawford, secretary; E. W. Walter, general manager. Organized under laws of Colorado, with capitalization $3,000,000. Lands, 19 claims, area circa 200 acres, in Cunningham Gulch, 7 miles from Silverton, opened by tunnels of 600′ and 800′, with about 4,000′ of workings. Ores are auriferous and argentiferous iron-copper-lead sulphides, with quartz gangue, averaging about $12 per ton in value. Has steam power and 12-drill Rand air-compressor. Has a 200-ton concentrator, connected with the mine by a 4,000′ aerial tram. Went into receiver's hands November, 1907.

GREENWATER ARCTURUS COPPER MINING CO. **CALIFORNIA.**

Office: care of Hon. T. L. Oddie, Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. C. M. Oddie, vice-president; H. H. Cookston, secretary and treasurer; preceding officers, F. A. Keith and W. D. Blackmore, directors.

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Organized, 1906, with capitalization $3,000,000. Lands, 12 claims, 8 fractional, in the Willow Creek section south of the Greenwater district. Idle.

GREENWATER BIMETALLIC COPPER MINING CO. **CALIFORNIA.**

Office: care of E. C. Hughes, president, San Francisco, Cal. Mine office: Greenwater, Inyo Co., Cal. Sig. Weil, vice-president; A. K. Durbro, secretary; H. Zadig, treasurer; preceding officers, Marius Duvall, W. D. Tobey and W. E. F. Beal, directors. Organized, 1906, under laws of Arizona, with capitalization $1,000,000. Lands, 6 claims, adjoining the Furnace Creek Copper Co., showing a gossan up to 40′ wide, giving assays of 3.6 to 37.9% copper. Idle.

GREENWATER BLACK JACK COPPER MINING CO. **CALIFORNIA.**

Office: care of Dr. T. E. Enloe, secretary, Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. H. T. Bragdon, president; N. H. Truett, vice-president; J. R. Dortch, treasurer; preceding officers and H. F. Bartine, directors. Lands, 4 claims, near the Greenwater-Death Valley Mining & Smelting Co., said to show argentiferous lead ore and copper ore assaying up to 20% copper, 8 oz. silver and $3.25 gold per ton. Idle.

GREENWATER BLACK OXIDE COPPER MINING CO. **CALIFORNIA.**

Office: 75 Sutter St., San Francisco, Cal. Mine office: Greenwater, Inyo Co., Cal. Jas. Gleason, president; J. C. McBride, secretary; preceding officers, T. C. Risch and H. P. Mason, directors; Geo. Jones, superintendent. Lands, 9 claims, near the Furnace Creek Copper Co. Idle.

GREENWATER & BOSTON COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Apparently merely a stock-jobbing enterprise. Idle.

GREENWATER CALIFORNIA COPPER CO. **CALIFORNIA.**

Office: care of Harry W. Woods, Colorado Springs, Colo. Mine office: Greenwater, Inyo Co., Cal. F. M. Woods, president; L. R. Myers, vice-president; C. S. Buck, secretary and treasurer. Idle.

GREENWATER-CALUMET COPPER CO. **CALIFORNIA.**

Office: 8 Butler Bldg., Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. B. L. Smith, president; R. Chester Turner, vice-president; H. W. Clarke, secretary; R. C. Moore, treasurer; preceding officers, Jas. N. Mayhew, Zeb. Kendall and W. Brown, directors. Organized Aug. 27, 1906, under laws of Nevada, with capitalization $1,500,000, shares $1 par. Lands, 21 claims, area circa 360 acres, near the Furnace Creek Extension Copper Co., showing a gossan up to 200′ in claimed width, giving surface ores assaying up to 16.7% copper, slightly developed by tunnel. Idle, but plans driving a 500′ crosscut tunnel, in 1909.

GREENWATER CENTRAL COPPER CO. **CALIFORNIA.**

Office, 905 Calvert Bldg., Baltimore, Md. Mine office: Greenwater, Inyo Co., Cal. Oscar A. Turner, president; Hon. Buchanan Schley, vice-president; Addison E. Milliken, secretary; Henry B. Gilpin, treasurer; Henry G. Merry, general manager. Lands, on Sheep Creek, show a ledge nearly 100′ wide, carrying a little carbonate copper ore.

GREENWATER CONSOLIDATED MINING CO. **CALIFORNIA.**

Office: 131 East 53d St., Los Angeles, Cal. Mine office: Greenwater, Inyo Co., Cal. Way C. West, president and treasurer; D. D. Bickford, vice-president; B. X. Dawson, secretary. Organized, 1906, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 10 claims, area 200 acres, supposedly located somewhere in the Greenwater district, on which no development has been secured, also 4 claims at Brightwood, San Bernardino county, California, presumably undeveloped also. Formerly held 12 claims at Cima, San Bernardino county, which were transferred to the Arcalvada Mining & Milling Co. Does flamboyant advertising, but apparently no work. Is regarded with suspicion.

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GREENWATER COPPER CO. **CALIFORNIA.**

Office: care of L. G. Newby, secretary and treasurer, Pasadena, Cal. Mine office: Greenwater, Inyo Co., Cal. Z. H. Lowman, president; J. Q. Leslie, vice-president and superintendent; L. G. Newby, secretary and treasurer. Organized circa November, 1906, under laws of Arizona, with capitalization $1,000,000. Lands, 41 claims, in 7 groups, principal group, known as the Black Bird, showing ores giving assays of 3 to 12% copper. Idle.

GREENWATER COPPER HELMET CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Idle.

GREENWATER COPPER MINES & SMELTER CO. **CALIFORNIA.**

Office: care of Donald B. Gillis, manager, Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. Chas. R. Miller, president; M. R. Ward, vice-president; preceding officers, J. W. Brock, Chas. M. Schwab, W. H. Drayton, L. H. Dessar, Malcolm McDonald, J. E. Brown and Frank Keith, directors. Organized Dec. 12, 1906, under laws of Delaware, with capitalization $25,000,000, shares $5 par. Is a securities holding corporation only. Early 1908 owned 95% of capital stock of the Greenwater & Death Valley Copper Co., 94% of the capital stock of the United Greenwater Copper Co., and entire stock issues, except founder's shares, of the Governor Greenwater Copper Co., El Capitan Copper Mining Co., Ironclad Greenwater Copper Co. and Eagle Mountain Water Co. Owns the Davis ranch and water rights through the Eagle Mountain Water Co. Development work of subsidiary companies, 1907, was 4,140'.

GREENWATER COPPER MINING CO. **CALIFORNIA.**

Office and mine: Greenwater, Inyo Co., Cal. Arthur Kunze, president; Malcolm Smith, vice-president; Tom J. Gardner, secretary; H. B. Gee, treasurer; preceding officers, John Salisbury and J. S. Wandell, directors. Organized under laws of South Dakota. Lands, circa 3 miles south of Greenwater, are claimed to give promising surface indications. Idle.

GREENWATER COPPER MINING CO. **CALIFORNIA.**

Office: care of Isaac T. Stoddard, Phoenix, Ariz. Mine office: Greenwater, Inyo Co., Cal. Organized 1906, under laws of Arizona, with capitalization $5,000,000. Apparently no work done.

GREENWATER COPPER MINING SYNDICATE. **CALIFORNIA.**

Office: care of Wm. T. Virgin, treasurer, Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. L. S. Finnegan, president; Fred A. Hussman, vice-president; Wells Morton, secretary. Organized 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 5 claims, known as the Hussman group. Idle.

GREENWATER COPPER QUEEN MINING CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Idle.

GREENWATER COPPER RANGE MINING CO. **CALIFORNIA.**

Office: care of Fred H. Begole, Pasadena, Cal. Mine office: Greenwater, Inyo Co., Cal. T. B. Rickey, president; W. H. Wells, vice-president; Frank H. Lathrap, secretary; J. L. Lindsay, treasurer; Capt. Thos. Hooper, superintendent; preceding officers, J. R. Elgin and E. A. Snowman, directors. Capitalization $2,000,000. Lands, 220 acres, near the Furnace Creek Extension, said to have a good surface showing. Presumably idle.

GREENWATER & DEATH VALLEY COPPER CO. **CALIFORNIA.**

Office: care of Donald B. Gillis, vice-president, Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. Frank Keith, president; W. L. Carden, secretary; Chas. E. Knox, treasurer; preceding officers, M. R. Ward, J. Ross Clark, T. L. Oddie, Malcolm McDonald and C. B. Zabriskie, directors. Organized 1906, under laws of South Dakota, with capitalization $3,000,000, shares $1 par. Is controlled, through ownership of 95% of stock, by Greenwater

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Copper Mines & Smelters Co. Lands, 21 claims, 5 fractional, area 400 acres, including first or second locations in the Greenwater district, having ore bodies claimed to range 8′ to 200′ in width, giving assays of 10 to 25% copper, but the wider ore bodies evidently are below commercial grade. Has 5 shafts, Copper Glance No. 2, of 125′ depth, showing a vein of 6′ to 10′ width, having stains of malachite and chrysocolla. Main shaft, 700′, planned to be sunk to 1,600′, has crosscuts on the 400′ and 500′ levels. Has four 60-h. p. gasoline hoists and a sawmill. Was systematically touted, and vastly overestimated, during the Greenwater boom, but is one of the few properties of promise in the district. Was developing steadily, with circa 40 men, at last accounts.

GREENWATER DEATH VALLEY COPPER MINING CO. **CALIFORNIA.**

Office: care of C. M. Sumner Investment Securities Co., Denver, Colo. Mine office: Greenwater, Inyo Co., Cal. Lands supposed to be 2 claims, 4 miles north of Greenwater. Is regarded with much suspicion, and presumably is a mere stock-jobbing enterprise, the title alone being an obvious attempt to play upon the name of the Greenwater & Death Valley Copper Co.

GREENWATER & DEATH VALLEY EXTENSION CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Malcolm Smith, superintendent. Idle.

GREENWATER EL CAPITAN COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Is controlled, through ownership of entire stock issue, except founder's shares, by Greenwater Copper Mines & Smelters Co.

GREENWATER ELY CONSOLIDATED COPPER CO. **CALIFORNIA & NEVADA.**

Letters returned unclaimed from former office, 312 O. F. Johnson Bldg., Los Angeles, Cal., and from former mine office, Ely, White Pine Co., Nev. S. M. Mingus, president; L. Mingus, vice-president; S. F. Crandall, secretary; A. L. Markwell, treasurer. Organized under laws of Arizona, circa November, 1906, with capitalization $1,000,000, shares $1 par. Lands, 3 claims at Greenwater and 4 at Ely, White Pine Co., Nev. No development of importance has been secured at either point. Idle and moribund.

GREENWATER-ETNA COPPER CO. **CALIFORNIA.**

Office: 1215-15 William St., New York, N. Y. Mine office: Greenwater, Inyo Co., Cal. Organized circa November, 1906, under laws of Arizona, with capitalization $200,000, by John V. Lesher, W. B. Bohrbach and Geo. E. Deppen. Idle.

GREENWATER FURNACE CREEK COPPER CO. **CALIFORNIA.**

Letter returned unclaimed from former office, 219 Citizens National Bank Bldg., Los Angeles, Cal. Mine office: Greenwater, Inyo Co., Cal. A. H. Busch, president; Hon. Jas. Lacklan, vice-president; S. E. Cannell, secretary and treasurer; preceding officers, Hon. Geo. S. Nixon, H. H. Clark, Wm. Bayley and H. J. Woollacott, directors; Maj. J. W. A. Off, general manager. Organized August, 1906, under laws or Arizona, with capitalization $1,500,000, shares $1 par. Lands, 21 claims, 6 fractional, area 375 acres, in the eastern part of the Greenwater district, reported by company to show fissure veins in limestone and contact veins between limestone, ore bodies obviously being remarkable both as to size, shape and occurrence. Company claims 20 ore bodies on its lands, with average width of 200′ and average length of 3,500′, which would fill the company's entire holding with solid copper veins, with exception of nineteen 30′ strips of barren limestone between the 20 veins. Ores are reported by the company as melaconite, azurite, chalcocite and occasional chrysocolla, averaging 18 to 36% copper tenor. Taking the lowest percentage of ore reported by the company, and the company's own figures as to size of its ore bodies, the first 100′ in depth on this wonderful property would carry upwards

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of 20,000,000 tons of refined copper, worth, at 13 cents per pound, the comparatively trifling sum of $5,200,000,000. Company was promoted by the Off-McGarvin-Brown Co., which advertised, October, 1906, that the firm would not get into a mining proposition where a losing was possible. The fact that a major is manager, and a United States senator is vice-president, will prove a great consolation to the shareholders. It is indeed lamentable to note that this magnificent mine, which carries, according to the company's own statements, more copper than all the developed copper mines of the world, is idle, and present office address a mystery.

GREENWATER IBEX COPPER & GOLD MINING CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Organized November, 1906, under laws of Arizona, with capitalization $1,000,000, by W. W. Jones and F. Ainsworth.

GREENWATER-MOHAWK MINES CO. **CALIFORNIA.**

Office: care of Ernest Kennedy & Co., Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. Hon. A. E. Spriggs, president. Organized 1906, with capitalization $1,250,000, shares $1 par. Lands, 5 claims, considered fairly well located. Idle and apparently promoted mainly for stock-jobbing purposes, notwithstanding the president being a former governor of Montana.

GREENWATER PAY COPPER CO. **CALIFORNIA.**

Office: care of D. C. Aldridge & Co., fiscal agents, Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. T. F. Bonneau, president; H. H. Hunter, vice-president and general manager; L. T. Kibler, secretary and treasurer; preceding officers, D. C. Aldridge and T. S. Jacobs, directors. Organized 1906, with capitalization $1,500,000, shares $5 par. Lands, 5 claims. Idle.

GREENWATER POLARIS COPPER CO. **CALIFORNIA.**

Office: Salt Lake City, Utah. Mine office: Greenwater, Inyo Co., Cal. Organized circa December, 1906, by A. W. Smith and N. O. Nailor, on lands said to carry a 25′ ledge giving assays of 4.5% copper, 0.3 oz. silver and 83 cents gold per ton. Idle.

GREENWATER PROSPECTORS EXPLORATION CO. **CALIFORNIA.**

Dead. Was organized early 1907, under laws of South Dakota, with capitalization $250,000, shares $1 par, and was merged, July, 1907, in Copper Mines & Smelters Corporation of America. Company floated the Green Dragon. Officers were E. H. Kramer, president; F. Macpherson, vice-president; E. W. Ewing, secretary and treasurer. Formerly at Greenwater, Inyo Co., Cal.

GREENWATER RED BOY COPPER CO. **CALIFORNIA.**

Office: P. O. Box 227, Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. Thos. B. Rickey, president; H. T. Bragdon, vice-president; Robt. B. Todd, secretary; J. L. Lindsey, treasurer; preceding officers and A. D. Myers, directors; J. R. Fletcher, general manager. Organized 1906, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Is a twin of the Greenwater-Saratoga Copper Co. Lands, 5 claims, patented, area 100 acres, adjoining the Greenwater & Death Valley Copper Mining Co. on the west, showing 3 ledges, with gossan cappings giving assays up to 28% copper and $66 gold per ton, opened by a 400′ crosscut tunnel and a 600′ shaft. Has a 50-h. p. steam plant. Idle.

GREENWATER-SARATOGA COPPER CO. **CALIFORNIA.**

Office: P. O. Box 227, Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. Thos. B. Rickey, president; H. T. Bragdon, vice-president; Robt. B. Todd, secretary; J. L. Lindsey, treasurer; preceding officers and M. J. Monnette, directors; J. R. Fletcher, general manager. Organized 1906, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, partly patented, area 100 acres, adjoining the Greenwater Red Boy, of which this

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company is a twin, opened by a 300′ crosscut tunnel and a 550′ shaft. Has a 50-h. p. hoist. Idle, but plans sinking and crosscutting, in 1909.

GREENWATER SUNSET COPPER CO. **CALIFORNIA.**

Office: 1215-15 William St., New York, N. Y. Mine office: Greenwater, Inyo Co., Cal. Organized November, 1906, presumably under laws of Arizona, by P. D. Pike, H. M. Stevens and Wm. M. Mears. Idle and apparently moribund.

GREENWATER SUPERIOR COPPER MINING CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, 4 full and 2 fractional claims, near the Greenwater & Death Valley. Idle.

GREENWATER VICTOR COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Organized under laws of New Jersey, with capitalization $125,000, by Scott Newcomer and F. L. Rankin. Apparently no work done.

GREENWATER-VINDICATOR COPPER CO. **CALIFORNIA.**

Office and mine: Greenwater, Inyo Co., Cal. Arthur Kunze, president; J. F. A. Strong, vice-president; W. E. Johnson, treasurer; Tom J. Gardner, secretary; preceding officers, Ewald Kunze and Jas. B. Bailey, directors. Organized Jan. 25, 1907, under laws of South Dakota, with capitalization $500,000, shares $1 par. Lands, 17 claims, 6 miles east of Greenwater. Idle.

GREENWATER WILLOW CREEK COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Geo. A. Bartlett, president; Richard Sutro, first vice-president; Henry E. Epstein, second vice-president; R. C. Moore, treasurer; G. A. Patteson, Jr., secretary; preceding officers, Alonzo Tripp and W. A. Shockly, directors. Organized November, 1906, under laws of Nevada. Idle.

GREENWOOD-PHOENIX TUNNEL CO., LTD. **BRITISH COLUMBIA.**

Mine office: Phoenix, Boundary district, B. C. Richard Armstrong, general manager. Organized 1908, with capitalization $5,000,000. Company plans driving a 3½-mile tunnel from Greenwood to Phoenix, at an estimated cost of $2,000,000. Plan is considered of doubtful feasibility.

GREENWOOD SMELTER. **BRITISH COLUMBIA.**

Owned by British Columbia Copper Co.

FRANCISCO GREVE G. **CHILE.**

Mine office: Combarbalá, Coquimbo, Chile. Property is a smelter, known as El Durazno, 130 kilometers from Los Vilos railroad station, having a small reverberatory furnace, producing Chile bars of about 97% average copper tenor. Production, 1903, was 254,477 lbs. fine copper.

GREYHOUND MINING & MILLING CO., LTD. **IDAHO.**

Mine office: Ketchum, Blaine Co., Idaho. S. M. Smith, superintendent. Has auriferous copper ore, with steam power, and is said to have a 50-ton smelter.

GREY ROCK MINES. **MONTANA.**

The East and West Grey Rock mines are owned by the Butte & Boston Consolidated Mining Co.

GREYTON COPPER MINES CO. **COLORADO.**

Office: care of Thos. Potter, secretary, Denver, Colo. Letter returned unclaimed from former mine office, Pearl, Larimer Co., Colo. Organized January, 1902, with capitalization $75,000, shares 5 cents par. W. H. Kistler, president. Lands, 12 claims, near the Colorado and Wyoming line, opened by sundry pits and shallow shafts, deepest 70′, showing cuprite and copper sulphides. Idle several years and apparently moribund.

GRIBBELL ISLAND COPPER CO. **BRITISH COLUMBIA.**

Office: Fairhaven, Wash. Mine office: Gribbell Island, Skeena River

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division, Cassiar district, B. C. Lands, 2 miles northwest of Canadian American Copper Mining Co., have several pits, open-cuts and short tunnels, longest tunnel 354′, in a fissure zone in syenite, showing massive bornite with occasional chalcopyrite.

GRINDALL MINING & SMELTING CO. ALASKA.

Office: 200 Epler Blk., Seattle, Wash. Letter returned unclaimed from former mine office, Ketchikan, Alaska. T. J. Sweaney, superintendent, at last accounts. Lands, 21 claims, on the Kasaan Peninsula, showing low grade ore. Property said to have been leased, 1905, to Alaska Improvement Co.

GROWLER COPPER CO. ARIZONA.

Office: 14 Kilby St., Boston, Mass. Mine office: Gila Bend, Maricopa Co., Ariz. Geo. H. Morrill, Jr., president; Herbert Moseley, secretary and treasurer; M. W. Turner, general superintendent. Organized March 19, 1904, under laws of Maine, with capitalization $2,000,000, shares $5 par. Lands, 28 claims, unpatented, area 560 acres, in 2 groups, also a 25-acre millsite, lying circa 60 miles south of Gila Bend, nearest railway station. The Copper Hill group, 18 claims, has a contact ledge up to 300′ in width, with gossan traceable about 1 mile, and is opened by a 75′ tunnel and by shafts of 85′, 200′ and 360′, with about a quarter-mile of workings, showing oxidized ores, silicates and a little chalcocite, near the contact between limestone with quartz and diabase. Has steam power, and has shipped a little ore to Douglas. Property considered promising, though handicapped by inadequate transportation facilities.

GUILLERMO GRUNDY. PERÚ.

Office and mine: Musquituni, Lampa, Puno, Perú. Mine has argentiferous copper ores. Presumably idle.

FUNDICIÓN METALURGICA DE GUADALAJARA, S. A. MEXICO.

Office and works: Guadalajara, Jalisco, Mex. Diego Moreno, president; Justo Fernandez del Valle, vice-president; Alberto Zunigo, treasurer; Francisco Gonzalez y Arias, secretary; Luis Altorra, comissario; José S. Díaz, general manager. Capitalization 300,000 pesos. Works include a 100-ton lead stack, and a 100-ton copper matting furnace may be added.

MINA GUADALUPANA. MEXICO.

Mine office: Topia, Tamazula, Durango, Mex. Felix Briones, owner. Has copper-silver ores. Presumably idle.

GUADALUPAÑO MINING CO. MEXICO.

Dead. Formerly at Torres, Hermosillo, Sonora, Mex.

COMPAÑIA MINERA DE LA GUADALUPE. MEXICO.

Mine office: Santa Engracia, Cuidad Victoria, Tamaulipas, Mex. Organized 1907, to open an antigua mine, La Guadalupe, said to have been worked at a profit some years ago. Property, 14 miles from nearest railroad, is said to show ore averaging 30% copper, which is much too high.

MINA GUADALUPE. MEXICO.

Office: care of Vicente Visconti, Santa Rosalia, Chihuahua, Mex. Mine office: Maturana, Hidalgo, Chihuahua, Mex. Property is said to show circa 5,000 tons of copper ore. Idle.

MINA GUADALUPE. MEXICO.

Mine office: Muleros, Nombre de Dios, Durango, Mex. José B. Nava, owner; R. Romo, manager. Development is by open-cut, on a considerable body of copper ore. Presumably idle.

MINA GUADALUPE. MEXICO.

Office and mine: care of John Dee, owner, Autlán, Jalisco, Mex. Lands, 14 pertenencias, 8 miles west of Autlán, show a "manto" or blanket vein, with hematite capping, underlaid by carbonate copper ores, slightly developed. Apparently could be worked open-cast to advantage. Idle.

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GUANACEVÍ TUNNEL CO. **MEXICO.**

Office: care of L. Diamond & Co., Old South Bldg., Boston, Mass. Mine office: Guanacevi, Santiago Papasquiaro, Durango, Mex. Hilario Losoya, president. Lands, said to be circa 8,900 acres, well watered and timbered, and claimed to possess large bodies of gold and copper ore. Advertisements of Diamond in floating this stock contained gross exaggerations, and the company is not regarded favorably.

GUARDIAN COPPER MINING CO. **MONTANA.**

Dead. Lands sold, 1906, to Butte Coalition Mining Co. Formerly at Butte, Silver Bow Co., Mont.

FUNDICIÓN GUAYACÁN. **CHILE.**

Owned by Sociedad Chilena de Fundiciones.

GUAYNOPA DEVELOPMENT CO. **MEXICO.**

Letter returned unclaimed from former office, Trust Bldg., El Paso, Tex. Mine office: Temosáchic, Guerrero, Chihuahua, Mex. John A. Rice, general manager; Howard Viedel, superintendent. Property is an antigua, known as La Guaynopa, said to carry highly argentiferous and slightly auriferous copper ore.

GUAYNOPA SMELTING & REDUCTION CO. **MEXICO.**

Dead. Merged, 1904, in International Consolidated Smelting & Mining Co. Formerly at Temosáchic, Guerrero, Chihuahua, Mex.

GUAYNOPITA COPPER CO. **MEXICO.**

Office: 24 Broad St., New York, N. Y. Mine office: Temosáchic, Guerrero, Chihuahua, Mex. Col. Wm. C. Greene, president. Organized under laws of West Virginia, with capitalization $5,000,000, shares $10 par. Is controlled, through ownership of entire stock issue, by Greene Gold-Silver Co. Lands, circa 5,700 acres.

GUERRERO COPPER CO. **MEXICO.**

Office: care of Nathan Bickford, president, Washington, D. C. Herbert Warne, superintendent. Lands are 5 antiguas, circa 8 miles south of the Mexican Central Railroad bridge crossing the Balsas river, in the state of Guerrero, Mexico, showing ore assaying 13% copper and 40 grams gold per metric ton.

GUERRERO DEVELOPMENT CO. **MEXICO.**

Dead. Formerly at Chilpancingo, Bravos, Guerrero, Mex. Described Vol. VI.

GUGGENHEIM EXPLORATION CO. **U. S. A. & MEXICO.**

Office: 621-71 Broadway, New York, N. Y. General mine office: Tiburció 27, Mexico, D. F. Daniel Guggenheim, president; Morris Guggenheim, vice-president; Isaac Guggenheim, treasurer; John Hays Hammond, general manager; preceding officers, S. R. Guggenheim, M. Robert Guggenheim, H. P. Whitney and Geo. S. Field, directors; Chas. K. Lipman, secretary; W. C. Potter, general superintendent.

Organized June, 1899, under laws of New Jersey, with capitalization $17,000,000, increased, July, 1906, to $22,000,000, shares $100 par. Issued, $20,335,100. Regular dividend rate is 2½% quarterly. The American Smelters Securities Co. supposedly was organized to succeed the Guggenheim Exploration Co., but did not. It is said that about 80% of the stock is owned by the Guggenheim brothers. To all practical intents and purposes the company is controlled by the American Smelting & Refining Co., and it is difficult to differentiate between the holdings of the Guggenheim Exploration Co. and the American Smelters Securities Co. The Guggenheim Exploration Co. holds $13,860,000 class A stock, $1,800,000 class C stock and a large amount of common stock in the American Smelters Securities Co.

Assets of the company include $912,803 stock in the Cumberland-Ely Copper Co.; $1,671,589 stock in the Nevada Consolidated Copper Co.; $1,650,000

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bonds of Nevada Northern Railroad Co., and $4,632,283 stock in the Utah Copper Co. Company also controlled the Yukon Gold Co., which, in 1908, was foisted on a credulous public, with the assistance of Thos. W. Lawson, a partnership which has greatly injured the standing of the Guggenheims in the estimation of the investing public. The company also is supposed to have a 40% interest in the Kennicott Mines Co., and to control the Dairy Farm mine in California, the Minas Tepezalanes y Anexas at Tepezalá, Aguascalientes, Mex., and the Minas Gibosa y Anexas, at Jiménez, Chihuahua, Mex., though the latter are described under title of American Smelters Securities Co.

Company's balance sheet, as of date Dec. 31, 1907, showed assets of $39,879,726, including $541,390 cash and $4,449,976 bills and accounts receivable, with $4,153,510 bills and accounts payable, and a surplus of $13,744,252. The company is said to have expended about $27,000,000 in the purchase of properties within the past few years.

GUGGENHEIM-GREENWATER COPPER CO. CALIFORNIA & NEVADA.

Mine office: Ely, White Pine Co., Nev. S. M. Mingus, superintendent. Organized 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands include the Piñon group, circa 5 miles northwest of Ely, having a shallow 1-compartment shaft, also 3 groups at the mouth of Willow Creek, 35 miles southeast of Greenwater, Inyo Co., Cal. Advertising is flamboyant, and apparently company is merely a stock-jobbing enterprise.

GULF CREEK, LTD. AUSTRALIA.

Dead. Voluntarily liquidated, November, 1904. Formerly at Barraba, N. S. W., Australia.

GULF CREEK MINE. AUSTRALIA.

Mine office: Barraba, N. S. W., Australia. Jefferson Bros., operators. Lands, 250 acres, in the Gulf Creek district of the Barraba division, 350 miles north of Sydney and 72 miles from a railroad. Ore bodies include a 9′ vein of 7% sulphide ore, also a 5% lense of sulphide ore 25′ wide and 350′ long. Ore is very heating, being rich in sulphur. Country rocks are indurated clay-slates, of Carboniferous age, with dikes of serpentine. Has steam power and a 300-ton smelter. Production, 1901, was 560 long tons fine copper, from 9,400 tons of ore smelted, and in 1906 was circa 70 long tons fine copper, made from 2,400 long tons ore smelted. Employs 10 men, and is being managed prudently by practical men, with fair results.

GUM TREE CONSOLIDATED MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, superintendent. Has auriferous and argentiferous copper and lead ores, with steam power, employing about 20 men at last accounts.

GUM TREE GOLD MINING & MILLING CO. COLORADO.

Dead. Succeeded by Gum Tree Consolidated Mining & Milling Co. Formerly at Idaho Springs, Clear Creek Co., Colo.

GUNN'S PEAK COPPER MINING CO. WASHINGTON.

Office: 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Is said to be controlled by the Index-Bornite Copper Mining Co. Lands, 4 claims, showing 3 veins, widest said to be 25′, carrying chalcopyrite and bornite, said to give average assays of 11% copper and circa 2 oz. silver per ton. Has tunnels of 125′ and 800′.

GWIN MINE DEVELOPMENT CO. CALIFORNIA.

Office: 1208 Claus Spreckels Bldg., San Francisco, Cal. Mine office: Gwin Mine, Calaveras Co., Cal. F. F. Thomas, general manager; David McClure, superintendent. Organized March 26, 1904, under laws of California, with capitalization $1,000,000, shares $10 par. Is said to have paid dividends of $456,500 to Jan. 1, 1906, and levied a $20,000 assessment, 1907. Property

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is a gold mine, having steam and water power and a 100-stamp mill, but lands carry a large, undeveloped body of low grade copper ore.

GWYNANT COPPER MINES CO., LTD.

Dead. Dissolved, January, 1905. Apparently held no lands.

GYMPIE COPPER MINES, LTD. **AUSTRALIA.**

Dead. Liquidated voluntarily, May, 1904. Formerly at Gallangowan, Fitzroy Co., Queensland, Australia.

GYPSY BLAIR MINING CO. **UTAH.**

Dead. Lands sold, 1905, to Kennebec Mining Co. Formerly at Brighton, Salt Lake Co., Utah.

HACHITA COPPER DEVELOPMENT CO. **NEW MEXICO.**

Office: P. O. Box 933, El Paso, Texas. Mine office: Hachita, Grant Co., N. M. W. R. Thurston, president. Organized circa 1907, under laws of New Mexico, with capitalization $200,000, shares $1 par. Lands, 29 claims, 7 fractional, area 550 acres, in the Apache district, 7 miles south of Hachita, carrying 4,000′ of the McKinley fault, developed by several shallow shafts, deepest 110′, showing copper sulphides of concentrating grade.

HACKBERRY MINING, MILLING & DEVELOPING CO. **ARIZONA.**

Letter returned unclaimed from former office, 112 Clark St., Chicago, Ills. Mine office: Dewey, Yavapai Co., Ariz. Capt. Geo. H. McGee, general manager. Lands, 7 claims, in the Ash Creek district, circa 12 miles east of Dewey, showing ore carrying mainly gold values.

HADLEY CONSOLIDATED COPPER CO. **ALASKA.**

Office: 1257-25 Broad St., New York, N. Y. Operating office: 609 Mutual Life Bldg., Seattle, Wash. Mine office: Ketchikan, Alaska. Samuel I. Silverman, president; B. E. Barinds, vice-president and treasurer; Nelson W. Parker, secretary; preceding officers, G. S. Grinsfelder, Alex. Reith and Geo. Brown, directors; G. E. Green, superintendent; Robt. Pollock, mine superintendent. Organized circa 1904, as successor of Wales Copper Mining Co., with capitalization $5,000,000, shares $1 par, in $1,500,000 preferred and $3,500,000 common shares. Is controlled, through stock ownership, by Alaska Mines Securities Co. Paid 1% dividends, Dec. 10, 1905, and January, 1906, and a 4% dividend Oct. 9, 1906. Was placed in the hands of a receiver circa September, 1907.

Lands, 12 claims, partly patented, area circa 200 acres, on Mount Andrew. The principal property, known as the Stevenson mine, has a very large ore body, claimed to be 250′ wide and 600′ long, developed by 555′ of tunnels and 3 glory-holes, and is said to have 58,500 tons of ore blocked out for breaking. Smelter shipments, 1905, gave returns of 3.7% copper, 20 cents silver and $1 gold per ton. Ore carries 32% iron and is practically self-fluxing. Mine is connected with the smelter of the Alaska Smelting & Refining Co., at Hadley, circa 2 miles distant, by railway and aerial tram. Production 1905, was 9,439 tons of ore, yielding 698,486 lbs fine copper, and for 1906 was circa 35,000 tons of ore yielding circa 2,000,000 lbs. fine copper.

HADLEY SMELTER. **ALASKA.**

Owned by Alaska Smelting & Refining Co.

HAGGARTY COPPER MINING CO. **WYOMING.**

Mine office: Rudefeha, Carbon Co., Wyo. E. M. Cobb, president. Is controlled, through ownership of entire stock issue except founder's shares, by Penn-Wyoming Copper Co.

HAGGARTY COPPER MINING CO. **WYOMING.**

Office: 731 Monadnock Bldg., Chicago, Ills. Mine office: Rudefeha, Carbon Co., Wyo. Is controlled, through ownership of practically entire stock issue, by Penn-Wyoming Copper Co.

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HAGGARTY-JORDAN COPPER MINING CO. **WYOMING.**

Office: Watertown, N. Y. Mine office: Battle, Carbon Co., Wyo. C. H. Dunbar, president; Delos S. Dunbar, secretary and treasurer. Organized 1901, under laws of Delaware, with capitalization $150,000, shares 10c. par. Lands, 11 claims, area 220 acres, in the Battle Lake district, showing 4 fissure veins, of which 2, very slightly developed, are claimed, untruthfully, by the management, to carry carbonate and sulphide ores with average values of 35% copper, a trace of silver and $5 gold per ton. Company suffered a mysterious "burglary," by which all its books and papers were stolen. Is devoid of cash and bankrupt in reputation.

HAGUE & HULBERT EXPLORATION. **MICHIGAN.**

Office: 18 Wall St., New York. Mine office: Laurium, Houghton Co., Mich. Lands, 240 acres, in Sections 25 and 26, Town 50 North, Range 33 West, bought, 1905. Idle.

HAHN'S PEAK GOLD MINING CO. **COLORADO.**

Works office: Hahn's Peak, Routt Co., Colo. Is said to have a smelter under construction, to treat gold, silver and copper ores of adjacent mines in Routt county, Colorado, and Carbon county, Wyoming.

HALE MINING & MILLING CO. **ARIZONA.**

Mine office: Constellation, Yavapai Co., Ariz. Oscar Jennings, superintendent, at last accounts. Has gold and copper ores, with gasoline power.

HALIFAX COPPER CO. **VIRGINIA.**

Office and mine: Virgilina, Halifax Co., Va. Property is the Wall mine, which shipped a little ore, 1900, but since idle.

HALLIWELL COPPER CO. **MICHIGAN.**

Office: Society for Savings Bldg., Cleveland, Ohio. Mine office: Ontonagon, Ontonagon Co., Mich. A. H. Weed, president; John Beeker, vice-president; Chas. W. Voth, secretary; C. F. Uhl, treasurer. Organized January, 1895, under laws of West Virginia, and reorganized, 1901, under laws of South Dakota, with capitalization $3,000,000, shares $1 par; bonds, $6,500 issued. Lands, 880 acres, owned in fee, in Carp Lake township, carrying sundry copper-bearing amygdaloids, with shafts of 130′ and 190′, and tunnels of 190′ and 200′. Has a 60-h. p. steam plant, with hoist and 3-drill air-compressor. Buildings include a machine shop, shafthouse, rockhouse, smithy and sawmill. Idle since 1901.

HALL MINING & SMELTING CO., LTD. **BRITISH COLUMBIA.**

Office: 1 Leadenhall St., London, E. C., Eng. Mine office: Nelson, Kootenay district, B. C. Lord Ernest W. Hamilton, chairman; C. Harvey, consulting engineer; A. E. Ashley, secretary; J. J. Campbell, general manager; M. S. Davis, mine superintendent. Organized June 6, 1900, under laws of Great Britain, as a reconstruction of Hall Mines, Ltd., with capitalization £325,000, shares £1 par; issued, £275,000. Debentures, £50,000 authorized; issued, £24,560, first mortgage 6% bonds, redeemable at 105, on 6 months' notice, at option of company.

Lands, 18 claims, area 506 acres, also a 40-acre smelter-site, on Toad Mountain, including the Silver King, Hall and Highland mines, also a quarter interest in the Emma mine, near Summit. Mines produce auriferous and cupriferous silver-lead ores, the Silver King carrying bornite above and argentiferous tetrahedrite below, the lower levels not looking so well as the upper workings. Values are mainly in silver-lead ores.

The reduction plant, near the mine, includes a sampling mill, laboratory and smelter, latter having one large and one small furnace, originally built for copper, but used mainly for lead matting. The smelter has hand and mechanical roasters, and adopted, 1906, the Huntington-Heberlein process for

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desulphurizing galena. The reduction works, which were not successful as a custom smelter, are somewhat antiquated, and need remodeling.

Production, for fiscal year ending June 30, 1905, was 26,505 tons of ore, of which 17,257 tons were smelted in the company's own furnace, and balance sent to other smelters. In 1906 production was 39,898 short tons of ore. Last reported figures of copper production were 318,124 lbs. for fiscal year 1904.

Company lost money on operations, both 1906 and 1907, and a receiver was appointed Feb. 7, 1908, when property was taken possession of by debenture-holders.

CLEMENTE HAM. **MEXICO.**

Office, mine and works: Promontorios, Alamos, Sonora, Mex. Is a producer of copper ores, which are smelted to matte near the mine. Production, 1902, was 191,200 kgs. matte. Presumably idle.

HAMILTON COPPER MINING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Mine office, Hamilton, Ravalli Co., Mont. Norman Ebbley, manager. Development is by a shallow shaft.

HAMILTON MINING CO. **MICHIGAN.**

Dead. Lands sold to Copper Crown Mining Co. of Michigan. Formerly at Matchwood, Ontonagon Co., Mich. Described Vol. II.

HAMILTON MINING CO. **WYOMING.**

Office: care A. B. Hamilton, treasurer, Laramie, Wyo. Lands are in Carbon county, Wyoming.

HAMILTON MINING, MILLING & TRANSPORTATION CO. **COLORADO.**

Mine office: Winfield, Chaffee Co., Colo. Mine is opened by shafts and tunnels, showing argentiferous and auriferous copper ores. Presumably idle.

HAMLEY MINING CO. **AUSTRALIA.**

Office: Grenfell St., Adelaide, South Australia. Mine office: Moonta, Daly Co., South Australia. John S. Scott, secretary; Wm. Holland, manager. Lands are in the hundreds of Wallaroo and Taparra. Mine, opened 1861, under name of Karkarilla, has 6 parallel veins, of circa 3′ average width, carrying mainly chalcopyrite, with some bornite and occasional chalcocite, with quartz gangue, ore averaging about 3.8% copper, opened by 3 shafts, deepest 720′. Equipment includes a steam plant, 2 hoists, and an air compressor.

The mill has a crusher, 1 set of Cornish rolls, 1 jig and 3 buddles. Property closed down March, 1906, after 25 years' work, and was reopened March, 1907. Production, 1903, was circa 1,060 tons of 17% concentrates, equal to circa 400,000 lbs. fine copper, and for first half of 1905 was 3,169 long tons of ore, yielding 582 long tons of concentrates.

HAMMOND COPPER CO. **MONTANA.**

Dead. Supposedly infested some part of Montana, circa 1902.

HAMPDEN CLONCURRY COPPER MINES, LTD. **AUSTRALIA.**

Offices: 375 Collins St., Melbourne, Australia and Palmerston House, London, E. C., Eng. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. Employs circa 50 men. Wm. Knox, M. P., chairman; Hon. Wm. Laurence Baillieu, vice-chairman; preceding officers, D. W. H. Paterson, Herbert J. Daly, Herman H. Schlapp, Hon. Wm. Orr and H. C. F. Keats, directors; T. Pyke, J. Dowling and W. Douglas Reid, London directors; C. Lonsdale Smith, mine manager; Edw. Herbert Shackell, secretary; Edwin Habben, London secretary; S. W. Donner, agent. Organized March 2, 1906, under laws of Victoria, as successor of Hampden Copper Mines, N. L., with capitalization £200,000, increased, February, 1907, to £300,000, shares £1 par; issued, £200,000. Statement of May, 1907, gave cash on hand, £88,050, with liabilities of £22,304, including bank overdrafts of £17,665, these heavy overdrafts seeming strange, in view of the large cash assets claimed.

Lands, 260 acres, carrying some timber, 47 miles south of Cloncurry. The

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district is arid, though having occasional heavy rainfalls. Country rocks are Silurian slate and quartzite, with occasional diorite and trap, ore occurring as bunches and stockwerks in a belt of kaolinized slate and schist, having a nearly vertical dip, with strike of 15° West of North. Rich ores are very erratic in occurrence. Trenches show copper carbonates disseminated through kaolinized slate for widths of 2′ to 80′, estimated to average about 4% copper. Ore has been proven, at intervals, for a distance of about one-half mile.

Ore was discovered 1884, and mining begun 1898. Development is by a number of trenches, 3 open-cuts and 12 shafts, several of the shafts being mere pits of 8′ to 15′ depth. No. 1 pit is circa 60x80′ in size, and about 18′ deep. No. 2 pit shows large bunches of chalcocite and oxidized ores. Four new shafts have been sunk to depths of 164′ to 240′. No. 2, the main shaft, is 200′ deep, with drifts north and south, showing what is called melaconite, but what probably is chalcocite. No. 2 has levels opened at 45′ and 72′ depth, which is excellently poor practice. Shaft No. 12 shows sulphides on the 80′ level, and the deeper workings show considerable ore of 8 to 9% copper tenor, carrying up to 9 dwts. gold per long ton, with an estimated average of 2 dwts. 10 grains. Under former ownership the property was tributed, and gouged. Company estimated May, 1908, that it had ore reserves of the value of £107,003.

The Duchess mine, area 40 acres, bought of the Cloncurry Railway & Development Co., Ltd., for £15,000 cash and £15,000 shares, has 3 shafts, one, sunk 45′ on a 6′ vein, showing high grade carbonates and chalcocite.

Development has been slow, on account of trouble in landing machinery, mine being difficult of access. The company is said to have joined with the Mount Elliott in guaranteeing half of the cost of a £200,000 railway extension, to be built by the Queensland government, from Cloncurry to Mount Elliott, the share of the Hampden Cloncurry being £60,000. The company has a smelter site, with iron ore and limestone available. Production, under former ownership, to August, 1905, was 9,163 long tons of ore, averaging 12.7% copper, which yielded 1,165 long tons fine copper. Property is considered promising.

HANAWA MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi Kwaisha.

HANCOCK CONSOLIDATED MINING CO. **MICHIGAN.**

Mine office: Hancock, Houghton Co., Mich. John D. Cuddihy, president; Capt. Thos. Hoatson, vice-president; preceding officers, Capt. Jas. Hoatson, Capt. Samuel B. Harris and Allen F. Rees, directors; John H. Hicok, secretary and treasurer; John L. Harris, superintendent; John O. Peterson, mining captain; Daniel Fisher, clerk; C. W. McDougall, engineer.

Organized June 11, 1906, under laws of Michigan, with capitalization $5,000,000, shares $25 par; issued, $2,500,000. Paid in, $13. In 1908 levied a $3 assessment, payable in $1 installments, on June 25 and Nov. 25, 1908, and May 20, 1909. Company began business with $1,000,000, and paid $552,623 for its property. Disbursements, 1907, were $264,538.98, of which $227,681.23 was for construction and development. Receipts, 1907, were $7,616.77, all from interest. Surplus, Jan. 1, 1908, was $134,332.25.

Lands, 936 acres, all in Town 55 North, Range 34 West, including the original Hancock mine, area 136 acres, set aside, 1859, by the Quincy Mining Co., which reserved the mineral rights to the Pewabic lode. The Pewabic lode, on lands other than the original Hancock tract of 136 acres, is owned by the Hancock Consolidated. Lands lie adjoining the Quincy, to the southwest, and carry the Pewabic, Quincy West and Hancock or Sumner copper-bearing beds. While the Quincy Mining Co. claims the right to mine the Pewabic bed on the lands of the old Hancock Mining Co., the Hancock Consolidated claims that the Quincy has done unauthorized mining on its lands,

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and there is a prospect of litigation over mining rights. Perhaps the best part of the Quincy mine is tributary to No. 7 shaft, which is immediately north of the Hancock boundary.

The old Hancock mine, opened 1861 and closed June 1, 1885, on account of the low price of the metal, produced 5,709,384 lbs. fine copper. The Hancock or Sumner amygdaloid, which was worked by the old Hancock company, averaged about 12′ in width, below the fifth level, to a depth of 1,052′, where the old mine was bottomed, and returned 21 to 22 lbs. fine copper per ton, after selection, making about 50 tons of mineral monthly, secured from an average daily production of 210 tons of rock, in the latter years of its operation. Modern milling methods should save 2 to 4 lbs. of fine copper per ton formerly lost. The old mine found occasional masses up to 5 tons in weight.

The old Hancock mine had an air-shaft, and an 8x16′ working shaft, now known as No. 1, sunk at an angle of 54°, having 2 small skipways, which is being deepened below the old workings with size 8x21′, giving room for 3 compartments, and the shaft will be cut down, before beginning production, to full 3-compartment size, from top to bottom. Levels were opened at 100′ intervals in the old mine to the tenth level and below are opened at 125′ intervals to the depth of circa 1,400′, in November, 1908. The old mine was found in bad shape, after many years' idleness. Rapid sinking is impossible, owing to the hanging-wall giving much trouble, and requiring very close timbering. The best ground was found entirely stoped out in the upper levels of the Hancock bed, the old workings, about 800′ in length, having been stoped from the second to the tenth levels inclusive, on the Hancock vein, and the West vein was found stoped from the sixth to the ninth levels, inclusive, on the southern drifts. Though No. 1 shaft is sinking on the Hancock bed, drifting is mainly on the West lode, which lies about 70′ west of the Hancock amygdaloid, and is 10′ to 12′ wide, with a maximum of 16′, on the thirteenth level, showing some rich stopes, and very fair average ground throughout. No. 1 has a remodeled wooden shaft-rockhouse, with a Lake Shore hoist good for 2,000′ depth.

No. 2 shaft, 2,200′ northwest of No. 1, is 9x30′ in size over all, having 4 hoisting compartments, each 7x5′ 2″ in the clear, with a 4x7′ compartment for ladderway and pipes. This is one of the largest shafts in the Lake Superior district, and is planned for heavy production. The collar is concreted for a depth of 30′, into the rock ledge, with a thickness of 24″ at the top and 30″ at the bottom. This shaft was 1,300′ deep in November, 1908, sunk for the first 700′ or thereabouts through conglomerate. This vertical shaft should intersect the Hancock lode at a depth of circa 2,500′, the West lode at circa 2,800′, and the Pewabic lode at circa 3,600′, proving considerable territory west of the Pewabic lode, hitherto practically unexplored in the Portage Lake district.

No. 2 shaft has a first-motion Sullivan hoist with 24x48″ cylinders and 2 loose drums, 8′ in diameter with 9′ face, driven by band-friction clutches, calculated to operate 2 pairs of Kimberly skips in balance, at a speed of 3,500′ per minute, hoisting with 1¼″ steel rope. The engine has an automatic stop.

There are 2 air-compressors with aggregate capacity of 3,100 cubic feet of free air per minute, connected by pipe-line. The compressor at No. 1 shaft is a 10-drill Sullivan 2-stage machine, and at No. 2 is a 15-drill air-compressor.

The machinery plant and buildings, mainly at No. 2 shaft, include a 16x44′ engine-house, boiler-house and 30x80′ combined machine-shop and smithy, of wood, covered with corrugated iron, on concrete foundation. There also is an office, changing-house, and a number of dwellings, bought on property secured

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for a railroad right-of-way, which have been remodeled for mine use, where possible, otherwise serving as dwellings for employes.

About 150 men are employed. It was at first planned to begin production within a year, but the management decided to devote its time and energies to extensive opening work, before beginning production, and is to be commended for this wise decision. The management is experienced and financially strong, and is going about the working out of ambitious plans in a very systematic and efficient manner.

HANCOCK COPPER MINES CO. OF IDAHO, LTD. **IDAHO.**

Office: 1032 Old South Bldg., Boston, Mass. Mine office: Landore, Washington Co., Idaho. Col. C. F. Drake, president and general manager; W. M. Palmer, vice-president; John Sennett, secretary and treasurer; preceding officers, M. C. Drake and Dr. J. E. Stevens, directors. Organized 1905, with capitalization $1,000,000. Lands, 10 claims, on Camp Creek, 2 miles from Landore, opened by a tunnel said to show considerable bodies of auriferous copper ore.

HANCOCK COPPER MINING CO. **MICHIGAN.**

Dead. Organized, circa 1880, as successor of Hancock Mining Co., and succeeded, 1906, by Hancock Consolidated Mining Co. Formerly at Hancock, Houghton Co., Mich. Described Vol. II.

HANCOCK MINES CO. **NEW MEXICO.**

Dead. Formerly at Organ, Dona Ana Co., N. M. Described Vol. III.

HANCOCK MINING CO. **MICHIGAN.**

Dead. Organized 1859, and succeeded, 1880, by Hancock Copper Mining Co. Formerly at Hancock, Houghton Co., Mich.

HANE COPPER MINING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont.

HANNA MINING & MILLING CO. **COLORADO.**

Mine office: Capitol City, Hinsdale Co., Colo. G. H. Martin, superintendent. Has auriferous and argentiferous copper and lead ores, with steam and electric power and a 100-ton concentrator, employing circa 50 men.

HANOVER COPPER CO. **NEW MEXICO.**

Office: 905-17 Battery Place, New York, N. Y. Mine office: Hanover, Grant Co., N. M. Chas. W. White, president and treasurer; R. K. Wartmen, secretary. Organized under laws of South Dakota, with capitalization $1,000,000, shares $100 par. Company expended circa $75,000 on mining claims near Hanover, but work was done poorly and property, held on bond, was allowed to revert to the owner. New claims were secured, but apparently no work was done on these. Idle some years.

HANOVER MINING CO. **MICHIGAN.**

Dead. Lands sold, 1906, to Keweenaw Copper Co. Formerly in Keweenaw county, Michigan.

HANOVER MINING & MILLING CO. **NEW MEXICO.**

Dead. Formerly at Hanover, Grant Co., N. M.

HAPPY JACK COPPER MINING & DEVELOPMENT CO. **ALASKA.**

Office: 904 Tacoma Bldg., Chicago, Ills. Mine office: Valdez, Prince William Sound district, Alaska. Julius Singer, president and general manager; H. E. Walrath, secretary; preceding officers, R. H. Dickinson, H. W. Von Maur, R. A. Weir, Guy H. Powell and Nelson C. Davidson, directors. Organized January, 1907, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, on Knights Island, include 6 claims on Mummy Bay, opened by a 140′ tunnel, and a property on Hoyer Bay, at the northern end of the island, opened by tunnel and said to show ore averaging 8 to 10% copper, which seems rather high. Mouth of tunnel is 300′ from wharf, on tide-

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water. Has several mine buildings and is well spoken of locally. Employed circa 40 men, 1907, and planned making early ore shipments.

HAPPY JACK MINING CO. **ARIZONA.**

Office: care of G. & H. Barnett Co., Philadelphia, Pa. Mine office: Patagonia, Santa Cruz Co., Ariz. H. W. Barnett, superintendent. Mine is opened by a shallow shaft and a 950′ tunnel, showing auriferous and argentiferous lead and copper ores. Property has shipped considerable ore, of good average tenor, and is considered promising.

HAPPY JOHN MINE. **BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. A. J. Envik and Franklin Bros., owners. Lands, 4 claims, area 125 acres, west of the Monitor mine, on the western side of the Alberni canal, near its mouth, having a 175′ tunnel showing a vein with paystreak of 30″ extreme width assaying circa 12% copper, 1.7 oz. silver and $1.20 gold per ton.

HARCÚVAR COPPER CO. **ARIZONA.**

Office: 1201 Pennsylvania Bldg., Philadelphia, Pa. Mine office: Wendendale, Yuma Co., Ariz. Hon. John J. Hawkins, president; Dennis A. Burke, vice-president; N. A. Lund, secretary and treasurer; preceding officers, Amos Andrews and L. B. Woolston, directors; R. R. MacDonald, mine superintendent; H. C. Shotwell, engineer. Organized May, 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Annual meeting, first Monday in May.

Lands, 9 claims, area 180 acres, patents applied for, and a water right, adjoining the Oro Cobre, in the Cunningham Pass district, 12 miles west of Wendendale, showing several contact deposits between gneiss and diorite, of which one, of 40′ to 60′ estimated width, traceable for some distance, shows oxidized ores at surface with chalcopyrite at depth, opened by several prospecting shafts and trenches, and by a 269′ tunnel, giving ore assaying up to 24.5% copper and $20 gold per ton. Has gasoline power and 3 small buildings. Company plans reaching the vein by crosscut tunnel at length of 418′, and continuing development.

HARDSCRABBLE MINING CO. **NEW MEXICO.**

Office and mine: Magdalena, Socorro Co., N. M. W. A. Brown, lessee, at last accounts. Property shows 9 veins, occuring as fissures in granite and as contacts between granite and limestone, these being claimed to average about 25′ width, and to carry chalcopyrite, sphalerite and cerussite averaging about 4% copper, 30% lead, 44% zinc, 12 oz. silver and $1 gold per ton. Mines have a 200′ shaft and several tunnels, longest 200′ and 300′. Property includes a small smelter.

HARLEY GOLD MOUNTAIN MINING & SMELTING CO. **WASHINGTON.**

Office: 704 New York Blk., Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. Charles Burns, president and treasurer; Harley E. Burns, vice-president; Henry S. Noon, secretary; K. O. Neste, general manager. Organized Dec. 15, 1900, under laws of Washington, with capitalization $2,500,000. Lands, 16 claims, area 300 acres, in the White Horse district, showing 12 ore bodies, occurring as fissures in porphyry and as contact veins between granite and porphyry. Four veins under development are said to average 6′ width, and to carry 14.5% copper, 8 oz. silver and $25.65 gold per ton, which claim is excessive. Development is by tunnel, with 346′ of openings. Presumably idle.

OTTO HARNECKER. **CHILE.**

Office and mine: Las Gredas, La Ligua, Aconcagua, Chile. Works office: La Ligua, Aconcagua, Chile. El Carmen mine shows various ore bodies of about 1 meter average width, with dip of 31°, occurring as contact deposits between limestone and porphyry, ores being sulphide below an oxidized zone of

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about 20 meters depth. Mine has a 90-meter tunnel with a 60-meter back, and about 140 meters of horizontal workings. Shipped, 1903, circa 1,100 metric tons of ore averaging 5.2% copper, secured with 22 men, and had ore reserves of about 16,000 metric tons. Is considered a promising property.

Los Marquis mine shows 8 parallel veins, traceable about 5 kilometers, occurring in porphyry, with strike of North 18° East and dip of 43°, with widths of 5′ to 9′, carrying chalcopyrite with granitic gangue, ore being especially suitable for fluxing the silicate ores so common in the district. Production, 1903, was circa 2,000 metric tons of 4.5% ore, secured with 26 men.

Smelter, known as the Fundicion Peña Blanca, 5 kilometers from the station of Injenio, has a cylindrical water-jacket blast-furnace of about 30 tons daily capacity, using Westphalian coke and producing ejes of about 53% average copper tenor, giving very clean slags, which assay only 0.15 to 0.20% copper, from ore of 4.68% average tenor. Production, 1903, was 310,848 lbs. fine copper. Mines and smelters are well managed and successful, despite low average tenor of ore treated.

HARRINGTON MINING CO. **ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. Geo. P. Harrington, general manager. Property is the Tiger mine, carrying ores of gold, silver and copper. Has steam power. Idle several years.

HARRIS COPPER CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. Organized circa 1908. Lands, 3 miles east of the Pilares mines of the Moctezuma Copper Co., include La Caridad group, supposed to have been bought for $40,000, which is said to have 6,000 tons of ore blocked out averaging 4 to 6% in copper tenor. There also are 25 hectares of other lands, in the Pilares district.

H. C. HARRISON. **MEXICO.**

Office: Apartado 74, Monterey, N. L., Mex. Mine office: Cerralvo, Cuarto, Nuevo León, Mex. Property includes the Buenos Amigos and Esperanza mines, carrying argentiferous copper and lead ores. Has steam power and small smelter, employing circa 100 men at last accounts.

HARTFORD CONSOLIDATED COPPER CO. **CALIFORNIA.**

Mine office: Redding, Shasta Co., Cal. Wm. Geary, president; J. B. Giffen, secretary. Lands, 10 claims, 3 miles north of the mouth of Protem Creek, showing an 8′ vein carrying oxidized ores at and near surface, with low-grade sulphides at a little depth, opened by circa 400′ of tunnels. Idle for several years.

HARTFORD COPPER & GOLD MINING CO. **ALASKA & IDAHO.**

Office: 7 Exchange Pl., Boston, Mass. Henry J. Wilkins, president; Chas. M. Thayer, secretary. Capitalization $2,000,000. West Virginia charter forfeited 1902. Claims to have copper lands on Prince of Wales Island, Alaska. Had an option on a mine at Challis, Custer county, Idaho, but lost it. Management bad, property problematical, stock worthless.

HARTFORD MINING CO. **IDAHO.**

Mine office: Wardner, Shoshone Co., Idaho. Wm. F. Goddard, president; Jas. Fumerton, vice-president; W. J. Fumerton, secretary and treasurer; preceding officers, Vido Marich, and William Shaefer, directors; Robt. Sterling, consulting engineer. Organized circa 1901. Lands, 5 claims, having a 530′ tunnel on a fissure vein said to show an 18′ ore chute carrying auriferous and argentiferous copper and lead carbonates.

HARTWIG MINING CO. **IDAHO.**

Office: Tipton, Ia. Mine office: Pollock, Idaho Co., Idaho. Dr. R. A. Nash, president; W. G. N. Geiger, secretary; J. W. Moore, treasurer; preceding officers, Fred Goldsmith, Wm. Hartwig and Ernest Conrad, directors; Geo. Hartwig, mine superintendent. Organized 1905, under laws of Iowa, with

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capitalization $72,000. Lands, 6 claims, patented, area 80 acres, and a 5-acre millsite, in the Rapid River district, showing a contact deposit between limestone and diorite, of 40′ estimated average width, traceable circa 700′, opened by a 75′ shaft and 3 tunnels of 1,000′ aggregate length, showing malachite and chalcopyrite, estimated by company to average 12% copper, 3 oz. silver and $4 gold per ton. The 875′ lower tunnel has cut the ore zone, which shows but little ore. Has 3 mine buildings. Idle on account of lack of transportation facilities, but plans resumption when railroad comes nearer.

HASKINS MINING CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Lands are in the Tucson Mountains. Idle.

HASSAYAMPA COPPER CO. **ARIZONA.**

Office: 281 John St., Portland, Me. Mine office: Groom Creek, Yavapai Co., Ariz. C. H. Altmiller, president; Chas. Sumner Smith, treasurer; R. A. Sweet, general manager; preceding officers, E. P. Ricker and Harold N. Willis, directors; Millard W. Baldwin, clerk. Organized Dec. 24, 1906, under laws of Maine, with capitalization $2,000,000, shares $5 par; issued, $1,355,480. Property consisted, February, 1907, of about 60% of the stock issue of the Gold & Copper Consolidated Mining & Milling Co., and the Hassayampa Copper Co. is supposed to be negotiating for balance of stock issue of the subsidiary corporation.

Lands, 34 claims, 15 patented, area circa 650 acres, fairly watered and timbered, in 4 groups, known as the Little Kid, which is the most important, Rockefeller, Chicago and President, 12 miles southeast of Prescott in the Hassayampa and Big Bug districts. Lands show numerous fissure veins carrying auriferous and argentiferous oxidized and sulphide ores, claimed by old management of Gold & Copper Consolidated Mining & Milling Co. to average 7% copper, 46 oz. silver and $38 gold per ton, which figures are gross exaggerations. Development is by 34 pits and shafts, of 10′ to 315′ depth, and by 21 tunnels, of 20′ to 800′ length, with about 2 miles of workings. The old company claimed to have 150,000 tons of ore blocked out for stoping, which was untrue, and the new company is said to have opened 3 new veins, carrying copper, silver and gold ores assaying $25 to $200 per ton in value.

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Equipment includes steam power and a 50-h. p. hoist, with several shops. The Chicago group has a 10-stamp mill and a 50-ton cyanide plant, and was claimed by old management to have a 50-ton concentrator.

The directorate of the Hassayampa Copper Co. includes several men of excellent standing, and also includes R. A. Sweet, the general manager, who was the former president and treasurer of the Gold & Copper Consolidated Mining & Milling Co., which corporation peddled stock as long as possible, and claimed to be running the mill day and night, which was untrue. It was claimed, March, 1907, in behalf of the new company, that the Hassayampa would become an important producer, with quick dividends from gold alone, but these claims were not made good. Apparently the company expended about $12,000 on development work, in 1907. Notwithstanding the fact that some of the officers of the Hassayampa Copper Co. are good men, the company is not regarded favorably.

HASSAYAMPA GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly had an office at 202 North Ninth St., St. Louis, Mo. Formerly in Yavapai county, Arizona.

HASTINGS (BRITISH COLUMBIA) EXPLORATION SYNDICATE. **BRITISH COLUMBIA.**

Dead. Property was the Arlington mine, which, in 1906, shipped 1,312

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tons of ore to the Hall smelter that gave net returns of $53,315.80, an average of $40.64 per ton. Formerly at Greenwood, Boundary district, B. C.

HATASA MINE. **JAPAN.**

Mine office: Hatasa-mura, Gujo-gori, Mino, Japan. Mine was opened previous to A. D. 1600, and once was highly productive, but declined greatly in output, until latterly. Property has 4 principal veins, of 2" to 2' width, carrying argentiferous chalcopyrite, galena, sphalerite and pyrite. Production was 38,651 lbs. fine copper and 165,416 momme silver in 1900, and 82,123 lbs. fine copper and 189,838 momme silver in 1907, showing a fair growth.

HATHAWAY MINE. **MEXICO.**

Owned by Chihuahua Copper Mining Co.

HATTIE BELL COPPER, GOLD & NICKEL MINING CO. **ONTARIO.**

Dead. Lands sold to Consolidated Copper Co., of Parry Sound. Formerly at Parry Sound, Parry Sound district, Ont.

HATTIE GOLD AND COPPER MINING CO. **IDAHO.**

Dead. Formerly at Doniphan, Blaine Co., Idaho.

UNION MINIÈRE DU HAUT-KATANGA. **CONGO FREE STATE.**

Office: 7 Montagne du Parc, Brussels, Belgium. Mine office: L'Etoile du Congo, Katanga, Congo Free State. Baron Baeyens, chairman; Robt. Williams, vice-chairman and general manager; H. Buttgenbach, managing director; Geo. Velge, secretary; A. Bertholet, resident director; Allan Gibb, consulting engineer.

Organized Oct. 28, 1906, under laws of Congo Free State, with capitalization £200,000, shares £4 par, divided into £100,000 dividend shares and £100,000 capital shares, 40% paid in. The Tanganyika Concessions, Ltd., and Société Générale de Belgique each own £100,000 in shares. Annual meeting, first Monday in December.

Lands are very extensive, being a concession comprising a copper belt about 200 miles in length, containing over 100 exposures of copper, and a tin belt of nearly 100 miles length, north of the Kafue and Zambesi rivers, in the Katanga district, in a rolling country with a fairly healthy climate, the principal copper properties showing sandstone carrying malachite impregnations estimated by company to average 14% in tenor.

In addition to copper properties the company owns promising tin mines, these including the Busango mine, which has apparently payable stream-tin deposits in alluvium of 3' to 10' thickness, and the Kasonso and Chienzi mines, having lode-tin deposits.

The company also owns the Ruwe gold mine, which has an ore body of 9' to 14' width, opened for a quarter-mile by several shallow shafts, deepest circa 100' only, vein being a sandstone reef carrying gold up to 9 oz. 7 dwts. per long ton, and claimed to average 5 dwts. gold and 9 dwts. platinum, with occasional palladium, gold being quite coarse. The platinum figures seem to lack substantiation. The Ruwe mine also has a placer deposit, estimated to contain 20 oz. gold per long ton, from which considerable production has been secured, at an average cost of only circa 12s. per ton.

In addition to ores of copper, tin, gold, platinum and palladium, the company has an iron ore deposit, apparently of promise, near Shamerenga, on the Lualaba River.

The company reports a force of 1,000 men employed, and smelting was said to be in progress, early 1908, but it is probable that the smelter is of small capacity, and planned mainly for experimental purposes.

SOCIÉTÉ DES CUIVRES ET PLOMBS ARGENTIFÈRES DU HAUT-RHONE. **FRANCE.**

Offices: Lausanne, Switzerland, and 28 Blvd. St.-Denis, Paris, France.

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Organized Jan. 17, 1905, with capitalization 1,600,000 francs, shares 100 francs par.

HAWKEYE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VII.

HAWKEYE MINE. **OREGON.**

Office and mine: Comer, Grant Co., Ore. Byron Sherbindy, owner. Property carries auriferous and argentiferous copper ores, and is said to have a small smelter. Idle.

HAWKSWORTH COPPER CO. **ARIZONA.**

Dead. Formerly at Agua Caliente, Maricopa Co., Ariz.

HAYFORD MINES, LTD. **ENGLAND.**

Dead. Voluntarily liquidated, February, 1905. Formerly at St. Ives, Cornwall, Eng.

HAYMAN MINING & TUNNEL CO. **COLORADO.**

Mine office: Tarryall, Park Co., Colo. Lands, sundry claims, said to show lead and copper ores. Idle and apparently moribund.

HAYNES COPPER CO. **ARIZONA.**

Office: 1112 Union Trust Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. Clarence L. Bleakley, president; H. Judson Haynes, vice-president; J. R. Kinney, secretary and treasurer; preceding officers, Edwin E. Tate, Robt. Ferguson, and Dr. G. H. Merkley, directors; T. E. Campbell, superintendent. Organized October, 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par, as successor of Jerome Mines Development Co.

Lands, 8 claims, patented, area 160 acres, known as the Harryhousen group, adjoining the United Verde on the north. Property shows lenticular ore bodies occurring as replacements in schist, the two under development, of 3′ to 19′ width, traceable circa 2,000′, carrying a great variety of ores, estimated by company to average 6.2% copper, 3 oz. silver and $1.60 gold per ton. Property has been explored by about 2,000′ of diamond drill borings, and is opened by a 248′ tunnel and by shafts of 350′, 520′, 45′ and 40′, main shaft having 3 compartments. Mine is proving quite wet.

The mine has a 150-h. p. steam plant, 12x16″ double-drum hoist, 10-drill Ingersoll-Rand air-compressor and 12 buildings. Company plans continuing steady development by deepening the shaft to 700′, and driving 2 crosscuts to the ore body.

HAZEL MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. T. J. Nerny, Peter Sanger and Jerry Sullivan, directors. Organized May 26, 1906, under laws of Montana, with capitalization $1,500,000, shares $1 par. Apparently no work was done.

HEADLIGHT COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. II.

HEADLIGHT GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: 2115 South Union Ave., Los Angeles, Cal. Mine office: Needles, San Bernardino Co., Cal. C. R. Wischart, secretary. Organized circa December, 1906, under laws of Arizona, with capitalization $1,000,000. Lands, about 6 miles west of Needles, are being opened by a shaft, which has proven wet.

HEADLIGHT GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Spencer, Gunnison Co., Colo. L. C. Ehbeding, superintendent, at last accounts. Ores carry gold, silver and copper. Presumably idle.

HEARNE GOLD & COPPER CO. **COLORADO.**

Office: Central City, Gilpin Co., Colo. Henry W. Kane, manager. Organized 1907, under laws of Colorado, with capitalization $500,000. Property is a 5-year bond and lease on the Anchor mine, in Willis Gulch, idle for some years until drained by the Newhouse tunnel, showing considerable bodies of low

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grade copper and lead ores, and medium grade silver ores. Apparently copper values are small. Plans an electric installation.

HEART OF ARIZONA GOLD & COPPER CO. **ARIZONA.**

Dead. Lands sold, 1906. Formerly at Prescott, Yavapai Co., Ariz.

HEATH MINING CO. **IDAHO.**

Dead. Formerly at Heath, Washington Co., Idaho.

HECKLEY GOLD & COPPER MINING CO. **ARIZONA.**

Office: care of Arnold Nydegger, secretary and treasurer, Colorado Springs, Colo. Mine office: Wickenburg, Maricopa Co., Ariz. F. J. Webber, president; L. J. Markert, vice-president. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 13 claims, in 3 groups, on Copper Hill, in the Black Rock district, circa 6 miles east and northeast of Wickenburg, having a 268′ tunnel cutting veins of 6′, 10′ and 25′ claimed average width, showing ore assaying up to 28% copper.

HECLA & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Title changed, 1903, to Red Jacket & Bisbee Development Co. Formerly at Bisbee, Cochise Co., Ariz.

HECLA & ARIZONA GOLD & COPPER MINING CO. **ARIZONA.**

Office: Weatherford, Texas. Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. J. M. Carroll, manager. Organized 1902, to take over claims near Bisbee. Idle and apparently moribund.

HECLA CONSOLIDATED MINE. **MONTANA.**

Office and mine: Butte, Beaverhead Co., Mont. Henry Knippenberg, owner. Property is the Atlantis, Cleves and other mines, formerly owned by the Hecla Consolidated Mining Co., which for 20 years were large producers of silver and lead, with considerable gold and copper, latter reaching 100,000 lbs. fine copper yearly. Property paid dividends of $2,250,000 on an original investment of $40,000, but was bought, 1906, at sheriff's sale, for $28,000.

HECLA CONSOLIDATED MINING CO. **MONTANA.**

Dead. Was a large producer, for many years, of silver, lead, gold and copper, latter as a by-product, amounting to about 100,000 lbs. yearly, and paid dividends of $2,250,000, without assessments, on an original investment of $40,000. Property sold, 1906, for $28,000, to Henry Knippenberg. Formerly at Dillon, Beaverhead Co., Mont.

HECLA COPPER & GOLD MINING, MILLING & SMELTING CO. **WYOMING.**

Dead. Reorganized, October, 1904, as Hecla Mining Co. Formerly at Hecla, Laramie Co., Wyo.

HECLA COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. II.

HECLA MINING CO. **WYOMING.**

Office: 1624 Curtis St., Denver, Colo. Mine office: Hecla, Laramie Co., Wyo. Henry Schwartz, president and general manager; Geo. C. Norris, vice-president; Louis Williams, secretary; Geo. L. Bettcher, treasurer. Organized October, 1904, under laws of Wyoming, as a reconstruction of the Hecla Copper & Gold Mining, Milling & Smelting Co., with capitalization $1,000,000, shares $1 par.

Lands apparently include the Copper Crown group of 8 claims, the Amalgamated group of 11 claims, the Hecla group of 14 claims, 2 patented, a 45-acre millsite and the townsite of Hecla, 5 miles from a railroad, in the Silver Crown district. Property is claimed to show 16 fissure veins, of 8′ average width, in schist and granite, of which 3, of 7′ average claimed width, are claimed to be under development, carrying oxidized and sulphide ores, claimed to give average assays of 5% copper, 3 oz. silver and $10 gold per ton, in addition to which they are claimed to carry estimated average values of $10

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to $12 per ton in nickel, platinum and uranium, which values apparently are something more than doubtful. Development is by a 40′ tunnel, and 14 pits and shafts of 10′ to 140′ depth.

The mill, 80x100′ in size, has 15 stamps, a 50-ton concentrating plant and a leaching plant. The Ohly process was installed, in an attempt to save the rare metals, but was not a success. Ore, which is mainly low in grade, is only in part adapted to concentration, and the mill requires overhauling and adaptation to the ore.

The management peddled "guaranteed" stock, claiming that 5% interest was guaranteed, for 3 years, on the stock investment, by United States government bonds, but nobody seems to have seen the bonds. The company apparently is out of cash and hopelessly involved, and its officers should be prosecuted for peddling worthless "guaranteed" stock.

GEWERKSCHAFT HEDWIGSGLÜCK. **GERMANY.**

Dead. Lands sold, 1907, to Rheinbach Copper Mines, Ltd. Formerly at Rheinbach, Rheinprovinz, Germany. Described Vol. VII.

P. H. HEFFRON. **MEXICO.**

Office and mine: Miñaca, Guerrero, Chihuahua, Mex. Mine, known as Dos de Abril, carries auriferous and argentiferous copper and lead ores, and has a 30-ton mill, employing circa 50 men.

HELENA-BUTTE MINING CO. **MONTANA.**

Mine office: Clancey, Jefferson Co., Mont. Frederic E. J. Lloyd, president; Chas. J. Burgess, secretary. Organized under laws of Montana. Property, known as the Silver Crest mine, opened circa 1890, in Warm Spring Gulch, 6 miles from Clancey, has a 3-compartment 200′ shaft, showing mainly silver-lead ore, with fair copper and gold values, and with prospects of increasing copper at depth. Property has a fair power equipment and several small mine buildings.

HELENA COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Helena, Lewis & Clark Co., Mont. F. J. Mason, president; Peter Rattray, vice-president; I. H. Adams, secretary; A. E. Adams, treasurer. Organized January, 1906, under laws of Montana, with capitalization $80,000, shares 10 cents par. Lands, 5 claims, unpatented, area 80 acres, on Mount Ascension, one mile from Helena, having sundry pits, and shafts of 45′, 50′ and 220′. Idle and apparently moribund.

HELEN MINING CO. **NEW MEXICO.**

Mine office: Graham, Socorro Co., N. M. Thos. Graham, president. Property is the Confidence group, ores of which carry gold, silver and copper. Has a 30-stamp mill, with steam, water and electric power. Presumably idle.

HELGA GOLD & COPPER CO. **BRITISH COLUMBIA.**

Office: Sullivan Bldg., Seattle, Wash. Mine office: Clayoquot, Vancouver Island, B. C. B. F. McCurdy, superintendent. Lands, 5 claims, area circa 250 acres, known as the Good Hope group, on Trout river, developed by a tunnel, said to give a fair showing of ore.

HELLEN MINING SYNDICATE. **WASHINGTON.**

Mine office: Cle Elum, Kittitas Co., Wash. Lands carry copper ore and free milling gold. Development is mainly on the gold ores, a small stamp mill having been built, 1908.

HELSINGBORG'S KOPPARVERK AKTIEBOLAG. **SWEDEN.**

Office and works: Helsingborg, Malmöhus län, Sweden. Hon. N. Persson, manager. Property is a smelting and reduction plant, including a small leaching plant, treating mainly the unrefined copper of the Sulitelma Aktiebolag.

HELVETIA COPPER CO. **ARIZONA.**

Office: 905 Metropolitan Life Bldg., Minneapolis, Minn. Mine office:

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Helvetia, Pima Co., Ariz. Employs circa 75 men. C. C. Prindle, president; Chas. W. Sexton, vice-president and secretary; Wm. A. Paine, treasurer; preceding officers, Russell M. Bennett, Geo. A. McDougall, Jas. H. Seager and Fred. L. Smith, directors; W. C. Steubing, general manager. Organized March 3, 1899, under laws of New Jersey, and reorganized Oct. 4, 1905, under laws of Arizona, with capitalization $5,000,000, shares $25 par; issued, $2,250,000. Paid in, $13.50. Last assessment was 50 cents, payable July 20, 1908. Cash on hand, Sept. 1, 1908, was circa $80,000. Annual meeting, in October.

Lands, 48 claims, patented, area 825 acres, and 960 acres miscellaneous lands, giving total holdings of 1,785 acres, on the western slope of the Santa Rita Mountains, 30 miles southeast of Tucson. Formation resembles that at Bisbee, the Carboniferous limestone strata being of the same geological horizon, with similar porphyritic intrusions, but showing much stronger outcrops and gossans.

The mine made an exceptionally fine showing from a depth of 35′, but ores turned base on the third level, with average tenor under 5% copper. The property has about 25 old pits and shafts, with about a mile of trenches and open-cuts, and several miles of tunnels and drifts, showing considerable reserves of self-fluxing ore of 2.5 to 8% copper tenor. There are 5 principal ore bodies, known as the Isle Royale, Old Dick, Exchange, Pilot and Heavy Weight, with principal new development on the Copper World mine, which shows a vein of 15′ estimated width, traceable 3,000′, proven to depth of 400′, carrying carbonate and sulphide ore, mainly the latter, estimated by company to average 5% copper, 0.5 oz. silver and 50 cents gold per ton.

The Isle Royale mine has an 800′ shaft, and shows lenses of ore in limestone near a porphyritic contact, of 3′ to 5′ average width, with maximum of 15′, carrying ore averaging about 3% copper and $1 per ton in combined gold and silver values. The lower levels show sulphide ore, and this shaft furnishes sufficient water for mine and smelter use.

The Old Dick mine has an open-cut showing an ore body carrying 3 to 6% copper, with small gold and silver values, and a 127′ shaft, with one level, is said to show about 7,000 tons of 7% sulphide ore. There also is a tunnel leading to an open pit, showing a vein of about 7′ width, claimed to average better than 5% in copper tenor.

The Heavy Weight vein, of about 7′ width, circa 400′ from and nearly parallel with the Old Dick vein, carries sulphide ore at shallow depth of 3 to 5% copper tenor. This vein shows a considerable amount of low grade concentrating ore.

The Copper World mine, opened circa 1907, has a 350′ incline shaft, in sulphide ore estimated to average about 5% copper, with some 10% ore shown on the 300′ level. It is planned to connect this shaft with the Isle Royale mine.

The Leader mine shows considerable sulphide ore of 3.5 to 4% estimated average copper tenor.

The mine has a 250-h. p. steam plant with steam hoists of 25-h. p. and 50-h. p., and one gasoline hoist, also a 9-drill Ingersoll-Sergeant air-compressor and an electric light plant. There are about 30 buildings, a 40x75′ carpenter shop and dwellings.

The Helvetia railroad, owned by the company, is 2¾ miles in length, of 30″ gauge, equipped with one 10-ton Porter saddleback locomotive, one 15-ton Shay locomotive and 5 cars. A railway line has been surveyed from Helvetia to Vail, to connect at latter point with the Southern Pacific.

The first smelter, 1½ miles from the mine, built 1899, and burned in 1900, was rebuilt and blown in, 1901, and property was closed down circa 1902, owing to the exhaustion of the rich oxidized ores. During the first

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period of operations, about 27,000 tons of ore were smelted, largest production having been circa 1,000,000 lbs. fine copper in 1901. Property was reopened, 1904, and the smelter was again blown in, early 1906, but was wrecked, circa May, 1906, by the collapse of the ore-bins, which had been built on a poor foundation. The smelter was again rebuilt, and has a 100-ton water-jacket blast-furnace. In 1908 the company experimented with a 30-ton Medbery rotary oil burning furnace, which treated 2-ton charges, at frequent intervals, but this did not prove successful.

The matter of building a 500-ton concentrator has been considered. Considerable trouble has been experienced in the past from lack of fluxing ores, but these seem to have been developed on the property. Daily shipments of 100 tons to custom smelters were begun Nov. 1, 1908.

Production, 1906, was 379,823 lbs. fine copper, 3,888 oz. silver and 28 oz. gold, valued at $76,446, and for 1907 was 191,666 lbs. fine copper, 1,394 oz. silver and 6 oz. gold, valued at $39,387.54. The mine has considerable ore of fair tenor developed, and is considered promising, though present transportation facilities are inadequate.

WM. HENDERSON & CO., LTD. **SCOTLAND.**

Works office: Irvine, Ayrshire, Scotland. Property is a plant for the leaching of copper values from cinders remaining from the burning of cupriferous pyrites.

HENSON CREEK LEAD MINES CO. **COLORADO.**

Dead. Lands sold by sheriff, circa 1906. Formerly at Lake City, Hinsdale Co., Colo.

HERCULES & ARIZONA MINING CO. **ARIZONA.**

Mine office: Ray, Pinal Co., Ariz. Was developing with a small force, at last accounts.

HERCULES BOSHOF SYNDICATE. **TRANSVAAL.**

Mine office: Pietersburg, Zoutpansberg, Transvaal. Lands are part of the Farm Tweedale No. 1300, showing a ledge of about 150′ width, traceable 2 miles, carrying carbonate stains and small quantities of cuprite, azurite and malachite, with quartzite gangue.

HERCULES CONSOLIDATED MINING CO. **COLORADO.**

Office: Boston, Mass. Mine office: Silverton, San Juan Co., Colo. Edward P. Ricker, president; Chas. S. Smith, treasurer; Thos. H. Kane, managing director. Capitalization $1,000,000, shares $10 par. Has authorized an issue of $300,000 bonds at 6%, convertible into stock at par; outstanding, $253,000. Lands, 25 claims, area circa 300 acres, known as the Little Dora group, having tunnels of 1,500′ and 2,500′, showing auriferous and argentiferous lead and copper ores, with values mainly in gold and silver. Has steam and water power and a modern 30-stamp mill, employing circa 75 men at last accounts.

HERCULES COPPER CO. **ARIZONA.**

Mine office: Ray, Pinal Co., Ariz.

HERCULES GOLD & COPPER CO. **NORTH CAROLINA.**

Office: 81 Fulton St., New York, N. Y. Mine office: Cid, Davidson Co., N. C. Wm. A. Anderson, president; H. L. Prentice, vice-president; Robert E. Nuese, secretary; Saml. G. W. Brown, treasurer and general manager; Walter Cockrehan, superintendent. Organized May, 1901, under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, circa 1,000 acres, freehold, and 1,300 acres held under contract, including the Emmons mine, opened before the American Civil War. Lands show 3 fissure veins, ranging 18″ to 15′ wide, said to give average assays of 7% copper, 2 to 17 oz. silver and $1.50 to $15 gold per ton, from melaconite, bornite and chalcopyrite, mainly latter. Is opened by shafts of 90′, 140′, 450′ and 600′, and by tunnels of 100′, 100′, 1,500′ and 2,500′, estimated to show about 65,000 tons of ore blocked out for

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stoping. Has a 600-h. p. steam and electric plant, including 4 hoists, good for depth of 1,000′ each, a 20-drill Clayton duplex air-compressor and 16 power drills. Buildings include a 30x40′ smithy, 16x24′ compressor house, shafthouses of 40x64′ and 60x80′, and 12 dwellings. Has a 10-stamp gold mill, 30x60′ concentrator and a smelter with a 150-ton Allis-Chalmers water-jacket furnace. Nearest railway, 14 miles. Has on the dump several thousand tons of ore, extracted in development. Property considered promising. Idle several years.

HERCULES MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Thos. Stephens, president; D. J. Charles, vice-president; C. M. Parr, secretary; G. E. DeSnell, treasurer. Organized, 1906, with capitalization $2,000,000, shares $2 par. Lands, 10 claims, southwest of Butte. Apparently no work done.

HERCULES MINING CO. **WYOMING.**

Office: 307 Paxton Block, Omaha, Neb. Mine office: Battle, Carbon Co., Wyo. C. M. Jacques, president and general manager; H. H. Quinlan, vice-president; J. E. Thatcher, secretary and treasurer. Capitalization $1,000,000, shares $1 par. Lands, 4 claims, area 80 acres, showing fissure veins of 9′ average width, giving assay values of 5 to 49% copper, from carbonate and sulphide ores. Has a 90′ tunnel and a 280′ shaft, with steam and gasoline power. Idle since 1903.

MINAS HERCULES y OTRAS. **CHILE.**

Mine office: Taltal, Antofagasta, Chile. Henri Hintze, owner and manager. Property includes the Hercules, Silesia and Inesperada mines, producers of gold and copper ore. Equipment includes steam power and 4 Chilean mills.

HERCULES SONORA MINING CO. **MEXICO.**

Office: care of J. M. Strickler, secretary, Kansas City, Mo. Letter returned unclaimed from former mine office, Ures, Sonora, Mex. J. D. Forrester, president; H. C. Foster, vice-president; Godfrey Swenson, treasurer. Organized April, 1906, under laws of Oklahoma, with capitalization $2,000,000, shares $1 par. Lands, 30 pertenencias, area 74 acres, having a 75′ shaft in a 9′ fissure vein, showing ore assaying up to 12% copper and 7 oz. silver per ton.

HERKULES FRISCHGLÜCK-STOLLN UND KIESELS HOFFNUNG ERBSTOLLN. **GERMANY.**

Office and mine. Johanngeorgstadt, Saxony, Germany. E. R. Poller, manager. Ores are sphalerite and chalcopyrite. Presumably idle.

HERMINA MINING CO., LTD. **ONTARIO.**

Office: Calumet, Mich. Mine office: Massey, Algoma, Ont. Employs 60 men. Capt. Jas. Chynoweth, president and general manager; Hon. Wm. H. Greene, vice-president; H. Appleton, secretary; Wm. B. Anderson, treasurer; preceding officers, Jos. Hermann, Alex Dunsmore, T. H. Pollock, Paul P. Roehm and H. E. Lane, directors; Stephen H. Bryant, superintendent; John J. Jacka, engineer. Organized June 27, 1903, under laws of Ontario, with capitalization $2,500,000, shares $12.50 par: issued, $1,425,000, $9.75 paid in. Last assessment was 25 cents, October, 1907. Merchants & Miners Bank, Calumet, registrar. Annual meeting, third Tuesday in June.

Lands, 1,250 acres, freehold, in Salter township, circa 7 miles from Massey, and a 320-acre millsite, all fairly timbered. Property shows 3 contact veins, between schist and quartzite, of practically vertical dip, and strike of about 10° North of East, having reported average widths of 5′, 7′ and 21′. Veins Nos. 1 and 2, undergoing development, are about 1½ miles apart. Ore is exclusively chalcopyrite, with quartz gangue, estimated by company to average 4 to 6% copper and $2.50 per ton in gold. Careful sampling of No. 3 shaft, by Dr. G. Fernekes, gave 4.3% copper and $2.80 gold per ton, and the ore probably averages about 0.1 to 0.2 oz. silver per ton. Two 35-ton smelter shipments, circa 1907, returned 9.7% and 13.1% copper.

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Development has been continuous, since begun in 1903. The mine has a 260′ tunnel and 3 shafts, No. 1 being 300′ deep, No. 2 being 24′ deep and No. 3 being 445′ in depth, with total of 2,624′ of workings, June, 1908, estimated by company to show 800,000 tons of ore with 400,000 tons blocked out for *stoping*, which estimate seems high. No. 3 shaft, 445′ deep, 7x15′ in inside measurement, with 3 compartments, has 4 levels opened. No. 4 shaft is to be sunk on the Duluth claim, circa 1,000′ from No. 3. The ground stands well, requiring little timbering.

Equipment includes a 200-h. p. steam plant, with 50-h. p. and 100-h. p. *Allis-Chalmers* hoists, good for 1,000′ each, and a 10-drill Ingersoll-Rand air-compressor.

There are 21 buildings, including a 20x40′ frame machine-shop, a frame carpenter-shop, an 18x32′ smithy, boiler-house, engine-house, office and dwellings. The Hermina railroad, 5 miles long, of standard gauge, equipped with one locomotive and 10 cars, connecting the mine with the Canadian Pacific railway, is owned by the company.

The smelter, at Thessalon, Algoma, Ontario, is owned by a subsidiary corporation, the Algoma Custom Smelting & Refining Co., and is described under that title. Production was begun circa Nov. 1, 1908, when there were about 8,000 tons of ore on the dump. The company estimates earnings of $371,000 yearly, on a production of 115 tons of ore daily, which figures are not likely to work out in practice. The property has considerable good ore, though not in the best of shape for extraction, being somewhat bunchy.

HERMIONE COPPER MINES, LTD. **GREECE.**

Letter returned unclaimed from former office, 2 City Road, London, E. C., Eng. Edw. Riley & Co., managers; Wm. Taylor, secretary. Organized Apr. 6, 1905, under laws of Great Britain, with capitalization £140,000, shares £1 par; issued, £7. Succeeded Greek Minerals, Ltd., to acquire the Hermione mine, consisting of the Thermissy and Carcas concessions, in the districts of Hermione and Spetzia, Greece. Idle and moribund.

HERMIT GOLD & COPPER MINING & SMELTING CO. **ARIZONA.**

Dead. Formerly owned the Hermit group in Coconino county, Arizona.

HERMIT LAKE COPPER CO. **COLORADO.**

Office: 31 Milk St., Boston, Mass. Mine office: Silver Cliff, Custer Co., Colo. John H. Norton, president; Oliver J. Kimball, secretary; W. S. Elmendorf, superintendent. Organized 1899, under laws of Maine, with capitalization $2,000,000, shares $20 par. Ores carry gold and copper. Has water power and a 20-stamp mill. Idle and apparently moribund.

HERMOSA COPPER CO. **NEW MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: Hanover, Grant Co., N. M. Anson W. Burchard, president; M. F. Westover, secretary; D. M. Riordan, treasurer and general manager; Henry N. Darling, assistant treasurer; L. B. Judson, assistant secretary. Organized July 20, 1905, under laws of New Jersey, with capitalization $100,000, shares $100 par. Corporation Trust Co., New York, registrar. Annual meeting, first Monday in June.

The mines were discovered circa 1800, and opened 1880, but were worked *intermittently*, owing to various Indian troubles and lack of funds, until taken over, 1904, by the present owner, which practically is the General Electric Co., one of the strongest corporations of the United States.

Lands, 114 claims, area circa 2,200 acres, held partly in fee and partly under option, all in the Central or Hanover district. Lands include the Ivanhoe and Humboldt mines, which are the more important, also the Copper Queen, Treasure Vault, Wild Cat, Ninety, Tourmaline, and other mines and attempts at mines. Country rocks are porphyry, granite, quartzite and lime-

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stone, showing various contact deposits between granite and limestone, with porphyry intrusions, ores occurring as lenticular bodies, in veins with a generally northeasterly and southwesterly strike, and an average dip of circa 45°. Four different ore bodies are being developed, these ranging 15′ to 20′ in width, with a known depth of 410′ and known length of 2,000′. Development is by shafts, as follows: Ivanhoe, 350′; Ninety, 410′; Treasure Vault, 325′; Wild Cat, 410′; Humboldt, 300′; Copper Queen, 200′; Tourmaline, 300′; Mabel, 200′. All shafts show ore, and the various mines have about 3 miles of workings, estimated to show 100,000 tons of ore, with 25,000 tons blocked out for stoping. The property shows large bodies of low grade concentrating ore, carrying average values of 3% copper, 3 oz. silver and slightly under $1 gold per ton, with small quantities of lead near the surface, and occasional traces of zinc, but not in sufficient quantities to materially hamper reduction.

Equipment includes a 700-h. p. steam plant, with 7 hoists, good for 500′ to 1,000′ each, and 4 Sullivan air-compressors, of 26 drills aggregate capacity. Buildings include a 20x40′ machine-shop and smithy, a 40x100′ carpenter-shop and framing-mill, warehouse, sawmill, etc., with a total of 20 buildings, all of wood. The 40x90′ concentrator, of 100 tons rated daily capacity, built by a former management, was altered and used for experimental purposes. Equipment includes a No. 14 Blake crusher, 2 sets of rolls, 1 Hartz jig, 5 Overstrom tables, 2 Wilfley tables, 7 screw sizers, 1 hydraulic sizer and 1 Huntington mill.

Considerable systematic development was done, based upon estimates of tonnage by eminent engineers, but results did not come up to expectations. Though some very good ore bodies were found, they were not of sufficient size to make the property profitable. Further work may be done at a later date.

MINA LAS HERRERIAS. **SPAIN.**

Held by Bede Metal & Chemical Co., Ltd.

HERSTELLE-ELY COPPER CO. **NEVADA.**

Office: 20 Broad St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. Seward H. Fields, secretary. Organized circa February, 1907, under laws of Maine, with capitalization $1,000,000, shares $1 par.

HESPERUS GOLD & COPPER MINES CO. **BRITISH COLUMBIA.**

Office: care of Samuel P. Brannan, secretary, 709-145 La Salle St., Chicago, Ills. Mine office: Grand Forks, Boundary district, B. C. Chas. J. Magee, president; T. H. Rae, managing director. Organized February, 1903, with capitalization $1,000,000, shares $1 par. Property includes the Betts, Hesperus, Lancaster and Chicago claims, on Hardy Mountain, circa 4 miles from Grand Forks, developed by several hundred feet of crosscuts and shafts, showing good bodies of cupriferous pyrrhotite, opened by an 825′ tunnel. Has done about 3,000′ of diamond drilling.

HETTA MOUNTAIN GROUP. **ALASKA.**

Mine office: Coppermount, Prince of Wales Island, Alaska. Lands, 8 claims, near Copper Harbor, said to show a vein 2′ to 20′ wide and 3,000′ long, averaging 10% copper, 3 oz. silver and $2 gold per ton, which is an exaggeration. Idle.

HETTIE GREEN MINE. **BRITISH COLUMBIA.**

Office and mine: care of James Thompson, owner, Alberni, Vancouver Island, B. C. Lands, on Tranquil Creek, Bear River district, Clayoquot division, give a fair showing of chalcopyrite, with occasional bornite. Shipped, 1905, circa 200 tons of ore to the Tyee smelter.

HIAWATHA GOLD & COPPER MINING CO.

Office: Coronado Bldg., Denver, Colo. Location of lands, if any, unknown. Apparently a stock-jobbing outfit.

HIBBE GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: Sheridan, Cal. N. H. Kaichner, president; Geo. Grutman, secre-

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tary and treasurer. Organized 1903, with capitalization $75,000, to operate in California. Idle and apparently moribund.

HIBERNIAN COPPER SYNDICATE, LTD. IRELAND.

Dead. Organized May 7, 1907, with capitalization £2,000, shares £1 par; liquidated Oct. 25, 1907. Formerly in Ireland.

HIBIRA MINE. JAPAN.

Mine office: Kitakata-mura, Higashi-Usuki-gori, Hyuga, Japan. Property is located on the eastern bank of the Tsunansegawa, a branch of the Gokasegawa river, giving deep water transportation. The property is an old mine, which was a considerable producer at the close of the Seventeenth Century.

Property carries mainly cupriferous pyrite, with some chalcopyrite, averaging 5 to 6% in copper tenor, in lenses with maximum thickness of 20', occurring in clay-slate and sandstone. Production was 1,769,498 lbs. fine copper in 1900, 2,166,102 lbs. in 1906, and 1,880,839 lbs. in 1907.

HICKEY COPPER, LTD. TRANSVAAL.

Office: Exploration Bldgs., Johannesburg, Transvaal. Louis L. Playford, Hon. W. A. Martin, A. Keeling and M. C. Inglis, directors; Ball & Stuart, secretaries. Organized August, 1908, under laws of Transvaal, with capitalization £3,000. Lands are 288 base metal claims, on the Motale and Lumbuvi rivers, in the Zoutpansberg district, showing a vein carrying chalcocite assaying up to 40% copper, said to be traceable 4 miles, opened by several prospecting shafts.

J. P. HICKS & CO. TENNESSEE.

Mine office: Bristol, Sullivan Co., Tenn. Lands are slightly developed, showing copper. Idle some years.

HIDACHI MINE. JAPAN.

Mine office: Hidachi-mura, Taga-gori Hitachi, Japan. Production was 577,560 lbs. fine copper in 1906, and 1,775,417 lbs. fine copper in 1907. Is a new property of considerable promise.

HIDALGO COPPER MINING & SMELTING CO. MEXICO.

Mine and works office: Zimapán, Hidalgo, Mex. Capitalization $2,000,000, shares $10 par, in half preferred and half common shares. Lands, 13 hectares, including 9 leased mines. The Concordia and Purisima mines produce mainly silver-lead ores, but property also has argentiferous copper ores. Smelter has a 25-ton lead stack and 30-ton copper stack.

HIDALGO MINING CO. MEXICO.

Mine office: Moctezuma, Sonora, Mex. Wm. Adamson, president; Capt. John Birmingham, general manager; E. L. Mahoney, superintendent. Organized under laws of Arizona, with capitalization $3,500,000, shares $1 par. Lands, 80 pertenencias, area 198 acres, in 3 groups, known as the Hidalgo group of 11 hectares, Pilares group of 9 hectares and Batamole group of 71 hectares, lying 4 miles from the Nacozari railroad and circa 6 miles west of Moctezuma Copper Co. Property shows an ore body of 40' to 200' estimated width, occurring as a contact deposit between granite and limestone, with a 12' paystreak carrying mainly chalcopyrite and bornite, with occasional cuprite and melaconite, assaying 15 to 30% copper and up to 500 oz. silver per ton, with some lead. Mine has a 135' tunnel and 300' shaft, with about 3,000' of workings. A spring on the property carries water assaying up to 6.5 grains copper per gallon. Property considered promising and management good. Presumably idle.

HIDDEN TREASURE MINES CO. NEVADA.

Mine office: Ely, White Pine Co., Nev. Organized circa February, 1907. Presumably idle.

HIDDEN TREASURE MINING CO. MONTANA.

Office and mine: Higgins Blk., Missoula, Missoula Co., Mont. John P.

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Graves, agent. Organized circa May, 1908. Lands, 6 claims, patented, in the Wallace district, carrying 3 contact veins between slate and porphyry, main vein being said to show 40′ of concentrating ore, and a 30″ paystreak of sulphide ore giving smelter returns of 13% copper, 28 oz. silver and $5.50 gold per ton, average value of ore being estimated, by former owner, as 6% copper, 12 oz. silver and $3.75 gold per ton, which probably is too high. Mine is opened by shafts of 68′ and 149′, and by tunnels of 558′ and 1,300′, with circa 3,000′ of workings. Made small shipments, 1905-1906, under former ownership, to the East Helena and Tacoma smelters.

HIDDEN TREASURE MINING & MILLING CO. **WASHINGTON.**

Office: 428 Pacific Blk., Seattle, Wash. Mine office: Methow, Okanogan Co., Wash. Jas. West, treasurer and general manager. Organized 1896. Has a fissure vein of 2′ to 4′ average width, with occasional chutes of 8′ to 10′ width, traversing gneiss and carrying auriferous and argentiferous galena, sphalerite and chalcopyrite, with quartz and calcite gangue. Smelter shipment of 90 tons gave returns of $67 per ton. Presumably idle.

HIDDEN TREASURE MINING & TUNNELSITE CO. **WYOMING.**

Office: 1106 O St., Lincoln, Neb. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. John T. Dorgan, secretary; H. M. Rice, manager. Lands, 9 claims, patented, having about 950′ of tunnels, said to give a promising showing of auriferous and argentiferous copper ores. Idle.

HIGASHIYAMA MINE. **JAPAN.**

Mine office: Higashiyama-mura, Oe-gori, Awa, Japan. Ore is chalcopyrite, associated with iron pyrites, occurring in lenses lying in quartz schist, and averaging 2 to 2.5% copper. Latest recorded production, 1898, was 104,424 lbs. fine copper. Idle.

HIGGINS DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Very fully described Vols. IV and V.

HIGGINS MINE. **ARIZONA.**

Office: care of Thos. Higgins, owner, Los Angeles, Cal. Mine office: Bisbee, Cochise Co., Ariz. Fully described, under title Higgins Development Co., Vols. IV and V.

HIGHLAND BOY CONSOLIDATED MINING CO. **UTAH.**

Dead. Wound up, 1906. Formerly at Bingham Canyon, Salt Lake Co., Utah. Described Vol. VI.

HIGHLAND BOY GOLD & COPPER MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Is controlled, through stock ownership, by Utah Consolidated Mining Co., and property is described under title of latter.

HIGH ORE GOLD & COPPER MINING CO. **MONTANA.**

Office: care of Mrs. Ella Knowles Haskell, secretary, Butte, Mont. Letter returned unclaimed from former mine office, Basin, Jefferson Co., Mont. Organized under laws of Montana, with capitalization $150,000, shares $1 par. Lands are several patented claims and 2 water rights, 5 miles from Basin. Mine has a 1,900′ tunnel, showing ore of fair grade. Idle several years.

HIGH ORE MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

HIGH TOP COPPER MINING CO. **VIRGINIA.**

Office: 1552-150 Nassau St., New York, N. Y. Mine office: Elkton, Rockingham Co., Va. Morris D. Brown, president; Prentice W. Brown, secretary and treasurer; S. D. Brown, general manager. Lands, circa 1,000 acres, in Greene county, Virginia, 7 miles from the Norfolk & Western railroad, said to show 3 wide fissure veins, carrying carbonate and sulphide ores, latter claimed to contain average values of 6% copper, 10 oz. silver and $15 gold per

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ton, which is entirely too high. Apparently development consists of a 140′ shaft and some open-cuts. Has steam power. Idle and apparently moribund.

HIGLEY MINE. **VERMONT.**

Mine office: Corinth, Orange Co., Vt. Suspended, circa November, 1907, on account of low price of copper.

MINA LA HIGUERA. **CHILE.**

Mine office: Higuera, La Serena, Coquimbo, Chile. Was a small producer at last accounts.

HIKO NEVADA MINING CO. **NEVADA.**

Mine office: Hiko, Lincoln Co., Nev. Is said to have a 3′ vein, traceable some distance, giving average assays of 4.1% copper, 6.3% lead and 46 oz. silver per ton. Presumably idle.

MINA HILDA. **CHILE.**

Mine office: Higuera, La Serena, Coquimbo, Chile. Richard H. Everitt and Juan Bode, owners and managers. Lands, 2 pertenencias, area 10 hectares, 12 miles north of Higuera, carrying 3 parallel veins in diorite and granite. Main vein, circa 30′ wide, at surface, shows chrysocolla and carbonate ores of *good tenor*, opened by shafts of 20′ and 50′ Ore, as produced, averages about 15% copper, after selection, and is sold to the Sociedad Minera San Juan. Completion of a projected railroad will permit shipment of low grade ores, of which the mine apparently possesses large quantities.

HILETA GOLD & SILVER MINING CO. **MEXICO.**

Mine office: Velardeña, Cuencamé, Durango, Mex. Carter Barker, general manager. Lands, 79 acres, also 63 acres miscellaneous lands, including the Hileta or Yleta, San Mateo and Santa Rita mines, latter being the principal property, adjoining the Velardeña mines. Country rocks are limestone and porphyry, showing 5 veins, of which one, of 12″ to 3′ width, opened by a 1,600′ tunnel, with about 4,000′ of workings, carries ore said to average 2% copper, 7% lead, 5% zinc, 60 oz. silver and $4.50 gold per ton. Equipment includes a steam plant, with two hoists, good for 1,000′ each, and a 4-drill air-compressor.

HILLMAN COPPER CO., LTD. **ONTARIO.**

Office and mine: Sault Ste. Marie, Algoma, Ont. T. W. Trotter, president; Edw. Ewing, vice-president; Hugh McKinnon, secretary and treasurer. Organized 1907, under laws of Ontario, with capitalization $60,000, shares $10 par, as a holding and promotion company, with the plan of floating a larger company later. Lands, 640 acres, in the township of Aweres, near the Root River mine, on the main line of the Algoma Central railway, showing ore assaying up to 10% copper and 8 oz. silver per ton.

HILLSBORO CONSOLIDATED MINES CO. **NEW MEXICO.**

Dead. Was a swindle. J. N. A. Connor was president and general manager. Succeeded the Philadelphia Mining & Milling Co. Formerly at Hillsboro, Sierra Co., N. M.

F. C. HILLS & CO. **SPAIN.**

Operators of Compañía del Ferrocaril y Minas del Buitron.

HILLSIDE COPPER MINING CO. **NEVADA.**

Dead. Merged, June 4, 1906, in Bristol Consolidated Mines & Smelting Co Formerly at Pioche, Lincoln Co., Nev. Described Vol. VI.

HIMMELFAHRT FUNDGRUBE. **GERMANY.**

Office: care of Kgl. Sächs. Staatsfiskus, Dresden, Germany. Mine office: Freiberg, Saxony, Germany. K. Stephan, manager. Is owned and operated by the Saxon Crown, employing circa 1,000 men, and is a producer of silver-lead ores, with small incidental production of copper.

HINDS CONSOLIDATED MINING CO. **MEXICO.**

Office: 1 Wall St., New York, N. Y. Mine office: Santa Bárbara, Hidalgo, Chihuahua, Mex. Howell Hinds, president and general manager; R. W.

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Cavanaugh, vice-president and secretary; Wm. W. Elmer, mine superintendent. Organized circa 1907, with capitalization $5,000,000, shares $1 par. Lands include the Santa Gertrudis, La Reforma, Los Medios and Clarinas mines, circa 3 miles west of Santa Bárbara, showing 3 parallel fissure veins of 4′ to 30′ width, outcropping for about one mile, carrying sulphide ores. La Reforma mine gives ore assaying up to 20% lead and 2% copper, with silver values. Other mines carry gold ores. Idle at last accounts.

HINSDALE TUNNEL & REDUCTION CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. H. S. Bushnell, superintendent. Succeeded, circa 1907, the Henson Creek Lead Mines Co. Lands, known as the Bonanza group, carry auriferous and argentiferous lead and copper ores. Has water and electric power and a 50-ton concentrator.

HIRAKANE MINE. **JAPAN.**

Mine office: Nibukawa, Rikuchu, Japan. T. Yokoyama, owner; S. Tsubouchi, superintendent. Has argentiferous copper ores, 1906 production being 960,351 lbs. fine copper and 988,519 grams silver. Largest recorded production, in 1903, was 1,169,637 lbs. fine copper. Property has steam and electric power.

HISAMUNE MINE. **JAPAN.**

Mine office: Kawada-mura, Oe-gori, Awa, Japan. Is a comparatively new property. Ore, which is chalcopyrite, slightly argentiferous, and averaging 4% copper, occurs imbedded in clay-amphibolite, beds ranging 2′ to 5′ in thickness. Production, 1899, was 112,196 lbs. fine copper. Idle.

HISANICHI MINE. **JAPAN.**

Mine office: Nakagawa-mura, Senhoku-gori, Ugo, Japan. Main vein has a strike of North 60° East, with steep dip to North of Northwest, and is 1′ to 4′ in width, carrying chalcopyrite associated with galena, sphalerite and pyrite, all slightly argentiferous, principal values being in copper and silver. Production, 1900, was 566,268 lbs. fine copper and 134,074 momme silver, increased, 1906, to 1,444,464 lbs. fine copper and 1,012,012 grams silver, and again increased, 1907, to 1,574,499 lbs. fine copper and 229,680 momme fine silver. Management is progressive.

H. J. & F. H. COPPER MINING CO. **NEW MEXICO.**

Letter returned unclaimed from former mine office, La Luz, Otero Co., N. M. F. W. Hunt, general manager; M. J. Cox, superintendent. Lands, in the Highrolls district, include the old Courtney mine, 8 miles east of La Luz, carrying argentiferous lead and copper sulphides. Made considerable shipments, 1907, to El Paso smelter.

HOFMAN CLAIMS. **CALIFORNIA.**

Office and mine: Ukiah, Lake Co., Cal. Lands, 4 claims, showing carbonate and sulphide ores assaying 6% copper, 2 oz. silver and $5 gold per ton. Idle several years.

HOGASHO MINE. **JAPAN.**

Mine office: Hatayama-mura, Aki-gori, Tosa, Japan. Ore is chalcopyrite, associated with pyrite, averaging about 7% copper, and occurs in lenses in country rocks of shale and sandstone, with intercalated red and green schalkstein. Latest recorded production, 1900, was 138,032 lbs. fine copper. Presumably idle.

GEWERKSCHAFT HOHENSTAUFEN. **GERMANY.**

Mine office: Essen, Rheinprovinz, Germany. W. Brandenburg, president. Produces yearly about 3,000 metric tons of zinc and copper ores, zinc values predominating.

HOKOISHI MINE. **JAPAN.**

Mine office: Kamo-mura, Nii-gori, Iyo, Japan. Ore is chalcopyrite, associated with pyrite, averaging 3.5 to 4% in copper tenor, occurring in narrow

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veins of 12" average width, traversing chlorite-amphibolite. Production, 1900, was 52,373 lbs. fine copper. Presumably idle.

HOLDEN EXTENSION GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Chelan, Chelan Co., Wash.

HOLDEN GOLD & COPPER CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Chelan, Chelan Co., Wash. J. H. Holden, vice-president; Chas. H. Wolf, secretary; A. L. White, treasurer; Wm. Yolen Williams, general manager.

Lands, 3 claims, area 60 acres, on Railroad Creek, near Lake Chelan, opened by 3 tunnels, longest 500', with circa 2,000' of workings on 3 levels, and numerous open-cuts, showing a vein of 40' to 185' width, carrying low grade auriferous copper ores. New management is strong and experienced, and the property, though low in grade, has large ore bodies, and is considered promising.

HOLLAND GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Princeton, Similkameen division, Boundary district, B. C.

HOLLIS MINING CO. **NEVADA.**

Office: 171 Broadway, New York, N. Y. Mine office: Ely, White Pine Co., Nev. W. A. Douglas, president and general manager; Samuel Marshall, vice-president; E. L. Hollis, secretary and treasurer.

HOLLOWAY MINE. **VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. Property, the old Holloway or Eustis mine, 6 miles north of Virgilina, first worked previous to the American Civil War, shows sulphide ores, mainly chalcopyrite, carrying small gold and silver values. Was a small producer, 1900-1903. Idle.

HOLMES LIME CO. **CALIFORNIA.**

Office: Mutual Savings Bank Bldg., San Francisco, Cal. Mine office: Newcastle, Placer Co., Cal. Lands, 180 acres, known as the Alabaster Cave group, 7 miles east of Newcastle, showing a strong gossan, traceable several miles. Vein, between limestone and slate, is 12' to 20' wide, with a paystreak of 3' to 8', said to carry 4% copper ore. Idle several years.

HOLMES MINING & MILLING CO. **WISCONSIN.**

Office and mine: Mellen, Ashland Co., Wis. C. A. Poundstone, president; John Holmes, vice-president; A. W. Peterson, secretary and general manager. Organized 1902, under laws of Wisconsin, with capitalization $150,000, shares 25 cents par. Lands, 80 acres, in the Penokee district, showing 3 veins carrying native copper and sulphide copper ore assaying 30 oz. silver and $3.70 gold per ton, opened by a 140' shaft. Idle several years.

HOME COPPER CO. **ARIZONA.**

Office and mine: Morenci, Graham Co., Ariz. H. J. Degener, president; W. A. Leonard, vice-president; W. P. Gee, secretary and treasurer; N. L. Jenkins, superintendent. Organized April, 1901. Lands, 35 claims, area circa 700 acres, in 2 groups, also a millsite on Eagle River. The Peacock group of 23 copper claims, about one mile southwest of Morenci, is opened by an 85' shaft and by tunnels of 150' and 700', latter giving a 500' back. Ores are carbonates and oxides, with some chalcocite, also a wide ledge of low grade ore too lean for present working. The Buzzard Shadow group of 12 claims, across Gold Gulch, about one mile north of the Peacock group, shows a wide quartz vein carrying gold ore worth up to $50 per ton, slightly developed by tunnel and shaft. A $125,000 bond on the property was surrendered, 1906. Idle, but plans diamond drilling.

HOME COPPER CO. **WASHINGTON.**

Mine office: Cle-Elum, Kittitas Co., Wash. Idle and apparently moribund.

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HOME COPPER MINING CO. **MICHIGAN.**

Mine office: Copper Falls, Keweenaw Co., Mich. Lands, 240 acres, adjoining the Humboldt mine, in Town 57 North, Range 32 West. Did a little exploratory work, circa 1864. Never a producer and long idle.

HOME COPPER MINING CO. **MONTANA.**

Dead. Disincorporated, 1903, with all debts paid. Formerly at Copperopolis, Meagher Co., Mont.

HOME GOLD & COPPER CO. **NEW MEXICO.**

Dead. Formerly at Cooney, Socorro Co., N. M.

HOME GOLD & COPPER CO., LTD. **ONTARIO.**

Dead. Formerly infested Ontario. Described Vols. IV and V.

HOME RUN COPPER MINING CO. **WYOMING.**

Office: 34 Giddings Bldg., Colorado Springs, Colo. Letter returned unclaimed from former mine office, Rudefeha, Carbon Co., Wyo. A. L. Bohrer, president; J. F. Humphrey, vice-president; Adolph Fehringer, treasurer; Wm. C. Robinson, secretary. Capitalization $1,500,000, shares $1 par. Lands, 180 acres, partly patented, known as the Copper Bell group, near the Ferris-Haggerty mine of the Penn-Wyoming Copper Co., having a 350′ tunnel showing a vein of 30″ to 9′ width, giving assays up to 12% copper, with gold and silver values. Was developing with a small force at last accounts.

HOMESTAKE MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Rossland, Trail district, B. C. Ores carry gold, silver and copper. Idle some years and apparently moribund.

HOMESTAKE MINING CO. **ARIZONA.**

Dead. A petty swindle that advised investors to withdraw their money from savings banks before they "busted," and put it in Homestake, "sure to pay one per cent per month." Formerly at Jerome, Yavapai Co., Ariz.

HOMESTEAD COPPER, GOLD & SILVER MINING CO. **WISCONSIN.**

Office and mine: Iron Mountain, Dickinson Co., Mich. Eric Hager, president; Andrew Nelson, secretary; E. W. Holm, treasurer. Organized 1906, under laws of Wisconsin, with capitalization $1,000,000, shares $1 par. Lands, 5 miles south of Iron Mountain, are in Florence county, Wisconsin. Has 2 shallow shafts, deepest circa 100′, showing a vein 2″ wide at surface, with extreme width of 18″ at depth, giving assays, from selected samples, up to 10% copper and circa $3 per ton in combined gold and silver values. Idle.

HOMESTEAD COPPER MINES CO. **OREGON.**

Mine office: Homestead, Baker Co., Ore. L. L. Carter, superintendent. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $2 par.

HONERINE EXTENSION MINING CO. **UTAH.**

Mine office: Stockton, Tooele Co., Utah.

HONERINE MINING & MILLING CO. **UTAH.**

Mine office: Stockton, Tooele Co., Utah. F. A. Baird, president; C. M. Dupont, secretary; Chas. O. Ellingwood, general manager; W. K. Murdock, superintendent. Has a 10,800′ drainage and transportation tunnel, on the 1,300 level, costing circa $1,000,000. Ore is mainly silver-lead, with more or less copper secured as a by-product, smelting ore averaging about 50% lead, 3% copper, 30 oz. silver and $1.50 gold per ton, and concentrating ore averaging 15% lead, 1% copper, 12 oz. silver and 80 cents gold per ton. Has a 300-ton mill putting about 3½ into 1, which is said not to have been a metallurgical success. Company, in connection with its twin, the Honerine Tunnel & Milling Co., owed, 1908, the sum of $222,292.66, and was to be sold by the sheriff.

HONERINE TUNNEL & MILLING CO. **UTAH.**

Mine office: Stockton, Tooele Co., Utah. A twin of the Honerine Mining & Milling Co., and very closely connected with same.

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HONEST ENDEAVOR MINING CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. B. W. Wooding, president; Elmer *Hoff*, vice-president; C. S. Wood, secretary; F. D. Goodale, treasurer and general manager. Organized 1907, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, 4 claims, area 80 acres, west of Yerington, having an 80′ shaft showing a vein up to 3′ in width, giving assays of 19% copper, with small gold and silver values. Has gasoline power.

HONEYBUGLE COPPER MINES, N. L. **AUSTRALIA.**

Office: 93 Pitt St., Sydney, Australia. Mine office: Canonbar, Nyngan, N. S. W., Australia. Colin Y. Caird, chairman. Organized 1907, under laws of New South Wales, with capitalization £3,000, shares £1 par. Lands are isolated and arid, but show an ore body, apparently of considerable size, which is under development.

COMPAGNIE HONGROISE DES MINES. **HUNGARY.**

Office: Brussels, Belgium. Mine office: Urvölgi, Hungary. Comte C.-F. de Ferré de Peroux, chairman. Organized February, 1903, under laws of Belgium, with capitalization 1,500,000 francs. Dividend, for fiscal year 1906, was 7 francs 50 centimes. Controls, through stock ownership, the Société de La Mine de Cuivre Urvölgi, which owns the Urvölgi mines in Hungary.

HONJYO COPPER WORKS. **JAPAN.**

Owned by Furukawa Mining Co.

HOOSIER COPPER MINING & MILLING CO. **WYOMING.**

Office: Shelbyville, Ind. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Capitalization $1,500,000, shares $1 par. Lands, 9 claims, area 180 acres, developed by a shallow shaft, said to give a fair showing of medium grade ore. Idle and apparently moribund.

HOP CAÑON MINING & SMELTING CO. **NEW MEXICO.**

Office: 85-163 Randolph St., Chicago, Ills. Mine office: Magdalena, Socorro Co., N. M. Alpheus McCallum, president; Elias G. Raffety, secretary and treasurer. Capitalization $1,000,000, shares $1 par. Lands, 6 claims, area 120 acres, 3 miles from a railroad, in the Hop Cañon district, showing ores carrying copper, lead, zinc, silver and gold. Idle.

HORACE GREELEY & SACRED MINING CO. **UTAH.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah.

COMPAÑIA MINERA LAS HORMIGAS. **MEXICO.**

Mine office: Charcas, Moctezuma, San Luís Potosí, Mex. J. J. Murphy, superintendent, at last accounts. Has argentiferous copper ores.

HORN SILVER MINING CO. **UTAH.**

Office: 17 Battery Place, New York, N. Y. Mine office: Frisco, Beaver Co., Utah. Allan C. Washington, president; Juan M. Ceballos, vice-president; Ambrose L. Harrison, secretary and treasurer; Philo T. Farnsworth, manager. Organized 1879, under laws of Utah, with capitalization $10,000,000, shares $25 par.

The company has paid dividends of $5,642,000, to end of 1907, dividends for 1907 being $60,000, though the quarterly dividend due December, 1907, was passed.

Mine is extensively developed, and is a considerable producer of zinc, lead, silver and gold, securing a little copper as a by-product, the 1906 production having been 129 tons copper ore, of about 15% average tenor. The old Bonanza mine carries good values at a depth of 800′, showing silver ores on the footwall, with a little copper ore on the hanging-wall. Equipment includes a 30-stamp mill.

Production, 1906, was valued at $188,000, and for 1907 amounted to $110,181. Production, 1907, was 3,583,355 lbs. lead, 24,508 lbs. copper, 1,244,182 lbs. zinc, 206,537 oz. silver and 2,841 oz. gold. Largest annual copper output

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was 717,353 lbs., in 1902. Mining was suspended, circa 1907, for first time in 20 years, because of temporary inability to market ore.

HORSESHOE COPPER CO. IDAHO.

Mine office: Mackay, Custer Co., Idaho. D. E. McCallum, manager. Lands, 17 claims, adjoining the White Knob mine of the Empire Copper Co., on the north. Presumably idle.

HORSE SHOE COPPER MINING CO. ARIZONA.

Dead. Was a brazen swindle for which directors were jailed. Formerly at Safford, Graham Co., Ariz. Described Vol. V.

HORSESHOE GOLD MINING CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. Property is the Barnes mine, carrying gold, silver and copper ores. Presumably idle.

HORSE SHOE MINING CO. WASHINGTON.

Office: 231 Epler Blk., Seattle, Wash. Letter returned unclaimed from former mine office, North Bend, King Co., Wash. Swan Hansen, president and general manager; E. G. Moe, vice-president; S. P. Battleson, secretary and treasurer; preceding officers, Thos. Jones, O. E. Olson and O. Battleson, directors. Capitalization $1,000,000, shares $1 par. Lands, 11 claims, with 2 millsites and several water rights, well watered and timbered, 12 miles east of North Bend, carrying a vein up to 25′ in width, opened by 2 tunnels showing chalcopyrite assaying 8 to 32% copper, with gold and silver values. Idle and presumably moribund.

HORSFAL MINING CO. COLORADO.

Dead. Formerly at Gold Hill, Boulder Co., Colo.

HOUGHTON ALASKA EXPLORATION CO. ALASKA.

Office: Houghton, Mich. Mine office: McCarthy Creek, Copper River district, Alaska. Ocha Potter, manager; Prof. Arthur E. Seaman, consulting engineer. Organized circa 1905, under laws of Michigan, with capitalization $500,000.

Lands, 26 claims, area 380 acres, of which 12 claims, area 180 acres, are in process of patenting, with balance of claims held by location, also a 5-acre millsite and 160 acres placer lands, held for townsite and general purposes. Lands adjoin the Bonanza group of the Kennicott Mines Co., on the northeast, and are on the McCarthy Creek slope of the divide, the Bonanza group being on the Kennicott slope. About 1,000 h. p. is available from McCarthy Creek, for a hydro-electric installation.

The Bonanza fault, traceable circa 7,000′, consists of 6″ to 12′ width of brecciated limestone, with variable mineralization, latter occasionally up to 100′ in width, on the fault and along the stratification planes of intersecting veins. The Bonanza fault has a series of fissures cutting the main fault, with mineralization along both, at and near the points of intersection, but where other fissures intersect the cross-fissures, only the Bonanza fault is mineralized. Ore is exclusively chalcocite, except at surface, where sometimes broken down to carbonates, and the ore is pockety. Development consists of only 123′ of tunnels, as all work is exceedingly expensive and there is no particular object in developing extensively until transportation facilities are secured. It is hoped to have mixed rail and water shipping facilities, early 1909, by a steamer on the Chitina River, 24 miles to a railroad under construction. Management is good, and property is second only to the Bonanza mine in promise among all the copper properties of the Copper River district.

HOUGHTON CONCENTRATING CO. MICHIGAN.

Office and works: Houghton, Houghton Co., Mich. Livingston Whitney, president; Geo. F. Chauncey, vice-president and treasurer; Alfred Schwarz, agent. Organized under laws of New York, practically as successor of Copper Concentrating Co., described Vol. VII. Property is the entire stock issue of

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the Mason Manufacturing Co., which owns a lease of the Quincy sands, and property is described under title of latter-named corporation.

HOUGHTON DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vols. IV and V.

HOULIHAN GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. J. T. Whedon, president; Geo. Houlihan, vice-president; Geo. C. West, secretary and treasurer. Has a 100′ shaft, said to cut a 35′ vein. Idle several years.

HOUSTON-ARIZONA COPPER CO. **ARIZONA.**

Mine office: Wickenburg, Maricopa Co., Ariz. Wm. Owens, superintendent. Property is said to have 1,800′ of workings.

HOWARD COPPER CO. **MONTANA.**

Dead. Formerly at Philipsburg, Granite Co., Mont. Described Vol. VI.

HOWARD COPPER CO.

Office: 451 Equitable Bldg., Baltimore, Md. Location of lands, if any, unknown.

HOWARD MINING CO. **VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. C. N. Howard, general manager. Lands include the Chappel mine, 10 miles from Virgilina, adjoining the High Hill mine of the Virgilina Copper Co. on the northeast, also a gold property, about 4½ miles north of Virgilina. Idle.

HOWELL MINING CO. **ARIZONA.**

Dead. Lands sold, circa 1901, to American Copper Co. Formerly at Humboldt, Yavapai Co., Ariz.

HOWE SOUND MINING CO. **BRITISH COLUMBIA.**

Office: care of Moore & Schley, 50 Broadway, New York, N. Y. Mine office: Howe Sound, New Westminster district, B. C. Grant B. Schley, president. Organized under laws of Maine, with capitalization $2,000,000, shares $500 par. Was planned as a holding company, to take over control of the Britannia Copper Syndicate, Ltd., and Britannia Smelting Co., Ltd. Apparently out of business.

HUACHUCA CONSOLIDATED DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Palmerlee, Cochise Co., Ariz. Described Vol. VII.

SOCIEDAD MINERA HUACHUMACHAY. **PERU.**

Mine office: Morococha, Junín, Perú. Organized 1900. Lands, 10 pertenencias, known as the Santo Domingo mine, opened by tunnel. The Crucero and Octavio veins, with practically vertical dip, cross diagonally, giving a long throw on the Veta Crucero, which increased to width of about 30″, carrying ore averaging about 12% copper and 2 kilograms silver per metric ton, with quartzose gangue, the Veta Octavio being barren elsewhere. Production, 1904, was 133,152 lbs. fine copper, secured with a force of 71 men.

SOCIEDAD MINERA HUACRACOCHA. **PERÚ.**

Office: care of Dr. O. Valentine, general manager, Lima, Perú. Works office: Morococha, Junín, Perú. Property is the Fundición Huacracocha, having a concentrator and smelter. The mill has 3 stamps, 2 Blake crushers, 3 Hartz jigs, 2 Evans jigs, 1 classifier, 2 Frue vanners and 2 Wilfley tables. The smelter, 3 miles from Morococha, on the shore of Lake Huacracocha, having rail connections, is of 75 tons daily capacity, with 1 reverberatory furnace and 3 small blast-furnaces, largest 30 tons. Has a 3′ Pelton water-wheel and 30-light electric plant. Works run irregularly on custom ores of the Morococha district.

COMPAÑIA HUANCHACA DE BOLIVIA. **BOLIVIA.**

Office: 29 Rue de Londres, Paris, France. Mine office: Pulacayo, Potosí, Bolivia. E. Sénéchal de la Grange, president; Marquis J. de Gabriac, chairman French board; G. Rabut, general manager; Baron J. de Cotelin, consulting

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engineer; Segundo R. Nava, general secretary; Jorge Lewis, agent. Organized 1873, and reorganized 1891, under laws of Bolivia, with capitalization increased, 1877, and 1891, to 12,800,000 bolivars, shares 40 bolivars par, fully paid. In 1906 company earned a profit of 1,143,263 bolivars, and has paid considerable dividends.

Property is silver and copper mines, principal production being silver, though a little copper is produced from argentiferous tetrahedrite, at the company's smelter, and some copper is shipped. Company operates the Antofagasta & Bolivia railway, under lease, and has 600 miles of private telephone line.

The company has smelters at Pulacayo and Playa Blanca, latter, formerly leased by the American Smelting & Refining Co., apparently now idle. In 1907 the company shipped, to the Tacoma smelter, 1,600 tons of ore averaging 5% copper, 5% zinc and 50 oz. silver per ton, containing 160,000 lbs. fine copper.

SOCIEDAD DE MINAS I FUNDICIONES DE HUANILLOS. CHILE.

Office: Santiago de Chile. Works office: Tocopilla, Antofagasta, Chile. Organized Nov. 28, 1905, under laws of Chile, with capitalization £200,000, shares £1 par. Has a smelter with blast and reverberatory furnaces, making ejes of about 47% average copper tenor. Production, 1903, was 245,085 lbs. fine copper.

HUBBARD-ELLIOTT COPPER MINES DEVELOPMENT CO. OF ALASKA. ALASKA.

Office: 1115 Stock Exchange, Chicago, Ills. Western office: 411 New York Blk., Seattle, Wash. Mine office: Valdez, Prince William Sound district, Alaska. H. Curtis Elliott, president; H. P. Elliott, first vice-president and general manager; A. J. Elliott, secretary; John T. Evans, treasurer. Organized Jan. 6, 1904, under laws of Washington, with capitalization $1,500,000, shares $1 par. Controls, through ownership of 505,484 shares, the Knights Island Consolidated Copper Co.

Lands, 123 claims, area circa 2,500 acres, on Elliott Creek, an affluent of Copper River, interior Alaska, with 39 claims patented, and balance in process of patenting. Lands carry about 300 acres of timber, with an available waterfall, rated as capable of developing 5,000 h. p. Country rock at the Elliott Creek mine, which is near the Bonanza mine, is greenstone, the contact carrying bunches of oxidized ores and chalcocite, with extreme horizontal length of 25', limited to a few yards in depth, and apparently no clearly defined veins have been found in place in this belt of slightly crushed greenstone. Company claims that this property shows 26 fissure veins averaging 20' to 6' width, 300' to 1,000' length and 1,100' depth. Depth claimed must be based on diamond drill borings, which were made circa 1905. Development is by the 190' Ely shaft and 3 tunnels. The Elizabeth tunnel is claimed to show 31' of 20% ore. The Ely tunnel is about 160' long and the mine has about 500' of underground workings, a pitifully small amount of work to show the 600,000 tons of ore claimed by the company to be blocked out for mining, which is claimed to average 28% copper, an excessive estimate. Company claims that ores have been shown to continue unaltered for depth of 200'. Line has been surveyed for a 17-mile tramway, of 1,000 tons daily capacity, to connect mines with the Copper River & Northwestern railway. Buildings include a smithy, carpenter-shop and 4 log cabins.

Apparently the company has devoted its recent efforts mainly to the development of the Knights Island Consolidated Copper Co. Claims of the company for its Elliott Creek property not only are excessive, but are under suspicion of being deliberately untruthful. Is not regarded favorably.

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HUB MINING INVESTMENT CO. **ARIZONA.**

Mine office: Benson, Cochise Co., Ariz. Property is the Valenzuela group, in the Rincon Mountains, circa 25 miles northwest of Benson.

COMPAGNIE DES MINES DE CUIVRE DE HUELVA. **SPAIN.**

Dead. Formerly at La Granada, Huelva, Spain. Described Vol. VI.

SOCIEDAD PYRITES DE HUELVA. **SPAIN.**

Mine office: Calañas, Huelva, Spain. At last accounts property was in process of development.

HUELVA CENTRAL COPPER MINING CO., LTD. **SPAIN.**

Dead. Succeeded, 1903, by Huelva Copper & Sulphur Mines, Ltd. Formerly at Almonáster, Huelva, Spain.

HUELVA COPPER & SULPHUR MINES, LTD. **SPAIN.**

Offices: 23 Courthope Road, London, N. W., Eng., and 17 Blvd. Haussmann, Paris, France. Mine office: Cueva de la Mora, Almonáster, Huelva, Spain. Jules Roche, chairman; Chas. Blanchot, managing director; preceding officers, Max Duchanoy, Maurice Dutreil, Maurice Gabet and Vicomte de Terron, directors; G. D. Collas, secretary; J. L. Croze, assistant secretary; Baron de Pritzbuer, general manager. Organized Oct. 28, 1903, under laws of Great Britain, with capitalization £600,000, shares £1 par; issued, £486,487. Was practically a reconstruction of the Huelva Central Copper Mining Co., Ltd. Shares are listed on the Paris bourse.

Lands, 1,200 hectares, including the Monte Romero and Cueva de la Mora groups. Has leased 27 hectares, to the Tharsis Copper & Sulphur Co., Ltd., on royalty. Lands lie between the Rio Tinto and Tharsis mines, in a favorable location, and are opened by the Monte Romero, Cueva de la Mora and San Alberto shafts.

For year 1907 mining profits were £63,177 10s., from which was paid a 1s. dividend, amounting to £24,324 7s., company ending the year with a balance of £38,853 3s.

HUELVA INDUSTRIAL CO., LTD. **SPAIN.**

Office: 22 Abchurch Lane, London, E. C., Eng. Wm. Keswick, M. P., chairman; Harold B. Milne, secretary. Organized Dec. 30, 1893, under laws of Great Britain, with capitalization £100,000, shares £10 par, fully issued. Is operated as a close corporation, and apparently has some connection with the Rio Tinto Co., Ltd.

HUERFANO GOLD & COPPER MINING CO. **COLORADO.**

Mine office: Walsenburg, Huerfano Co., Colo. Organized 1902, under laws of Kentucky, to develop copper claims in the Ojo district. Idle.

HUESCA COPPER, IRON & LEAD MINES, LTD. **SPAIN.**

Dead. Formerly in province of Huesca, Spain.

HUGO COPPER MINING CO. **MONTANA.**

Office: Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Hermann Seidemann, superintendent. Organized 1907, with capitalization $1,000,000, shares $1 par. Lands, 3 claims, lying immediately east of Saltese, showing 2 veins, which should be cut by tunnel at length of circa 850′ and 1,000′ respectively. Has a 200′ tunnel with a 50′ winze, showing ore carrying 1 to 32% copper and $7 gold per ton.

SOCIEDAD MINERA HUILLCA. **PERÚ.**

Mine office: Morococha, Junín, Perú. Organized 1892. Lands, 3 pertenencias, known as La Huillca and La Vieja mines. Production, 1904, was 414 tons of 18% ore, yielding 166,491 lbs. fine copper. Employs circa 50 men.

HUINAC COPPER MINES, LTD. **PERÚ.**

Office: 101 Leadenhall St., London, E. C., Eng. Mine office: Huaraz,

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Ancachs, Perú. Col. D. Pedro Juárez, chairman; A. Ferguson, managing director; Wm. Warren, mine manager. Organized May 9, 1904, under laws of Great Britain, with capitalization £400,000, shares £1 par. Debentures, £40,000. Lands, 256 hectares, circa 30 miles from Puerto Culebra, including the Montaña de La Plata mines, carrying argentiferous copper ores. Also has anthracite coal lands 15 miles from copper property. Has been building a smelter, for several years, and expected, at last accounts, to put same in blast during 1908.

COMPAÑIA MINERA DE HUIBIÁCHIC. **MEXICO.**

Mine office: Chalchihuites, Sombrerete, Zacatecas, Mex. John Stenner, president; C. A. Phelps, treasurer and general manager, at last accounts. Ores are argentiferous and auriferous chalcopyrite and galena, developed by shaft and tunnel. Presumably idle.

HULBERT MINING CO. **MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Mine office: Leopold Bldg., Houghton, Houghton Co., Mich. Albert S. Bigelow, president; W. A. S. Chrimes, secretary; Wm. J. Ladd, treasurer; Norman W. Haire, general manager. Fred W. Nichols, agent. Lands, 1,598 acres, in Town 57 North, Range 37 West; Town 56 North, Range 33 West, and Town 55 North, Range 34 West, Houghton county, Michigan. Lands are mainly undeveloped properties, and a considerable part of the surface rights has been sold, mineral rights having been reserved by the company. Idle many years.

HULL COPPER CO. **ARIZONA.**

Office: 1505 Real Estate Trust Bldg., Philadelphia, Pa. Mine office: Jerome, Yavapai Co., Ariz. Hon. Geo. W. Hull, president and general manager; O. B. Stanton, vice-president; W. B. Hazeltine, treasurer; W. B. Wilcox, secretary; Capt. Wm. McDermott, general superintendent; J. W. Hubbard, mine superintendent. Organized 1906, under laws of Arizona, with capitalization $10,000,000, shares $1 par. Is said to have clear titles and no incumbrances. Apparently has no treasury stock, but it is understood that Mr. Hull donates 50% of profits of sales of stock to treasury, up to amount of $150,000. This arrangement cannot be regarded as giving an adequate financial basis for the development of a mine. The O. B. Stanton outfit, as fiscal agents, offered, circa 1907, to newspapers that would carry their advertisements, a 50% commission on all stock sales, showing that commissions were excessive.

Lands, 21 patented claims, area 249 acres, adoining on northwest and south the United Verde. Development is by the 1888 shaft, of 475′, located within 200′ of the United Verde smelter, which has produced a small amount of ore. Principal development is by the Dillon tunnel, of about 2,450′ length, which would connect with shaft at depth of about 3,850′ from portal, providing the tunnel is continued and shaft sunk to the point of intersection. The Dillon tunnel is quoted as showing ore of 19 to 20% copper tenor, with small gold and silver values, but has no body of commercial ore developed, despite the extremely optimistic claims made in advertisements, though the tunnel shows small bunches of ore at various points. Property has a total of about 7,000′ of workings, and it is claimed that considerable good ore has been proven by diamond drill cores, taken from the Hull lands by the United Verde, but this statement does not seem fully verified.

Property is considered promising, being perhaps the most promising of the developing mines in the United Verde district, and Mr. Hull is highly regarded personally; but the Stanton crew is viewed with deep suspicion, as utterly lost to all sense of truth, and company's advertisements claim entirely too much on the strength of the United Verde, and hold out roseate prospects to investors that lack substantial foundation.

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HUMBER CONSOLIDATED MINING & MANUFACTURING CO. NEWFOUNDLAND.

Office: 27 William St., New York, N. Y. Moribund. Formerly at York Harbour, Newfoundland. Fully described Vol. V.

HUMBOLDT-ARIZONA COPPER CO. ARIZONA.

Mine office: Humboldt, Yavapai Co., Ariz. Lands, 5 claims, near Humboldt, having an 80′ shaft.

HUMBOLDT COPPER CO. MICHIGAN.

Office: 64-50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. C. Howard Weston, president; John Brooks, secretary and treasurer; J. Wesley Clark, superintendent; preceding officers, W. C. Fisk and Ashley Watson, directors. Organized 1863, under laws of Michigan, and capitalization increased, later, to $1,000,000, shares $25 par. Amount paid in is $100,000 in real estate and $240,986.76 in cash. Annual meeting, fourth Tuesday in March.

Lands are Sections 16 and 21, former fractional, Town 58 North, Range 31 West, all on the mineral belt, about midway between the Arnold and Phoenix mines, lying north of the greenstone, with the Eagle River and Natick mines to the south. The mine was opened 1853, but never was a producer. There is a single shaft, circa 300′ deep, on the ashbed, which shows the same characteristics as at the Arnold, carrying occasional bunches of rich ground. Equipment includes an engine-house, compressor building, smithy, warehouse and 4 dwellings.

HUMBOLDT COPPER CO. NEVADA.

Office: 618 Kohl Bldg., San Francisco, Cal. E. J. Miloy, president; C. C. Darling, Jr., vice-president; M. P. Danly, secretary; preceding officers, E. B. Grace and Dr. Geo. E. Ebright, directors. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Company asserts that it has 8 claims, on Jackson Mountain, Humboldt county, Nevada, connected by a good wagon road, with a railroad 60 miles distant. Property is claimed to have circa 1,400′ of workings, showing a vein of 12′ width at surface, widening to 74′ in the lower tunnel, carrying ores that have assayed 15 to 16% copper, 3 to 5 oz. silver and $1.65 gold per ton. Company's business methods are devious.

HUMBOLDT ORE CO. ARIZONA.

Mine office: Humboldt, Yavapai Co., Ariz. Capitalization presumably $100,000. Is controlled, through ownership of practically entire stock issue, by Consolidated Arizona Smelting Co.

HUMBOLDT SMELTER. ARIZONA.

Owned by Arizona Smelting Co.

HUMBOLDT SMELTING & REDUCTION CO. NEVADA.

Dead. Was reorganized May 5, 1904, under laws of District of Columbia, with capitalization $500,000, shares $1 par. Property was sold, 1906, to Golconda Mining Co., Ltd. Officers were E. L. Labadie, president; G. A. Bretonnel, secretary; preceding officers, Geo. Haldorn, C. E. Fish, A. S. Donaldson, E. W. McCormick, E. L. Freeman and P. T. Kretschmann, directors. Former office was 520 Tenth St., N. W., Washington, D. C. Formerly at Golconda, Humboldt Co., Nev.

HUMBUG MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver and copper. Idle and apparently moribund.

HUMPHREY-ARIZONA GOLD-COPPER MINES CO. ARIZONA.

Letter returned unclaimed from former mine office, Wickenburg, Maricopa Co., Ariz. Lands, near the Rio Tonto Copper Co., east of Wickenburg, in the Picacho district, were being developed, 1907, on a small scale. Idle.

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HUNGARIAN COPPER CO. **MICHIGAN.**

Dead. Wound up circa 1898 and lands sold to Oneco Copper Mining Co. Formerly at Hancock, Houghton Co., Mich.

HUNT COPPER CO. **NEW MEXICO.**

Office: Alamagordo, N. M. Mine office: Mountain Park, Otero Co., N. M. Organized 1907. Lands, in the Highrolls district, 3 miles from Mountain Park, are said to show considerable sulphide copper ore.

HUNTERS CREEK MINING & MILLING CO. **WASHINGTON.**

Office: 1515 Masonic Temple, Chicago, Ills. Geo. W. Smith, president; M. L. Brain, secretary; Manson Rexford, treasurer. Lands, 20 claims, in Stevens county, Washington, claimed to show a vein of 18" to 40" width, assaying 17 to 20% copper. Company claims to have a 755' tunnel. Secretary Brain writes that a great injustice was done by the statement in Vol. V. that the company was alleged by shareholders to be a fraud. The annual report of the company is a curiosity, including the most remarkable financial statement ever seen by the Copper Handbook. Is in litigation, and is viewed with suspicion.

HUNT MINING & MILLING CO. **IDAHO.**

Office: 8 India St., Boston, Mass. Letter returned unclaimed from former mine office, Weiser, Washington Co., Idaho. Idle some years and moribund.

HURON GOLD CO. **ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Geo. W. Hull, president, treasurer and general manager; H. E. Wilcox, secretary. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, area 80 acres, known as the Swindler mine, in the Big Bug district, having a 125' shaft and 680' tunnel, with upwards of 1,000' of workings, showing a vein up to 18' width, carrying ore giving assays of 2.5 to 11% copper and $5 to $30 gold per ton. Is said to have 800 tons of ore on dump. Idle several years.

HURON MINING CO. **WASHINGTON.**

Office: Everett, Wash. Mine office: Darrington, Snohomish Co., Wash. Ores carry copper and gold values. Has water power. Idle several years.

HUSTON MINE. **ONTARIO.**

Office: care of John J. Case, Morococha, Junin, Perú. Mine office: Thessalon, Algoma, Ont. Lands, 1,400 acres, 15 miles north of Thessalon, showing a 60' vein, standing circa 40' high, traceable circa 3,000', with an 18' pay streak carrying sulphide ore with quartz gangue, up to 8% in copper tenor. Is but slightly developed. Idle since circa 1902.

HYATT-VERDE COPPER CO. **COLORADO.**

Office and mine: Steamboat Springs, Routt Co., Colo. B. C. Hazelbacker, manager. Was developing, 1907, on a small scale.

HYDAH COPPER CO. **ALASKA.**

Office: care of Fred J. Eitel, president, Seattle, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. J. A. Jackson, vice-president; Victor Vigelius, general manager; F. W. Crary, secretary; J. Albert Johnson, treasurer; C. H. Waters, superintendent. Organized 1906, under laws of Washington, with capitalization $60,000. Lands, known as the Mammoth group, are on the north side of Karta Bay, circa 2,000' from tidewater, developed by a 40x40' pit showing an ore body of 40' width, low in copper tenor and carrying up to $2 gold per ton. Has a tunnel connecting with upper bins, which in turn has a 2,100' tramline running to ore bunkers on the wharf, at tidewater. Shipped some ore, 1907. Property considered promising.

HYPOCKA MINING CO. **MONTANA.**

Dead. Lands sold, 1906, to Butte Coalition Mining Co. Formerly at Butte, Silver Bow Co., Mont.

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HYPOTHEEK MINING & MILLING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Kingston, Shoshone Co., Idaho. Octave Guay, president; Walter J. Bracking, vice-president; Norman Ebbley, general manager; Abraham Wyman, secretary; B. S. Knudson, treasurer; preceding officers, Frank Guay, C. W. Wingate and A. H. Conner, directors.

Lands show 3 veins, two of 10′ to 20′ estimated width, and one, known as the Great Western, under development, which is opened by a 180′ blind shaft from the breast of a 700′ tunnel, showing a vein of 8′ to 25′ width, with a 12″ to 18″ paystreak carrying native copper and cuprite, said to average 4.5% in tenor, and chalcopyrite assaying up to 16% copper, balance of vein carrying low grade ore estimated at 2% copper, with small gold and silver values. Property also shows galena, apparently undeveloped. Equipment includes a 65-h. p. boiler, 10-h. p. hoist, 5-drill air-compressor and a sawmill.

SOCIEDAD COLECTIVA IBARRA HERMANOS. **SPAIN.**

Office: Sevilla, Spain. Mine office: Cortegena, Huelva, Spain. José Luis Buiza, manager. Property is the San Telmo group of 29 old mining claims, area 222 hectares, carrying cupriferous iron pyrites.

IBEX PLOMOSA MINING CO. **ARIZONA.**

Office: Yuma, Ariz. Mine office: Bouse, Yuma Co., Ariz. Thos. L. DeSpain president; H. H. McPhaul, vice-president; Wm. C. DeSpain, secretary and treasurer; preceding officers, J. L. DeSpain and J. D. Marrs, directors. Organized 1907. Lands, circa 30 claims, and 28 claims said to have been added, early 1908, in the Plomosa Mountains, 12 miles south of Bouse, showing oxidized ores of high copper tenor, carrying up to $4.50 gold per ton.

ICONOCLAST CONSOLIDATED MINES CO. **WASHINGTON.**

Office: 412 Berlin Bldg., Tacoma, Wash. Mine office: Keller, Ferry Co., Wash. J. R. Turner, president; C. E. Peterson, secretary; Alexander McMasters, superintendent. Organized 1902, under laws of Washington, with capitalization $2,500,000, shares $1 par, as a merger of Alliance Copper Mining Co. and Iconoclast Gold & Copper Mining Co.

Lands, 7 claims, area 115 acres, circa 2 miles north of Keller, showing 3 contact deposits, one claimed by company to be 150′ wide and to carry chalcopyrite assaying 5% copper, 2 oz. silver and $5 gold per ton, which is a serious overestimate all around, property apparently having an ore body up to 30′ in width, giving average assays of 3.6% copper and 2 oz. silver per ton, with some gold. Development is by a 325′ main shaft, and 3 tunnels with claimed aggregate length of 514′, longest tunnel apparently being 120′ only. Has gasoline power. Resumed work, early 1907, after a period of idleness. Apparently idle again.

ICONOCLAST GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Absorbed, 1902, by Iconoclast Consolidated Mines Co. Formerly at Keller, Ferry Co., Wash.

IDAHO CONSOLIDATED COPPER CO. **IDAHO.**

Office: Newcastle, Pa. Mine office: Grangeville, Idaho Co., Idaho. J. P. H. Cunningham, president; Irvin E. Rockwell, manager. Lands, on the Salmon River, have a 700′ tunnel, showing ore assaying up to 15% copper, 41 oz. silver and $2 gold per ton. Equipment includes an 800-h. p. hydro-electric installation and a 200-ton mill, in 2 units, one dry and one wet, the dry section having Sutton & Steele dry tables, while the wet section is equipped with Wilfley tables, Callow screens and tanks.

IDAHO CONSOLIDATED COPPER MINES CO. **IDAHO.**

Dead. Was a bit of stock-jobbery. Formerly at Decorah, Washington Co., Idaho.

IDAHO CONTINENTAL MINE. **IDAHO.**

Mine office: Priest River, Bonner Co., Idaho. Lands, north of the Priest

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Lake Mining Co., are opened by tunnel, showing ores carrying values mainly in silver-lead, with some copper.

IDAHO COPPER CO. IDAHO.

Office: care of John H. Nordquist, Wallace, Idaho. Mine office: Coeur d'Alene, Kootenai Co., Idaho. Lands adjoin the Reindeer mine, extension of vein of which is being sought by tunnel.

IDAHO COPPER MINES CORPORATION, LTD. IDAHO.

Office: 1906-74 Broadway, New York, N. Y. Thos. Greenwood, manager; N. S. Edwards, consulting engineer. Location of lands in Idaho, if any, unknown.

IDAHO COPPER MINING CO., LTD. IDAHO.

Mine office: Wallace, Shoshone Co., Idaho.

IDAHO COPPER MINING & SMELTING CO. IDAHO.

Dead. Formerly in Idaho county, Idaho. Described Vol. VII.

IDAHO MILLING CO. IDAHO.

Dead. Formerly at Doniphan, Blaine Co., Idaho.

IDAHO REDUCTION CO., LTD. IDAHO.

Office: Corcoran Bldg., Washington, D. C. Letter returned unclaimed from former mine office, Weiser, Washington Co., Idaho. Works office: Clarkston, Asotin Co., Wash. Geo. A. Rahm, president; C. F. Drake, vice-president; F. S. Bright, secretary; John Sennett, treasurer; preceding officers and S. Fairfield, directors. Organized 1903, with capitalization $1,000,000, shares $1 par. Said to plan removal of smelter, on account of high price of fuel. Presumably idle.

IDAHO SMELTING & REFINING CO. IDAHO.

Office: Rookery Bldg., Spokane, Wash. Mine office: Sand Point, Bonner Co., Idaho. J. Herbert Anderson, president; C. C. Titus, general manager. Organized circa 1907, with capitalization $2,000,000, as a reconstruction of the Panhandle Smelting Co. Has authorized a $500,000 issue of 6% bonds. Indebtedness of old company, amounting to circa $217,000, was assumed by the new corporation.

Lands include the Venezuela group of claims, slightly developed, on the southeastern shore of Lake Pend d'Oreille, carrying silver-lead ores.

The 200-ton reduction plant, known as the Panhandle or Ponderay smelter, on Lake Pend d'Oreille, is primarily a lead plant, though capable of handling copper ores also. Equipment includes four 60-ton roasters. There is a wharf, and the company owns a small steamboat.

The smelter was blown in circa June, 1907, and blown out shortly thereafter, ostensibly owing to lack of sulphide ores for fluxing. The smelter was again blown in Oct. 20, 1908, with a force of circa 75 men, and is planned to do a general custom smelting business, more especially on silver-lead ores, and is being managed under the advice of the Montana Mineowners' Association, which furnishes moral support and has promised to furnish ore. There has been talk of increasing the capacity of the plant, but this is premature, as the works should first demonstrate their ability to operate profitably.

IDAHO & SPRING GULCH MINING & MILLING CO., LTD. MONTANA.

Office and mine: Mullan, Shoshone Co., Idaho. F. Carson, president and general manager; Andrew Swanson, vice-president; R. A. M. Vitty, secretary; Wm. Coumerlh, treasurer. Organized Oct. 30, 1906, under laws of Idaho, with capitalization $1,000,000, shares $1 par; issued, circa $850,000.

Lands, 7 claims, 1 fractional, area circa 110 acres, well timbered, between the Little Pittsburg and King and Queen mines, in an unorganized district near Carter, Missoula Co., Mont. Property shows porphyry, slate and limestone, carrying 2 ore bodies, of which one, under development of 6' estimated average width, traceable 2,000', is estimated to average 6% copper and

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32 oz. silver per ton, mainly from gray copper ore. There also is a parallel vein, carrying silver-lead ore. Development on the copper vein is by shafts of 50′ and 300′, and tunnels of 60′ and 700′, longer being planned to be driven 1,700′, to cut both copper and lead veins. The upper tunnel shows malachite and azurite, assaying circa 7% copper, 1.4 oz. silver and 1 to 6 oz. gold per ton. Mine has 3 small buildings and is circa 3 miles from the Montana and Northern Pacific railroads.

IDA MONTANA DEVELOPMENT CO. **MONTANA.**

Dead. Was organized June 6, 1906, under laws of Arizona, with capitalization $800,000, shares $10 par, and reorganized circa August, 1907, as Ida Montana Mining Co. Formerly at Butte, Silver Bow Co., Mont.

IDA MONTANA MINING CO. **MONTANA.**

Office: Calumet, Mich. Mine office: Butte, Silver Bow Co., Mont. P. D. MacNaughton, president; Capt. Jas. W. Milligan, vice-president and mining director; Wm. J. McDonald, secretary; Jos. W. Selden, treasurer; M. J. McEvans, superintendent; preceding officers, Wm. H. Thielman, F. P. Rugee, Victor Nordberg, Edward Ulseth, Angus McDonald and Jeremiah E. O'Neil, directors. Organized 1907, under laws of Arizona, with capitalization $3,000,000, as a reconstruction of the Ida Montana Development Co.

Lands, 3 claims, known as the Ida, A and B, near the Amazon-Butte, across the valley and about 1½ miles southeast of Butte, just south of Columbia Gardens, said to have been bought for $175,000, and to be fully paid for.

The property had 2 old shafts, of 115′ and 118′, one of which, known as No. 3, has been cut down to 3-compartment size, and sunk to 480′ depth, and is planned to be sunk 1,000′. This shaft shows, on the 250′ level, copper sulphides carrying silver and gold values of commercial grade, and a little ore was shipped, 1908, by leasers.

Equipment includes a hoist good for 1,500′, from the Baltic mine, and a 20-drill air-compressor, with several small mine buildings. Property employed circa 50 men, late 1907, but was attached December, 1907, in 3 actions, for supplies furnished. Apparently the indebtedness has been liquidated, and, late 1908, company planned early resumption. Management includes some strong and experienced mining men, but property lies outside the proven ore zone of Butte.

IDEAL MINING CO. **UTAH.**

Office: care of Newton A. Dunyon, president, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Wm. M. Bradley, vice-president; W. T. Atkin, secretary and treasurer; preceding officers, C. M. Strevell and J. H. Paterson, directors. Property adjoins the Burning Moscow mine. Presumably idle.

IDEAL MINING & DEVELOPMENT CO. **ARIZONA.**

Office: 38 Wall St., New York, N. Y. Mine office: McCabe, Yavapai Co., Ariz. Cecil G. Fennell, general manager; M. J. Enright, superintendent Gladstone mine; Jas. O'Brien, superintendent Model mine.

The Gladstone mine has a 1,000′ shaft, with auriferous and argentiferous copper and lead ores, values being mainly in gold. Equipment includes an electric pump, on the 800′ level, handling 20,000 gallons daily, a 120-h. p. Hendrie & Bolthoff hoist, capable of raising 3-ton loads from 1,500′, and a 4-drill Ingersoll-Sergeant air-compressor, all electrically operated by a Crocker-Wheeler motor. The Gladstone ships high grade ore, and runs concentrating ore through the McCabe mill.

The Model mine, 6 claims, formerly known as the McCabe, bought, circa 1906, for $81,521, has a 750′ incline shaft, with about 12,000′ of workings, showing several ore bodies carrying 8″ to 10″ of smelting ore, and 12″ to 24″ of milling ore, former with combined gold, silver and copper values of $35

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to $85 per ton, and latter carrying about 2% copper, with small gold and silver values. Country rock is granite, with numerous intrusive porphyry dikes, granite being much shattered. Oxidized zone is only about 40′ deep, followed by auriferous and argentiferous copper, lead and zinc sulphides.

The McCabe, or Model mill, has 10 stamps, a 50-ton Elspass mill, 1 Wilfley and 3 Standard tables. Production, 1906, was 518,895 lbs. fine copper, 139,766 oz. silver and 14,696 oz. gold, of the total value of $497,152. Production, 1907, was 361,257 lbs. fine copper, 117,582 oz. silver and 12,004 oz. gold.

IKONOMOFF CESSION. **BULGARIA.**

Office: care of M. Dimitri Ikonomoff, owner, Hotel Boulevard, Sofia, Bulgaria. Mine office: Kara-Baïr, Bourgos, Bulgaria. Lands, slightly developed, are held as a cession from the principality. Idle.

IKUNO MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

ILION MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands, 2 claims, known as Grand Cross and Rough & Ready. Idle some years.

ILLINOIS COPPER MINING CO. **WYOMING.**

Office: 862 Monadnock Blk., Chicago, Ills. Mine office: Encampment, Carbon Co., Wyo. Geo. H. Miller, president and general manager; N. V. S. Mallory, secretary and treasurer; A. H. Oldman, superintendent. Organized 1899, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 9 claims, area 185 acres, in the Upper Platte district, near the Colorado line, showing 3 contact veins, principal said to be 18′ wide, 50′ deep and 4,500′ long, carrying chalcocite, with quartz gangue, assaying 14 to 27% copper, 20 oz. silver and $4 gold per ton, which is excessive. Has 3 shafts, deepest 70′. Was working a small force early in 1907.

ILLINOIS COPPER MINING & MILLING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Republic, Ferry Co., Wash. Is said to have 40′ vein, opened by a tunnel showing copper ore of commercial grade.

ILLINOIS GOLD & COPPER MINING CO. **MEXICO.**

Dead. Formerly at Pánuco de Monclova, Coahuila, Mex.

ILLINOIS-JALISCO MINING CO. **MEXICO.**

Office: 213 South Sixth St., Springfield, Ills. Mine office: Ayutla, Autlán, Jalisco, Mex. E. A. Perry, president; Homer Vandevender, vice-president; Thos. Montgomery, secretary; J. T. Ash, treasurer; preceding officers and Geo. D Gibbons, directors; John Breckenridge, general manager. Capitalization $1,000,000, shares $1 par; issued, $750,000.

Lands, 45 hectares, including El Crudo and El Bajio mines, latter an antigua. Property is said to show 15 veins, with 6 under development, main vein being 8′ to 17′ in width, traceable 2 miles. El Crudo shaft, of 225′ depth, shows ore of 5 to 20% copper tenor, estimated to average 5% copper, 15 oz. silver and $5 gold per ton. Mine has about 3,000′ of workings, estimated to show circa 50,000 tons of ore.

Company plans a 500-h. p. hydro-electric installation, mining equipment and building a concentrator. Employs circa 75 men.

ILLINOIS & JEROME COPPER CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. A. D. Zallanack, president; Fred H. Gorham, vice-president; Annie E. Zallanack, secretary and treasurer; preceding officers are the directors. Organized circa August, 1908, with capitalization $1,000,000, shares $1 par. Lands are near the Copper Chief.

ILLINOIS MEXICAN COPPER CO. **MEXICO.**

Office: 15 Broad St., New York, N. Y. Mine office: Ayutla, Autlán.

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Jalisco, Mex. L. C. Frey, manager. Organized 1906, with capitalization $800,000. Presumably idle.

MINA ILUSION. **CHILE.**

Mine office: Talcuna, La Serena, Coquimbo, Chile. Victor Illanes, owner and manager. Property, 16 kilometers from Marquesa railway station, shows a vein of about 12′ average width, and, in 1903, with a force of 16 men, produced about 400 metric tons of ore of about 9% average copper tenor.

IMA CONSOLIDATED MINING & MILLING CO. **IDAHO.**

Dead. Formerly at Patterson, Lemhi Co., Idaho. Described Vol. VI.

IMLAY COPPER MINING CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Humboldt House, Humboldt Co., Nev. Geo. W. Morgan, president; R. E. Siddoway, secretary; preceding officers, Jos. Lippman, Sidney M. Bamberger, F. M. Smith and O. W. Powers, directors; J. R. Turner, superintendent. Changed name, early 1907, from Morrison Mining Co. to present title, and increased capitalization to $5,000,000.

Lands, 26 claims, unpatented, 2 millsites and a townsite, circa 5 miles from Humboldt House. Mine has 250′ incline shaft, with circa 1,500′ of workings, showing ore assaying up to 8.8% copper, 7.6% lead and 0.18 to 66.5 oz. gold per ton. Equipment includes two 60-h. p. boilers, a hoist and several small buildings. A concentrator is planned. Begun shipments circa April, 1908, to the Selby smelter, shipping one carload weekly, of ore running $50 to $100 per ton in values. A mill is planned. Property considered promising.

IMPERIAL COPPER CO. **ARIZONA.**

Dead. Formerly at Wickenburg, Maricopa Co., Ariz. Described Vol. III.

IMPERIAL COPPER CO. **ARIZONA.**

Office: 1408-11 Pine St., New York, N. Y. Operating office: Tombstone, Ariz. Mine office: Silver Bell, Pima Co., Ariz. E. B. Gage, president; W. F. Staunton, vice-president and general manager; A. N. Gage, secretary and treasurer; preceding officers, Selwyn Eddy, V. L. Mason and H. M. Robinson, directors; David Morgan, mine superintendent; C. C. Klingerman, railroad superintendent; S. F. Shaw, engineer; J. C. Woodworth, mine foreman.

Organized May 15, 1903, under laws of Arizona, with capitalization $5,000,000, shares $10 par. Bonds, $2,000,000 authorized, at 6%. Is controlled, through ownership of practically entire stock issue, by Development Co. of America. Apparently controls, through ownership of practically entire stock issue, the Southern Arizona Smelting Co., though latter-named corporation may be controlled by the Development Co. of America. Paid 2% dividends, April, 1906, and January and April, 1907, but suspended dividends on account of the depression in the copper market. Net earnings, for fiscal year ending March 31, 1908, were $220,129. Fiscal year has been changed to end September 30. Annual meeting, second Tuesday in November.

Lands, 60 claims, mostly patented, area circa 1,000 acres, also a 640-acre millsite at Red Rock, with total holdings of about 3,000 acres, in the Silver Bell Mountains, a small independent range having a granitic base, with limestone and quartzite capping, latter much eroded and entirely gone at many points. There has been much faulting and shearing, ore bodies occurring as irregular contact lenses, having a northwesterly strike, with axes parallel to fault and fissure planes. The granite-porphyry in the vicinity of the lenses is strongly mineralized with copper sulphides. The eruptive dioritic dykes are highly altered, and the ore bodies carry strong gossans. The oxidized zone is comparatively shallow, being not deeper than 150′ in the principal workings, with a sharp change from the oxidized to the base zone. The oxidized ores are mainly cuprite, malachite and azurite, with furnished the bulk of past production, while the sulphide ore is mainly chalcopyrite, with occasional bornite. The mines also show some cupriferous silver-lead ore,

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much of which is an intimate mixture of galena, sphalerite and chalcopyrite, decidedly difficult of satisfactory reduction. Ores mined, 1905, were reported to average 9.08% copper, 1.2 oz. silver and 12 cents gold per ton.

Property includes the Old Boot mine, now known as the Mammoth, opened circa 1865, which was a small producer, at irregular intervals, of high grade copper and silver-lead ores, under former ownership. This mine is opened by the 2,000′ Page crosscut tunnel, and by the Mammoth and Union shafts, to depth of circa 800′, with upwards of 6 miles of workings. The old Mammoth incline shaft, of 400′ depth, was replaced by a new 2-compartment vertical shaft, the old shaft now being used solely for ventilation and pump-columns.

Equipment includes a power plant with six 70-h. p. boilers, burning petroleum, with oil storage tanks, and 5 hoists, of 12-h. p. to 200-h. p. each, larger, having 14x18″ cylinders, being good for 2,000′ depth. There are 10-drill and 15-drill 2-stage Norwalk straight-line air-compressors, and a Nordberg cross-compound condensing air-compressor, with piston efficiency of 3,000 cu. ft. of free air per minute.

Buildings include 20x30′ and 30x80′ machine shops, of wood, sheathed with corrugated iron, a 36x40′ carpenter shop, a framing-mill, an 18x50′ smithy, bunk-houses, boarding-houses, changing-houses and about 20 dwellings, with a 3-story mine store, carrying a large stock. There also is an electric light plant.

The 300-ton concentrator, completed September, 1908, is said to have cost circa $165,000. There also is a 20x40′ experimental mill, of 10 tons daily capacity.

The Arizona Southern railway, 21 miles long, from Silver Bell to Red Rock, where connection is made with the Southern Pacific, is of standard gauge, and was built by the company. Equipment includes 2 locomotives and 5 cars.

The smelter, at Sasco, 8 miles south of Red Rock, is described separately under title of its owner, the Southern Arizona Smelting Co.

About 300 men are employed, mainly Mexicans, at average wages of $2 per day.

Production has been as follows: 3,030,630 lbs. fine copper in 1904; 5,687,152 lbs. in 1905; 4,385,246 lbs. in 1906; 5,267,401 lbs. fine copper and 63,170 oz. silver in 1907. For fiscal year ending March 31, 1907, production was 38,072 tons of ore, yielding 4,275,090 lbs. fine copper and 48,252 oz. silver, and for fiscal year 1908 output was 49,205 tons of ore, yielding 5,740,975 lbs. fine copper and 67,701 oz. silver. For first half of 1908 copper is said to have been produced for 10.68 cents per pound. Until Feb. 1, 1908, when the Sasco smelter was blown in, all ore was shipped to outside smelters. Copper is sold by the American Metal Co., Ltd., under a 3-year contract. Production, 1909, should show a very large increase, owing to increased productive capacity of the mill and smelter, and the company plans making 12,000,000 to 15,000,000 lbs. fine copper yearly. The property is well managed and is considered exceptionally promising.

IMPERIAL COPPER CO. **ONTARIO.**

Dead. Formerly at Parry Sound, Parry Sound district, Ont.

IMPERIAL COPPER & GOLD MINING CO. **WYOMING.**

Office: 219 Germania Bldg., Milwaukee, Wis. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Lands, 160 acres, near the Portland mine, on Upper Cow Creek, 12 miles west of Encampment, claimed to show 2 veins, 1 with width of 26′ to 32′ being a schist dike, having about 400′ of workings, showing ore assaying 6 to 14% copper. Idle several years, except for selling stock.

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IMPERIAL COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Pollasky, Fresno Co., Cal. Described Vol. VI.

IMPERIAL COPPER MINING CO. **UTAH.**

Dead. Formerly at Frisco, Beaver Co., Utah.

IMPERIAL CORONA GOLD MINING CO. **IDAHO.**

Office: 67 Wall St., New York, N. Y. Lost lands, 1908. Stock of El Progreso Copper Mining Co. was exchanged, December, 1905, for stock in this concern. Apparently merely a bit of stock-jobbery. Formerly at Elk City, Idaho Co., Idaho.

IMPERIAL GOLD & COPPER MINING CO. **UTAH.**

Dead. Lands sold June 10, 1907, to Nevada-Utah Mines & Smelters Corporation. Formerly at Frisco, Beaver Co., Utah.

IMPERIAL MINING CO. **IDAHO.**

Mine office: Burke, Shoshone Co., Idaho. Henry Billberg, president; Homer G. Brown, secretary; John H. Nordquist, general manager. Organized 1906, with capitalization $1,000,000, shares $1 par. Lands, near the Copper King, have about a quarter-mile of tunnels. Plans a new 3,000′ tunnel.

IMPERIAL MINING CO. **WASHINGTON.**

Office· Marysville, Wash. Mine office: Silverton, Snohomish Co., Wash. Jas. E. Dupree, president. Lands, 11 claims, showing a contact vein between diorite and conglomerate, carrying gold, silver, copper and lead ores. Idle several years.

IMPERIAL MONTANA COPPER MINING, SMELTING & WATER POWER CO. **MONTANA.**

Dead. Reorganized, 1904, as Bornite Copper Co. Formerly at Blackfoot, Teton Co., Mont. Described Vol. V.

IMPERIAL PAINT & COPPER CO. **CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Mine is developed open-cast, and has steam power. Idle.

IMPERIAL STATE MINING & MILLING CO. **NEVADA.**

Office: care of A. C. Rector, secretary, Los Angeles, Cal. Letter returned unclaimed from former mine office, Searchlight, Lincoln Co., Nev. U. S. G. Todd, president. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, also a 5-acre millsite and a water right, having tunnels of 35′ and 265′ showing ore said to give average assays of above 10% copper and about $90 gold per ton, which figures seem excessive. Idle and apparently moribund.

IMPERIO COPPER CO. **MEXICO.**

Office: Tucson, Ariz. Lands were said to be near Imperio, Sonora, Mexico, which is not a postoffice, and seems non-existent.

COMPAÑIA MINERA INCA DE ORO i COBRE DE COPIAPÓ. **CHILE.**

Office: Iquique, Chile. Mine office: Copiapó, Atacama, Chile. Organized Dec. 14, 1906, under laws of Chile, with capitalization £30,000, shares £1 par.

INCA MINING & MILLING CO. **IDAHO.**

Office: Colfax, Idaho. Mine office: Cuprum, Washington Co., Idaho. Property is the Mineral World mine, carrying auriferous and cupriferous silver-lead ores. Idle.

INDEPENDENCE COPPER & GOLD MINING CO. **UTAH.**

Office: care of E. O. Leatherwood, secretary-treasurer, Salt Lake City, Utah Mine office: Alta, Salt Lake Co., Utah. Chas. Park, president; E. R Morgan, general manager. Organized 1904, with capitalization $50,000, shares 10 cents par. Lands, 7 claims, in the Little Cottonwood district. Idle several years.

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INDEPENDENCE COPPER MINING & SMELTING CO. **IDAHO.**

Dead. Merged, November, 1905, in Bonanza Mining Co. Formerly at Montpelier, Bear Lake Co., Idaho.

INDEPENDENCE DEVELOPMENT CO. **ARIZONA.**

Office: 1525 Western Ave., Los Angeles, Cal. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Col. Thos. E. Farrish, president; Chas. J. Hall, secretary and treasurer; Chas. Kumke, superintendent; Wm. Sultan, receiver. Organized Oct. 22, 1906, under laws of Arizona, with capitalization $1,500,000, shares $10 par.

Lands, on Lyons Fork of Mineral Creek, 4 miles from the Gibson mine, show Pinal schist, with fissure veins of copper ore, mainly sulphide, carrying considerable silver and gold values. Lands show 3 practically parallel fissures, and considerable ore of 5 to 25% copper tenor has been blocked out. Has steam power. Shipped circa 400 tons, February, 1908, to the Old Dominion smelter, securing good average returns in copper, gold and silver. Property considered promising, but finances in a bad way.

INDEPENDENCE GOLD, COPPER & IRON MINING CO. **CALIFORNIA.**

Dead. Formerly at Lavic, San Bernardino Co., Cal.

INDEPENDENCE MINE. **MONTANA.**

Mine office: Kalispell, Flathead Co., Mont. Property, on the Tobacco plain, is claimed to show a 25′ vein giving average assays of 8% copper and $4 to $10 gold per ton, which is obviously a serious overestimate. Idle for several years.

INDEPENDENCE MINING CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Has auriferous copper ores, with steam power. Presumably idle.

INDEPENDENCE MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Lands adjoin the Copper King mine, on the east, and give a promising surface showing. Idle, but ground is being developed by a tunnel driven by the Missoula Copper Co.

INDEPENDENCE MINING CO. **WYOMING.**

Office: 55 High St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. Employs 16 men. E. E. Meilins, president; Henry L. Larsen, vice-president; H. O. Granberg, secretary, treasurer and general manager; E. M. Sanders, superintendent. Organized June 28, 1904, under laws of Wyoming, with capitalization $1,000,000, shares $1 par, as successor of Leighton-Gentry Mining Co.

Lands, 6 claims, patented, area 120 acres, in the Battle Lake district, showing eruptive metamorphic country rocks, carrying an 11′ contact vein between quartzite and diorite, opened by a 200′ shaft and 250′ tunnel, showing occasional stringers of 3″ to 12″ width, carrying a little chalcopyrite assaying 12% copper, with small quantities of nickel and cobalt and traces of silver and gold. Has steam power, hoist and several small mine buildings. Company reports having a smelter with a 60-ton MacDonald blast-furnace.

INDEPENDENCE MINING & SMELTING CO. **MEXICO.**

Letter returned unclaimed from former office, St. Paul, Minn. Mine office: Guachinango, Mascota, Jalisco, Mex. Chris. D. O'Brien, Jr., manager. Mine has a 300′ shaft and a 370′ tunnel, showing argentiferous copper ore. Has a 50-ton smelter.

INDEPENDENT COPPER MINING & MILLING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Jos. Bean, president; John H. Nordquist, vice-president and manager; C. D. Miller, treasurer; preceding officers, Henry Billberg, D. F. Clark, R. R. McCormick, August Matt, and H. Leithead, directors. Capitalization increased, 1907, to

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$1,250,000. Lands, near the Snow Storm, have a 786′ tunnel, showing seams of copper carbonates and impregnations of chalcopyrite.

INDEPENDENT MINING CO. **WASHINGTON.**

Office: 705 First Ave., Seattle, Wash. Mine office: Baring, King Co., Wash. Edward Peterson, agent. Lands, sundry claims, on the north fork of Fortune Creek, Kittitas county, Washington, claimed by company to show 14 veins of galena, 2 gold veins, 1 cobalt vein, and an asbestos deposit, one gold vein being asserted to be 30′ to 70′ wide. The company claims too much and has performed too little. Apparently moribund.

INDÉ REDUCTION CO. **MEXICO.**

Works office: Indé, Durango, Mex. Is said to have a smelter, known as La Roca. Presumably idle.

INDEX-BORNITE COPPER MINING CO. **WASHINGTON.**

Office: 36 Dexter Horton Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A. M. Watt, secretary, treasurer and general manager. Lands, 2 claims, area 40 acres, 3 miles east of Index, having a 50′ shaft and tunnels of 70′ and 300′, lower tunnel showing a 2′ to 4′ vein with paystreak carrying argentiferous bornite assaying 16 to 50% copper and 6 to 8 oz. silver per ton. Was developing at last accounts.

INDEX INDEPENDENT MINING CO. **WASHINGTON.**

Dead. Lost lands, Jan. 1, 1905. Formerly at Index, Snohomish Co., Wash.

INDEX MINING CO. **WASHINGTON.**

Office: Snohomish, Wash. Mine office: Index, Snohomish Co., Wash. Lot Wilbur, president and general manager. Lands, 5 claims, known as the Miller group, opened by tunnels of 300′ and 800′, showing chalcocite, bornite and chalcopyrite, in a 12′ vein of concentrating ore carrying a 2′ paystreak of smelting ore, on the footwall. Idle.

INDIANA-ARIZONA MINING CO. **ARIZONA.**

Dead. Succeeded circa 1906, by Indiana-Arizona Development Co. Formerly at Silver Bell, Pima Co., Ariz.

INDIANA COPPER CO. **MICHIGAN.**

Office: Houghton, Mich. Mine office: Rockland, Ontonagon Co., Mich. R. M. Edwards, R. C. Pryor, J. H. Rice, Dean Robinson and Frank McM. Stanton, directors. Organized 1862, under laws of Michigan, with capitalization $500,000, shares $25 par. Control was bought, circa 1907, from John R. Stanton and others, by present management. Lands, 1,280 acres, in Sections 21, 27 and 28, Town 50 North, Range 37 West. Assessments paid, $178,708. Mill was burned, 1864, and property since idle. Lands presumably carry the extension of the amygdaloid bed now being opened by the Lake Copper Co., and probably will be explored therefor.

INDIANA COPPER CO. **WYOMING.**

Mine office: Holmes, Almany Co., Wyo. Lands, 6 claims, near the Rambler mine. Idle some years and apparently moribund.

INDIANA-DARRINGTON MINING CO. **WASHINGTON.**

Office: care of Jas. G. Givens & Co., 405 Bailey Bldg., Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. G. A. Rochester, president; Geo. M. Crawford, secretary. Capitalization $1,000,000, shares $1 par. Presumably idle.

INDIANA DEVELOPMENT CO. **ARIZONA.**

Dead. Reorganized, circa 1906, as Indiana-Arizona Development Co. Formerly at Silver Bell, Pima Co., Ariz.

INDIANA MINING CO. **OREGON.**

Office: 25 Becker Bldg., Anderson., Ind. Operating office: Baker City, Ore. Mine office: Medical Springs, Baker Co., Ore. John W. Messner, president and general manager; J. W. McAlpine, vice-president; Dr. W. H. Stapish,

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treasurer; Dr. A. A. Cleaver, auditor; W. L. Myers, superintendent; preceding officers, E. E. Cleaver, G. F. Aldrich, Henry Schies and Wm. Godejohann, directors; W. G. Drowley, secretary. Organized June 18, 1903, under laws of Oregon, with capitalization $1,500,000, shares $1 par.

Lands, 14 claims, also a 280-acre townsite, on Big Creek, circa 25 miles east of Baker City, in the foothills of Powder Mountains. Property shows strong outcrops, and has a contact deposit between porphyry and greenstone carrying auriferous and argentiferous copper sulphides with quartz gangue, averaging 2 to 3% copper, with occasional ore of higher grade. Development is by a tunnel, which has not reached the ledge, and a 2-compartment 330′ shaft, with 3 levels opened, and about 2,000′ of workings, said to show 2 ore bodies, one of 55′ and one of 10′ width, carrying 3.5 to 5% copper, and circa $3 gold per ton.

Equipment includes a Leyner hoist, good for 1,000′ depth, a 4-drill Leyner air-compressor, 8 power drills and a small electric light plant. There are about 10 buildings, including a 40x70′ shafthouse, 40′ high, a 16x30′ office and a boarding-house. A precipitation plant has 7 tanks, each 4x4x3′. Mine was said, September, 1907, to have circa 20,000 tons of ore on the dump, mainly broken in development, which probably is an excessive estimate. Property is considered promising. Idle.

INDIANAPOLIS COPPER MINING CO. — **WYOMING.**

Dead. Formerly at Riverside, Carbon Co., Wyo.

INDIANA-SONORA COPPER & MINING CO. — **MEXICO.**

Office: 99 John St., New York, N. Y. Mine office: La Cananea, Arizpe, Sonora, Mex. Prof. Jas. Douglas, president; Geo. Notman, secretary and treasurer; preceding officers, Cleveland H. Dodge, Arthur C. James, S. W. Esterbrook, N. J. McGowan and Dr. Henry Jameson, directors; Walter Douglas, general manager; G. W. McBride, superintendent; T. H. Wiggins, engineer.

Organized November, 1900, under laws of West Virginia, with capitalization $5,000,000, shares $10 par; issued, $3,700,000. For 1906 expenditures were $40,901 and receipts from ore sales were $102,610.

Lands, 164 pertenencias, area 405 acres, in the heart of the Cananea Mountains, surrounded by holdings of the Cananea Consolidated. Property shows rhyolite, quartzite and limestone, carrying at least 4 large ore bodies, of very irregular outline, with nearly horizontal dip, main ore body showing a width of 300′, with proven length of 600′, carrying chalcocite and chalcopyrite of 3 to 4% average copper tenor. Shipments of May, 1907, averaged 3.3% copper and 2 oz. silver per ton, with a trace of gold. Development is by the 1,800′ Llave tunnel, developing the main ore body, on ground adjoining the Capote mine of the Greene Cananea, the 1,200′ Eureka tunnel, and a third or lower tunnel, known as the Limestone, and by shafts of 400′, 300′, 300′, 200′, 100′ and 100′. The mine has about 3 miles of workings, and has been estimated to show 400,000 tons of concentrating ore.

Machinery equipment includes 7 hoists, of 25-h. p. to 150-h. p. each, an air-compressor and power drills.

There are about 25 buildings, including a 20x20′ carpenter shop, 25x50′ machine shop, 20x40′ smithy, laboratory, general store and dwellings.

The mine has shipping bins at the mouth of the Llave tunnel, and a short narrow-gauge railway, connecting with the line of the Cananea Consolidated. Some ore has been shipped to the Douglas smelter, and the property employed circa 75 men, before closing down, March, 1907. While the ore is low in average grade, the ore bodies are large, and the management is excellent.

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INDIAN CHIEF MINING CO. **BRITISH COLUMBIA.**

Dead. Was succeeded by Spitzee Gold Mines, Ltd. Formerly at Phœnix, Boundary district, B. C.

INDIAN FALLS DEVELOPMENT CO. **CALIFORNIA.**

Office: 1111 C St., Tacoma, Wash. Mine office: Quincy, Plumas Co., Cal. C. A. Darmer, president; J. H. Spencer, vice-president; Horace W. Tyler, secretary; O. B. Roeder, treasurer; preceding officers, Anton Huth, Fred H. Murray and John Arthur, directors; G. H. Goodhue, general manager; Capt. C. Henry Thompson, consulting engineer. Organized May, 1908, under laws of Washington, with capitalization $2,000,000, shares $1 par; issued, $1,600,000.

Lands, 21 claims, area circa 420 acres, also the townsite of Indian Falls, in the Shoefly district, showing talcose schists and slate, with 8 lenticular ore bodies, said to be traceable 12,000′, opened by tunnels of 80′, 84′, 220′ and 40′, showing chalcopyrite assaying 2% copper, 1.4 oz. silver and $1.10 gold per ton. Has 2 small mine buildings. Company plans development by tunnels, installing a 300-h. p. hydro-electric plant and building a concentrator.

INDIAN GROUP COPPER CO.

Dead. Formerly had an office at 1016-25 Broad St., New York, N. Y.

INDIAN QUEEN CONSOLIDATETD MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Newhouse, Beaver Co., Wash. Jesse Knight, president; L. N. Morrison, vice-president; B. E. Allen, secretary and treasurer; David Evans, manager; Jas. Quinn, superintendent. Organized 1907, under laws of Utah, with capitalization $150,000. July 1, 1908, had a cash balance of $6,619.95.

Lands, circa 60 claims, principal properties being about 2 miles east of Newhouse, taken over from the Indian Queen and Leland companies. Has a 600′ tunnel, planned to be driven circa 2,500′, giving a 1,600′ back. Has electric power and an air-compressor. Property considered promising and management good.

INDIAN QUEEN MINING CO. **UTAH.**

Dead. Merged, 1907, in Indian Queen Consolidated Mining Co. Formerly at Newhouse, Beaver Co., Utah.

INDIAN SPRINGS COPPER MINING CO. **NEVADA.**

Office: care of T. R. L. Harris, secretary and treasurer, Spokane, Wash. Letter returned unclaimed from former mine office, Goldfield, Esmeralda Co., Nev. E. F. Burns, president; Millard T. Harsten, vice-president; Ross S. Craddock, superintendent. Organized, late 1906, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands are between Goldfield and Greenwater. Idle and presumably moribund.

INDUSTRIAL COPPER MINING CO. **ARIZONA.**

Dead. Lands were about 2 miles from the Valenzuela mine of the Hub Mining & Investment Co. Formerly at Benson, Cochise Co., Ariz.

INDUSTRIAL MINING CO. **MEXICO.**

Office: Apartado 2, Hermosillo, Sonora, Mex. Letter returned unclaimed from former mine office, Carbó, Ures, Sonora, Mex. W. D. Schellinger, agent. Lands, 20 hectares, known as the Mina Mixto, circa 30 miles west of Carbó.

INDUSTRIAL MINING CO. **MONTANA.**

Office and mine: 114 East Main St., Bozeman, Gallatin Co., Mont. J. W. Wilcox, president; S. J. V. B. Henderson, vice-president, treasurer and general manager; J. M. Morris, secretary. Organized Oct. 2, 1902, under laws of Montana, with capitalization $600,000, shares $100 par. Lands, 12 claims, area 240 acres, well timbered, in an unorganized mining district near Bozeman, showing gneiss, quartzite and shale, said to carry fissure and contact veins, opened by tunnels of 380′, 450′, 180′ and 1,481′, showing sulphide ores, reported by company to average 16 to 40% copper and 6 oz. silver per ton.

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COMPAGNIE d'INGUARÁN. **MEXICO.**

Office: 56 Rue de Provence, Paris, France. Mine office: Inguarán, Ario, Michoacán, Mex. Ch. Laforgue, general manager; J. L. Philips, superintendent. Organized Jan. 15, 1898, under laws of France, with capitalization 12,000,000 francs, shares 500 francs par. Supposedly is controlled by the French house of Rothschild, and a considerable portion of the company's stock is owned by the Compagnie du Boleo. Property was bought for 1,500,000 pesos, and company is said to have expended about $8,000,000 thereon, which undoubtedly is an overestimate.

Lands, 185 hectares, also mineral concessions covering 5,000 additional hectares, in the Tacambara district, lying on the plateau of the volcano Jorullo, circa 1,500′ above the plains. The mountains form a succession of rugged, almost inaccessible peaks, with ore outcrops near their crests, these, of 90′ to 200′ width, having a generally east and west trend. Country rock is granite, in several stages of alteration, capped by a silicious limestone of 200′ to 300′ thickness. Ore bodies, of immense size, carry almost exclusively copper sulphides, mainly disseminated chalcocite and chalcopyrite, with a little bornite, having a granite-porphyry gangue, assays giving 1.5 to 65% copper, 2 to 100 oz. silver and from a trace to 1 oz. gold per ton. As a rule the silver values are considerable, with slight gold values. Proven depth of the ore is about 300 meters, at which depth it apparently cuts off. Development is by a 2,500′ tunnel and 2 main shafts, deepest circa 350′, with levels opened at 80′ intervals. Both ore and country rock are exceedingly firm, little timbering being required. Estimates of size and value of the ore bodies vary greatly, but the best authorities estimate an average of circa 3.25% copper, with 2,000,000 to 3,000,000 metric tons of ore blocked out. The ore is well adapted to concentration, and apparently could be put about 8 or 10 tons into one, before smelting.

Steam and electric power are used, latter secured from a 200-h. p. hydro-electric installation at Mata de Plantano, 7 miles from the mine, where there is a stream flowing about 80 litres per second, with an available head of 930′, fed by springs that burst forth from the foot of Mt. Jurullo, about 150 years ago, after the last eruption of that volcano.

In 1905 a survey was made for a railway from Patzcuaro, the present shipping point, to Inguarán, a distance of 32 leagues. A complete survey has been made, and plans drawn for a railway from the mines to Zihuatenejo, south of Acapulco, on the Pacific, the route of the proposed line traversing a rugged country, and requiring several years for construction.

Owing to the fact that this property is controlled by the Rothschilds, and is but rarely visited by mining men, many exaggerated and misleading stories have been printed regarding it. The mine has a large body of low grade ore, but the ore is not equal, in quantity or quality, so that of several other Mexican copper mines. Production, 1904, was only 598,439 lbs. of ore, valued at 21,870 pesos, this doubtless having been shipped for test purposes. Property is idle, and is not likely to become a producer until rail connections are secured, and apparently the company is in no hurry about building a railway, as 10 years have been required to get the property to its present very modest stage of development.

INLAND MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Bonney Swanson, president. Lands, 10 claims, on Dominion Creek, circa 5 miles from Saltese, having tunnels of 100′, 250′ and 550′, upper tunnel showing a 5′ vein carrying ore up to 25% in copper tenor, claimed to average circa 5.5% copper, 11 oz. silver and $6 gold per ton. Property considered promising.

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INNAI MINE. **JAPAN.**

Owned by Furukawa Mining Co.

INSIZWA NICKEL & COPPER DEVELOPING CO., LTD. **CAPE COLONY.**

Office: Mount Ayliff, Cape Colony. Mine office: Kokstad, Griqualand East, Cape Colony. Wilfred Vernon Parsons, secretary. Organized circa March, 1908, under laws of Cape Colony, with capitalization £200,000, shares £1 par. Lands are 2 mining areas, formerly held by South Namaqua Syndicate, showing ore disseminated through norite, occasionally occurring as lenticular masses of considerable size in norite, with shale contact. Average assays give 2.05 to 3.37% copper and 3.29 to 4.75% nickel.

INSPIRATION MINING CO. **ARIZONA.**

Office: Kansas City, Mo. Mine office: Globe, Gila Co., Ariz. E. A. Hosier, president; W. A. Neiswanger, vice-president; E. P. Wilder, secretary and treasurer; John D. Coplen, general manager. Has authorized a $200,000 bond issue. Property was under option to General Development Co., but was not sold. Lands, 12 claims, area 240 acres, circa 9 miles west of Globe, near the Live Oak mine. Company also said to have bought, 1906, lands of the Rookwood Copper Co. Mine, having about 1 mile of workings, is opened by the Mercer, Woodson and 2 shorter tunnels. Upper workings show oxidized ores of 4 to 7% copper tenor, succeeded by chalcocite and disseminated chalcopyrite in a ledge of very great width, not all of which is workable, carrying much ore that is below commercial grade at present, though possibly adapted to leaching, and which, in any case, may become valuable in time. Has a 50-ton mill, planned to be doubled in capacity and size to 36x200′, terraced in 9 floors. Shipped some ore, 1906. Property considered promising.

INTERCOLONIAL COPPER CO. **NEW BRUNSWICK.**

Office: 702 Banigan Bldg., Providence, R. I. Mine office: Dorchester, Westmoreland Co., N. B. Darius L. Goff, president; T. J. Edwards, secretary. Organized 1899, under laws of Arizona, and capitalization decreased; 1906, to $2,000,000, shares $5 par, in preferred and common shares, latter with restricted voting privileges. Lands, 250 acres freehold and 1,100 acres leasehold from the crown, showing a blanket vein carrying carbonate and sulphide ores, said to give returns of 3 to 4% copper. Has shafts of 40′, 75′ and 150′, also a 1,500′ drainage tunnel, with about 8,000′ of underground workings.

Works include a 200-ton concentrator, leaching plant and electrolytic refinery, having 2 boilers, 4 engines, crusher, rolls, 15 tubular roasting furnaces, six 300-ton leaching vats and two 50-kw. dynamos. The electrolytic plant has 550 lead cathodes, and 550 lead anodes, 22x33″ each, giving a plating surface of 5,000 square feet, for the deposition of electrolytic copper. Plant also includes tanks for precipitation of metal on scrap iron. The reduction plant did not prove satisfactory, machinery going wrong after making about 50 tons fine copper. Idle since 1904 and apparently moribund.

INTERIOR MINING & TRUST CO. **ARIZONA.**

Mine office: Wickenburg, Maricopa Co., Ariz. Frank L. Baldwin, president; D. L. Murray, vice-president; R. W. Baxter, second vice-president; W. J. Casey, manager. Organized December, 1902, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, in the Black Rock district, circa 16 miles northwest of Wickenburg, show ores carrying values mainly in gold. Is said to have a 40-stamp mill. Production, 1907, was 1,616 oz. gold.

INTERMOUNTAIN EXPLORATION CO. **UTAH.**

Office: 26 Mesaba Bldg., Duluth, Minn. Operating office: 208 Atlas Bldg., Salt Lake City, Utah. Mine office: Stockton, Tooele Co., Utah. H. E. Smith, president; Peter Porter, vice-president; Theophilus F. Smith, treasurer; W. H. Brownrigg, secretary; R. D. Raddatz, manager. Organized Sept. 6, 1906, under laws of Utah, with capitalization $500,000, in half preferred and

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half common shares, of $10 par. Is developing the property of the Duluth & Utah Development Co., at Stockton, and also holds auriferous and argentiferous copper claims in the Silver Rock district of San Bernardino county, California, and has small holdings of silver claims in Cobalt, Ontario.

INTERMOUNTAIN GOLD & COPPER MINING CO. **IDAHO.**

Mine office: Pocatello, Bannock Co., Idaho. G. B. Rogers, president; Frank Ball, treasurer; G. A. Clark, secretary. Lands are the Lost Horse group, on the Ft. Hall Indian reservation, opened by a 50′ shaft, said to be bottomed in good ore. Idle several years.

INTERMOUNTAIN MINING & INDUSTRIAL ASSOCIATION. **UTAH.**

Dead. Lands sold August, 1906. Formerly at Bingham Canyon, Salt Lake Co., Utah. Fully described Vol. VI.

SOCIEDAD INTERNACIONAL MINERA I BENEFICIADORA DE HUANTAJAYA. **CHILE.**

Office: Iquique, Chile. Mine office: Huantajaya, Tarapacá, Chile. Organized June 27, 1900, under laws of Chile, with capitalization 300,000 pesos, shares 50 pesos par.

INTERNATIONAL CONSOLIDATED SMELTING & MINING CO. **MEXICO.**

Office: 12 West 38th St., New York, N. Y. Mine office: Guaynopa, Guerrero, Chihauhua, Mex. Dr. J. M. Bishop, president; Wm. L. Saunders, secretary. Organized Jan. 1, 1904, as a merger of Guaynopa Smelting & Reduction Co. and Mexican Lead Co. The Guaynopa lands, variously reported as 254 hectares and as 133 acres, in Guaynopa Cañon, are claimed to show ores carrying 5 to 8% copper, with good silver values. Company was promoted by Daugherty & Albers, with the assistance of C. B. James, hence is regarded unfavorably. Idle and moribund.

INTERNATIONAL COPPER CO. **ARIZONA.**

Dead. West Virginia charter forfeited, 1902.

INTERNATIONAL COPPER CO. **COLOMBIA.**

Dead. Was a swindle. Formerly at Natagaima, Tolima, Colombia. Described Vol. VI.

INTERNATIONAL COPPER CO. **MONTANA.**

Dead. Was organized June 13, 1906, under laws of Maine, and title changed, July 19, 1906, to Montana Consolidated Copper Co. Formerly at Basin, Jefferson Co., Mont.

INTERNATIONAL COPPER CO. **UTAH.**

Dead. Merged, 1903, in Dirigo-La Sal Gold & Copper Mining Co. Formerly at Castleton, Grand Co., Utah.

INTERNATIONAL COPPER CO., LTD. **ARGENTINA.**

Office: 56 Cannon St., London, E. C., Eng. Capt. W. B. McTaggart, D. L., J. P., chairman; A. Dangerfield, secretary. Organized July 7, 1905, under laws of Great Britain, with capitalization £100,000, shares £1 par; issued, £75,000. Was formed to finance the Famatina Development Corporation, Ltd., having bought £20,000 debentures and £20,000 income bonds of that company, and having agreed to advance £60,000 additional, at 6%, for the erection of a smelter, if required, securing in return the right to act as exclusive agent for sale of Famatina company's copper at 2% commission.

INTERNATIONAL COPPER CORPORATION, LTD. **NEW CALEDONIA.**

Dead. Lands sold, 1900, to Caledonian Mining Corporation. Formerly at Noumea, Diohot, New Caledonia.

INTERNATIONAL COPPER & GOLD CO. **COLORADO, MONTANA & MEXICO**

Office: 1122-135 Adams St., Chicago, Ills. A. P. Ballou, secretary and treasurer; W. C. Hermbuecher, general manager. Organized 1899, under laws

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of Arizona, with capitalization $3,000,000, shares $1 par. Apparently is a holding company only, controlling, through stock ownership, the Montana Copper & Gold Mining Co. and the Santa Fé Gold & Copper Mining Co. Supposedly controlled by Sonora Central Mines Co. Apparently all properties idle, and company not regarded favorably.

INTERNATIONAL COPPER MINING CO. **ARIZONA.**

Office: P. O. Box 530, Hancock, Mich. Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. Fred. J. Bawden, president; R. Mount Beattie, secretary; Geo. H. Nichols, treasurer; Carl Clausen, general manager. Organized May 18, 1903, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Lands, 14 claims, patented, near Solomon Springs, 6 miles southeast of Bisbee. Idle since birth and apparently moribund.

INTERNATIONAL COPPER MINING CO. **MEXICO.**

Letter returned unclaimed from former mine office, Carbó, Ures, Sonora, Mex. Property, in the Carnero Mountains, circa 30 miles west of Carbó, is said to show 4 veins.

INTERNATIONAL COPPER MINING CO. **UTAH.**

Dead. Merged, circa 1906, in Boston & Utah Copper Co. Formerly at Castleton, Grand Co., Utah.

INTERNATIONAL COPPER MINING CO. OF LAKE SUPERIOR. **MICHIGAN.**

Dead. Was wound up, 1901, and lands sold to Wetterhorn Land Co. Formerly at Matchwood, Ontonagon Co., Mich.

INTERNATIONAL COPPER MINING & MILLING CO. **WYOMING.**

Office: care of F. M. Dunn, Minneapolis, Minn. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Capitalization $600,000, shares $1 par. Lands, one claim, the Arlington, patented. Has a 90′ shaft. Idle since 1905 and out of cash, with poor prospects.

INTERNATIONAL EXPLORATION & INVESTMENT CO. **ARIZONA.**

Dead. Succeeded, circa 1902, by Lady Helen Copper Mining Co. Formerly at Pima, Graham Co., Ariz.

INTERNATIONAL GOLD & COPPER CO., LTD. **ONTARIO.**

Office: Mooney-Brisbane Bldg., Buffalo, N. Y. M. M. Wall, president; G. W. Stanley, treasurer; E. F. Goff, secretary; R. E. Erdmann, superintendent. Organized under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, in the Hastings district of Frontenac county, Ontario, have a 100′ shaft. Ide and apparently moribund.

INTERNATIONAL GOLD & COPPER MINING CO.

Office: 62 Commercial Blk., Salt Lake City, Utah. Somebody gets the mail still at that address. Location of lands, if any, unknown.

INTERNATIONAL GOLD-COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Lost lands, circa 1899. Formerly at Rossland, Trail district, B. C.

INTERNATIONAL INDUSTRIAL CO. **ALASKA & WASHINGTON.**

Office: Bellingham, Wash. O. B. Brown, president; J. W. Romaine, vice-president; C. T. Canfield, secretary; W. S. Bacon, treasurer. Capitalization $1,000,000. Property includes coal mines on Lake Whatcom, near Bellingham, from which coal has been shipped. Has gold claims in the Nome district of Alaska, and in Okanogan county, Washington, and copper claims near Valdez, Alaska, latter apparently idle.

INTERNATIONAL MINE & INVESTMENT CO. **MEXICO.**

Office: care of E. F. Fisher, secretary, Douglas, Ariz. Dr. W. E. Lindley, president; J. M. French, treasurer; S. C. Morrison, superintendent. Lands, 108 pertenencias, adjoining lands of the Santa Rosa Development Co., about 15 miles south of Douglas, and 4 miles from the Nacozari railroad, in the Arizpe district of Sonora, Mexico, showing a 2′ to 6′ quartz vein carrying oxide and

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carbonate ores assaying 3 to 30% copper, and up to 6 oz. silver, with traces of gold, opened by shafts of 20′ to 50′. Also owns sundry mineral lands near Mulatos, Sahuaripa, Sonora, Mex. Idle several years.

INTERNATIONAL MINING CO. **ARIZONA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Chloride, Mohave Co., Ariz. John Lopizich, president. Property, known as the Elkhart mine, is a silver-lead mine, with strong copper indications on the 500′ level, at the bottom of the mine, where there is a wide vein of low-grade silver-lead ore, carrying small copper and gold values. Has about 50,000 tons of low-grade silver-lead ore on the dump, and has a 100-ton mill. Idle.

INTERNATIONAL MINING CO. **COLORADO.**

Dead. Formerly at Black Hawk, Gilpin Co., Colo.

INTERNATIONAL MINING CO., LTD. **ONTARIO.**

Office: Sault Ste. Marie, Mich. Mine office: Dean Lake, Algoma, Ont. C. S. Beadle, general manager; V. E. Metzger, secretary and treasurer. Lands, 1,400 acres, known as the Brady location, lying in Patton and Thompson townships, east of the Mississagua river, 5 miles from Dean Lake and circa 30 miles east of Sault Ste. Marie, opened by 12 test pits, deepest 24′, showing a 3′ vein carrying chalcopyrite assaying 5 to 28% copper, with small gold and silver values. Idle for several years.

INTERNATIONAL MINING & REFINING CO. **CHILE.**

Mine office: Chañaral, Atacama, Chile. Property is an old group of mines near Chañaral, also sundry claims in the Huantajaya district of Tarapacá, Chile. Idle.

INTERNATIONAL SMELTING CO. **MEXICO.**

Office: 502 Hall Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. J. V. Hammer, president; H. W. Tracey, secretary; C. T. Finley, treasurer. Organized 1905, with capitalization $1,000,000, shares $1 par. Planned building a smelter, but did not do so. Promised dividends, but apparently found the hostilities of the Yaqui Indians a convenient pretext for failing to carry out its promises. Is regarded with much suspicion.

INTERSTATE EXPLORATION CO. **ARIZONA, ILLINOIS & WISCONSIN.**

Office: Endicott Bldg., St. Paul, Minn. Maj. E. L. DeLestry, general manager. Claims to have copper claims at Globe, Gila Co., Ariz., and zinc and lead claims at Benton and Platteville, Wis., and at Galena, Ills.

INTER STATE MINING CO. **MONTANA.**

Office and mine: Helena, Lewis & Clark Co., Mont. Organized 1894. Lands, 19 claims, in the Amazon district, circa 30 miles from Helena, showing a 4′ vein, and silver, lead and argentiferous copper ore, in a vein of 4′ to 12′ width, traceable nearly one mile. Company formerly operated near Marysville, Montana, but abandoned the original properties and secured, 1908, the Amazon group, from A. L. Palmer.

INTERSTATE MINING & MILLING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. M. J. Rodermill, president; C. M. Crago, vice-president; R. M. Fox, secretary; O. D. Wallace, manager; preceding officers, C. L. Stacy, W. P. Russell and M. H. McCall, directors. Lands, 24 claims, well timbered, adjoining the Hercules mine on the west and the Callahan on the east, said to show an 18″ vein of massive ore averaging 10% copper and 20% lead, with good silver values. Development is by a tunnel, planned to be driven 2,800′, cutting 3 veins to give backs of 600′, 800′ and 1,000′.

INVESTORS MINING & PROSPECTING CO. **WYOMING.**

Office: P. O. Box 132, Encampment, Wyo. Mine office: Rambler, Carbon Co., Wyo. Aaron Slothower, president and general manager; C. E. Winter,

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vice-president; C. B. Bergquist, secretary and treasurer. Organized July 19, 1904, under laws of Wyoming, with capitalization $1,000,000. Lands, 8 claims, partly patented, area 84 acres, in the Battle Lake district, showing a contact vein between schist and quartzite, up to 22′ in width, with a gossan showing some oxidized ores, changing to chalcopyrite at slight depth. Has a 110′ shaft. Idle several years.

INYO COPPER CO. **CALIFORNIA.**

Mine office: Darwin, Inyo Co., Cal. Chas. Wing, manager. Presumably idle.

INYO COPPER MINES & SMELTERS CO. **CALIFORNIA.**

Office: 353 Kearny St., San Francisco, Cal. Mine office: Keeler, Inyo Co., Cal. Employs 10 men. R. G. Paddock, president and general manager. T. J. Fitzsimmons, vice-president; Philip S. Montague, secretary; H. L. Wrinkle, engineer. Organized July 3, 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 21 claims, area 415 acres, showing limestone, granite and grano-diorite country rocks, with porphyrytic intrusions, carrying 8 contact veins, between limestone and porphyry or grano-diorite, showing a little native copper, malachite, azurite, chalcopyrite and chrysocolla, in veins of 2′ to 40′ width, said to give average assays of 12% copper, 6 oz. silver and $7.50 gold per ton. Development is by several shallow shafts, one planned to be sunk to 800′, and by several tunnels.

INYO COUNTY CONSOLIDATED COPPER CO. **CALIFORNIA.**

Office· 254 Wilcox Bldg., Los Angeles, Cal. Mine office: Citrus, Inyo Co., Cal. Formerly held 5 gold claims and 12 copper claims; sold 5 copper claims to New-York & Inyo Copper Co. Idle and apparently moribund.

IOWA & NEW MEXICO MINING CO. **NEW MEXICO.**

Dead. Formerly at Carrizozo, Lincoln Co., N. M.

IRIGOYEN HERMANOS y CA. **MEXICO.**

Mine office: Huetamo, Michoacán, Mex. Production, 1902, was 107,804 lbs. fine copper. Presumably idle.

IRISH COPPER MINES, LTD. **IRELAND.**

Office: Great Winchester St., London, E. C., Eng. Lt.-Col. E. B. Burnaby, chairman; R. L. Spicer, secretary. Organized July 10, 1906, under laws of Great Britain, with capitalization £60,000, in 50,000 ordinary shares, par £1, and 100,000 deferred shares, par 2s.; issued, £10,512. Was organized to acquire and work copper mines near Waterford, Ireland. Cannot be learned that property has been secured.

IRISH MAG MINE. **ARIZONA.**

Owned by Calumet & Arizona Mining Co.

IRISH MINES. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. B. A. Boyles, president; N. L. Lewis, vice-president; Otto Rosenthal, secretary; C. P. Dunn, treasurer. Lands, 7 claims, said to show a vein of 10′ to 15′ width, carrying oxides and altered sulphide ores, with values up to 15% copper, opened by a 100′ tunnel. Idle some years.

IRISH MINES PROPRIETARY CO., LTD. **IRELAND.**

Office: 4 Dawson St., Dublin, Ire. Mine office: Bonmahon, Co. Waterford, Ire. Organized Aug. 2, 1906, under laws of Ireland, with capitalization £20,000, in 10,000 ordinary shares, £1 par, and 100,000 deferred shares, 2s. par. Idle.

IRON CAP MINE. **ARIZONA.**

Owned by National Mining Exploration Co.

IRON CAP MINING CO. **ARIZONA.**

Office: Globe, Ariz. Mine office: Florence, Pinal Co., Ariz. Original lands, near Globe, were sold to National Mining Exploration Co. Present

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property, 5 claims, held under bond and lease, is in the Picacho district, 16 miles south of Florence. Presumably idle.

IRONCLAD COPPER MINING CO. **WASHINGTON.**

Office: Portland, Ore. Mine office: Spirit Lake, Skamania Co., Wash. Dr. P. L. McKenzie, manager; W. H. Warren, secretary. Lands, 10 claims, in the St. Helens district, show 2 veins, slightly developed, giving average assay values of about $25 per ton, in copper, silver and gold. Idle several years.

IRON CROWN MINING & MILLING CO. **IDAHO.**

Dead. Succeeded Jan. 6, 1908, by Copper Crown Mining Co. Formerly at Mullan, Shoshone Co., Idaho.

IRON DYKE COPPER CO. **OREGON.**

Office: care of Erie Trust Co., Erie, Pa. Mine office: Homestead, Baker Co., Ore. C. N. Conrad, president; H. G. Fink, vice-president; A. A. Clauss, secretary; F. F. Curtze, treasurer; preceding officers, Geo. R. Metcalf and Davenport Galbraith, directors. Frank E. Pearce, superintendent. Organized under laws of Pennsylvania, with capitalization $500,000, shares $100 par. Property shows considerable ore, on the dumps and blocked out for stoping, having several thousand feet of workings. Erie Trust Co. holds title by trust deed and bond. Presumably idle.

IRON FALLS GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Formerly had an office at 713 New York Blk., Seattle, Wash.

IRON HAT COPPER-GOLD MINING CO. **COLORADO.**

Dead. Formerly at Silverton, San Juan Co., Colo.

IRON HAT MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Wm. Hoffman, superintendent. Lands are in the East Tintic district. Presumably idle.

IRON HORSE MINING & MILLING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Organized 1904, with capitalization $500,000. Idle.

IRON KING EXTENSION MINING CO. **ARIZONA.**

Dead. Was a Douglas, Lacey & Co. swindle. Formerly at Humboldt, Yavapai Co., Ariz.

IRON KING MINE. **ARIZONA.**

The Iron King mine at Humboldt, Yavapai county, Arizona, is owned by the American Gold & Copper Consolidated Mining Co.

IRON KING MINE. **ARIZONA.**

The Iron King mine at Jerome, Yavapai county, Arizona, is owned by the Equator Mining & Smelting Co.

IRON MASK GOLD MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly owned the Iron Mask mine, which was sold, by foreclosure, circa 1901, to B. C. Corbin, who sold to the Consolidated Mining & Smelting Co. of Canada, Ltd. Office of company was at Spokane, Wash. Formerly at Rossland, Trail district, B. C.

IRON MASK MINE. **BRITISH COLUMBIA.**

Owned by Kamloops Mines, Ltd.

IRON MOUNTAIN COPPER CO. **UTAH.**

Mine office: Lund, Iron Co., Utah. Has argentiferous lead ore and auriferous copper ore. Idle since circa 1903.

IRON MOUNTAIN MINE. **CALIFORNIA.**

Owned by Mountain Copper Co., Ltd.

IRON SILVER MINING CO. **COLORADO.**

Offices: 1408-27 William St., New York, N. Y., and 615 Stevens Bldg., Detroit, Mich. Mine office: Leadville, Lake Co., Colo. DeForest Paine, president; W. R. Cobb, vice-president; Homer A. Hoit, secretary; Frémont Woodruff, treasurer; preceding officers, Hon. Thos. W. Palmer, Gen. Anson G. McCook,

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John Greenough, Winfield Scott, Henry G. Stevens and Samuel R. Reinhardt, directors; Waldemar Arens, general manager; Wm. Carson, superintendent; Geo. O. Argall, engineer. Organized March, 1880, under laws of New York, with capitalization $10,000,000, shares $20 par. Dividends, 1906, were $400,000, and 1907 were $300,000, with total dividends, to end of 1907, of $4,100,000. Net earnings have been as follows: $267,035.64 in 1904; $515,127 in 1906; $65,366.14 in 1907. Company begun 1908 with a surplus of $189,259.60. Farmers Loan & Trust Co., New York, registrar. Annual meeting, second Wednesday in March.

In addition to other properties, company controls, through stock ownership, the Nisi Prius Consolidated Mining Co., mine being leased to 3 different parties. Operating mines of the Iron Silver are the Moyer, Tucson and Dome, the Moyer being much the most important, having circa 2 miles of workings. The Tucson shaft is 925′ deep. Ores are mainly sulphide, the Dome mine furnishing zinc and lead carbonates, the Tucson mine supplying argentiferous zinc and lead ores, and the Moyer mine yielding argentiferous and auriferous zinc, lead and copper ores, and iron ore. Production has been as follows: 45,805,699 lbs. zinc, 3,608,351 lbs. lead, 948,902 lbs. copper, 950,067 oz. silver and 3,049 oz. gold in 1904; 61,738,134 lbs. zinc, 4,542,938 lbs. lead, 69,477 lbs. copper, 425,050 oz. silver and 2,043 oz. gold in 1906; 34,239,954 lbs. zinc, 5,489,047 lbs. lead, 21,321 lbs. copper, 298,598 oz. silver and 1,360 oz. gold in 1907. Property is well equipped and well managed, but inclined to show decreased production.

IRON SPAR COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. John J. Curran, manager. Lands, on the Montana side of the divide, in Leslie Gulch, are opened by a 375′ tunnel, showing chalcopyrite and galena assaying up to 22.5% copper, 52% lead, 8 oz. silver and $2.80 gold per ton.

IRONWOOD & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Office: Ironwood, Mich. Letter returned unclaimed from former mine office, Salome, Yuma Co., Ariz. Lands, 28 claims, in the Harcuvar Mountains, 7 miles northwest of Salome, opened by a shaft of circa 150′, said to show high grade sulphide ore. Idle and likely to be liquidated.

IROQUOIS COPPER CO. **MICHIGAN.**

Dead. Was liquidated, circa 1899, and lands sold to Osceola Consolidated Mining Co. Formerly at Kearsarge, Houghton Co., Mich.

IRVINEBANK MINING CO. **QUEENSLAND.**

Office: Irvinebank, Queensland, Australia. Mine office: Klondyke, via Mungana, Queensland, Australia. Geo. C. Young, secretary; Dan Mackey, mine manager. Company employs circa 700 men, and incidentally is engaged in copper mining, on a small scale. Property includes the Linedale West Chillagoe and the Lamington mines, latter having a 160′ shaft showing a 12″ vein averaging circa 20% copper and 5 to 6 dwts. gold per long ton.

Smelter has a water-jacket blast-furnace, planned for treatment of both copper and silver-lead ores, and also for the accumulation of tin slag, which seems a rather ambitious program for one small furnace. Produced, 1906, from the Lamington mine, circa 400 tons of 17% ore, carrying circa 150,000 lbs. fine copper, which was sold to the Chillagoe.

IRVINGTON SMELTING & REFINING CO. **NEW JERSEY.**

Works office: Irvington, Essex Co., N. J. Property is a small electrolytic refinery.

ISABEL COPPER MINING CO. **WYOMING.**

Dead. Lands sold, October, 1902, to Rambler Mining & Smelting Co. Formerly at Riverside, Carbon Co., Wyo.

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ISABELLA MINING CO. **NEW MEXICO.**

Mine office: Tres Piedras, Taos Co., N. M. Property is the Whale mine, said to show ore of good copper tenor.

ISLAND CITY COPPER MINING CO. **WYOMING.**

Office: Eaton Rapids, Mich. Letter returned unclaimed from former mine office, Saratoga, Carbon Co., Wyo. Has a copper ore body occurring as a contact between a norite dike and schist. Idle since circa 1904.

ISLAND MINING CO. **MICHIGAN.**

Office: 1000-32 Broadway, New York, N. Y. W. R. Todd, president; W. A. O. Paul, secretary and treasurer. Organized under laws of Michigan, with capitalization $1,000,000, shares $25 par; $13.75 paid in. Michigan charter expired 1904, but company has been unable to secure sufficient representation of stock to obtain an extension of its corporate existence. Last meeting of stockholders, held June 5, 1900, authorized a dividend of 80 cents per share. Property is circa 4,000 acres of mineral land on Isle Royale, Michigan.

ISLAND MOUNTAIN CONSOLIDATED COPPER CO. **CALIFORNIA.**

Dead. Formerly in Trinity county, California.

ISLANDS COPPER CO. **BRITISH COLUMBIA.**

Office: 234 Eppler Blk., Seattle, Wash. Lands include the True Blue group, on Valdez and Gowlland Islands, in the Nanaimo district of British Columbia, having a 50' shaft on a vein in diorite. Trial shipment, 22 tons, to the Tyee smelter, assayed 2.84% on low grade ore and 6.2% on high grade ore, with small gold and silver contents.

ISLE ROYALE CONSOLIDATED MINING CO. **MICHIGAN.**

Dead. Succeeded, March, 1899, by Isle Royale Copper Co. Formerly at Houghton, Houghton Co., Mich.

ISLE ROYALE COPPER CO. **MICHIGAN.**

Office: 303-199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Employs circa 400 men. Albert S. Bigelow, president; Hon. Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer: preceding officers, Clarence H. Bissell and Chas. N. King, directors; Wm. J. Uren, general superintendent; James E. Richards, mine superintendent; James G. Glanville, mill superintendent; Chas. D. Hohl, chief engineer; John T. Reeder, chief clerk and purchasing agent; Harry E. Lukey, clerk; Edward Colenso, chief mining captain.

Organized March, 1899, under laws of New Jersey, with capitalization $3,750,000, shares $25 par, as a merger of the Isle Royale Consolidated Mining Co. and Miners' Copper Co. Owns $50,000 stock in the Lake Superior Smelting Co. Annual meeting, first Wednesday in April, at Jersey City.

Lands, 3,520 acres and an 80-acre millsite. Mining lands include the old Isle Royale, Grand Portage and Huron mines, the Dodge and Frue prospects, and sundry undeveloped lands. The Hussey-Howe tract of 280 acres, lying northeast of the Superior and carrying the extension of the Baltic bed, was bought, 1907, for $220,000. An option on the mineral rights of the Montezuma tract, of circa 240 acres, lying next west, has expired. Lands include all of Sections 1, 2 and 11, and parts of Sections 3, 9, 10 and 15, T. 54 N., R. 34 W., also 160 acres in Section 6, T. 54 N., R. 33 W., 40 acres in Section 31, T. 55 N., R. 33 W., and 160 acres in Section 36, T. 55 N., R. 34 W., giving a compact tract carrying about 2½ miles of the strike of the system of copper-bearing beds.

The three old mines included in the present Isle Royale tract, made 48,452,590 lbs. fine copper, of which the Huron furnished 35,766,225 lbs., the Isle Royale 9,204,071 lbs., and the Grand Portage 3,482,294 lbs. These products were secured under primitive conditions, at a net aggregate loss of about $2,500,000. The old Isle Royale and Grand Portage mines were opened in

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1853, and the Huron in 1855. The history of all three is given in detail in Vol. II.

The Isle Royale has 3 parallel amygdaloidal beds, with strike of N. 32° E. and average dip of 56°, of which two have been extensively opened, these being the Isle Royale and Portage, the latter lying approximately 200′ west of the former. The shafts are on the Isle Royale lode, but the Portage bed is opened on many levels by crosscuts. East of the amygdaloids is the "Mabbs *vein*," lying near the Eastern Sandstone, 4′ to 7′ wide and rich in mass and barrel copper, but deficient in stamp rock. It was opened to a depth of about 250′, by John and Austin Mabbs, circa 1875, and has been tested, to some extent, by the present owner. There also are unidentified and unexplored copper bearing amygdaloids, lying west of the Portage bed, and occasional narrow *fissure* veins, carrying arsenical copper ores. Considerable diamond drilling has been done, and new openings were 8,251′ in 1906 and 8,728′ in 1907. The mine works 27 power drills, which number is to be considerably increased.

In addition to the new shafts, there are 28 old shafts in the three old mines, and masonry dams have been built underground, at various points, to *hold* back the water in the old openings. There are about 5 miles of old workings in the Huron, and 3 miles in the old Isle Royale and Grand Portage mines.

No. 1 shaft, near the northern boundary, was completely gutted by fire, December, 1903. This shaft had 3 compartments, and was 1,335′ deep, opened *on* the Isle Royale bed, with crosscuts driven on the eleventh to fifteenth levels, inclusive, to the Portage bed, lying 150′ to 220′ westward, with about 2 miles of drifts opened thereon, stoping having been about equally divided between *the* two beds, which were found markedly similar in characteristics and copper values. The surface plant at No. 1 was dismantled, 1908, machinery being taken mainly to No. 4 shaft. Concrete dams have been built across the south drifts of No. 1 at the thirteenth and fourteenth levels, holding back the mine water. Surface water is collected on the eighth level, and sent to No. 2 shaft *for forking* out.

No. 2 shaft, with 3 compartments, 2,400′ deep, is located 2,280′ southwest of No. 1, and in 1908 supplied two-thirds of the rock tonnage of the mine, its production running about 13 lbs. fine copper only, as against circa 17 lbs. fine copper per ton from the rock of the 3 new shafts. Stoping is in progress *from the* thirteenth to the twenty-second levels, inclusive. Less mass copper is being produced than formerly, and the north drifts are not looking especially well.

No. 3 is merely a site for a shaft, to reopen the old Huron mine, which has workings nearly 1,900′ in depth. In 1908 the nineteenth level south drift *of No.* 2 was sent under the old Huron workings, which remain filled with water.

The new shafts, Nos. 4, 5 and 6, all on the Isle Royale bed, at the southern end of the property, have about 2 miles of workings. These shafts show considerable heavy copper, the amount of mass copper raised May, 1908, having *been nearly* 50 tons. The new shafts have been connected with the railroad line, and given permanent equipments.

No. 4 shaft, circa 3,100′ south of No. 2, was 425′ deep October, 1908, developing good stamp-rock. Equipment includes a 32x72″ Nordberg duplex-cylinder hoist, good for one mile depth, and a 35-drill air-compressor, both *taken from* No. 1 shaft. There is a cylindrical steel shaft-rockhouse, built by the Wisconsin Bridge & Iron Co., having cylindrical rock-bins 42′ in diameter and 32′ high. The power plant has a 140′ steel brick-lined self-supporting *stack*.

No. 5 shaft, circa 5,100′ south of No. 2, on Section 2, was begun October,

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1906, and was circa 425′ deep October, 1908. The shaft is sunk in the foot-wall, and will be given a new shaft-rockhouse similar to that at No. 4, in 1909.

No. 6 shaft, formerly known as the Section 11 exploratory shaft, is circa 7,300′ southwest of No. 2, near the centre of Section 11, and was cut down, 1908, to 3-compartment size. The shaft was 550′ deep October, 1908, developing very good average ground, the bed showing much epidote. Levels are opened at 120′ intervals. The permanent equipment, added 1908, includes a brick engine-house, steel boiler-house with a 140′ brick-lined self-supporting steel stack, and a circular steel shaft-rockhouse, similar to that at No. 4.

A shaft was started, 1904, on Section 10, but was discontinued because of the heavy overburden, and a diamond drill substituted, the drill cores showing an amygdaloidal bed, of which about 5′ in width carried stamp-copper in fine grains.

The Section 12 shaft was begun October, 1905, and was discontinued January, 1908, at depth of 812′, after drifts and crosscuts had been driven four ways to locate the Baltic bed. The shaft was sunk in a badly disturbed bed, practically barren of copper, and was abandoned because later developments showed the Baltic bed to be located elsewhere on Isle Royale lands.

The new Baltic shaft, on the Hussey-Howe tract, was circa 35′ deep October, 1908, with temporary equipment, and a promising showing of copper was found therein, on the Baltic bed, Nov. 1, 1908.

Shafts Nos. 1 and 2 formerly had duplicate equipments. No. 2 shaft has a combination shaft-rockhouse, 44x60′ in size and 90′ high, with 18x24″ and 13x20″ Portage Lake crushers. The engine-house is 50x90′, of steel on stone foundations, with a hoist having 18′ 6″ drums with lathe-turned grooves for 6,000′ of 1½″ cable, capable of raising 6-ton skips from a depth of 6,000′. The compressor-house has a 35-drill Nordberg 2-stage air-compressor. The boiler-house is 44x72′, with a 16x72′ coal-storage addition, and a 3,000-ton coal trestle, with three 150-h. p. 84″ Burt Horizontal boilers, taking water from a dam 300x500x6′. The machine shop is 40x60′, of steel, on stone foundations. There are about 100 dwellings on the company's lands.

The Isle Royale railroad, owned by the company, connects the mine and mill with about 5 miles of main line, having easy grades, and was reballasted and bridges and trestles strengthened, 1908, for heavier rolling stock. Equipment includes 35-ton, 55-ton and 60-ton locomotives, and 40 forty-ton steel rock cars equipped with air-brakes.

The millsite, at the mouth of Pilgrim River, has nearly one mile of frontage on Portage Lake. The mill, 134x210′, of steel frame, on stone foundations, has three 2,000-ton rock-bins and 3 Nordberg stamps having circular mortars and ⅜″ screen openings. As built, each stamp had 32-ton mortars, resting on anvil-blocks bedded on 20x20′ platform 3′ thick, of 14x24″x20′ oak timbers. Underneath each platform is a caisson, reaching to bedrock, made of 5/16″ boiler steel, 74′ long and 12′ in diameter, until near the top, where there is a bell-shaped flare, 20′ in diameter, to support the oak platforms underneath the anvil-blocks. The caisson and spaces between are filled with concrete. The first head was rebuilt, 1908, and given solid concrete foundations to bed-rock. The first head was changed over, March, 1905, to the steeple-compound system, and a second was altered similarly, during the latter half of 1908, the third remaining a simple head, of circa 500 tons daily capacity, while the compound heads are of about 750 tons daily capacity each. The dressing floor has 72 rough jigs and 30 finishing jigs, of the Parnall-Krause type, circular slime tables, and Bartlett and Wilfley tables to treat slimes from the round tables. There are rolls with fixed bearings to regrind coarse gravel from the mortars.

The mill has a complete machine-shop, on the second floor, and power is

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furnished by a 750-h. p. engine, taking steam from four 250-h. p. boilers in a 46x72′ boiler-house at the rear of the mill.

There is a 32x600′ wharf, with deep water alongside, at the millsite, with appliances for unloading coal and general freight, and for the dispatch of mineral, in scows, to the smelter at Dollay Bay, 2 miles across Portage Lake.

Water is furnished the mill by a 16,000,000-gallon Nordberg Corliss pump, especially designed to handle muddy water, having a triple discharge into a 30″ riveted steel water-main running 2,200′ from pump-house to mill, the pump being located some distance from the mill to obviate stamp-sand clogging the intake. Three 100-h. p. boilers furnish power for the pumps, fuel being taken from a large coal-trestle at the rear of the pump-house boiler-rooms. A dam near the mill furnishes feed-water for boilers.

Production of fine copper has been as follows: 3,569,748 lbs. in 1902; 3,134,601 lbs. in 1903; 2,442,905 lbs. in 1904; 2,973,761 lbs. in 1905; 2,937,098 lbs. in 1906; 2,354,198 lbs. in 1907. Yield of fine copper, per ton of rock stamped, has been remarkably uniform, showing less variation than almost any other mine in the Lake Superior district, returns for 5 years, 1903 to 1907, inclusive, ranging from a minimum of 15.2 lbs. per ton in 1905 and 1907 to a maximum of 15.8 lbs. in 1904. Production, September, 1908, was about 18,000 tons of rock stamped, yielding circa 175 tons of mineral, or about 265,000 lbs. fine copper. The new shafts should be capable of more than doubling the former production, and 1909 should show a considerable increase in output.

Costs per ton of rock stamped have been as follows: $1.86 in 1903; $1.86 in 1904; $1.71 in 1905; $2.25 in 1906; $2.92 in 1907. Costs per pound of fine copper have been as follows: 11.83 cents in 1903; 13.3 cents in 1904; 12.76 cents in 1905; 12.22 cents in 1906; 17.09 cents in 1907. In addition to the preceding figures, costs per pound, for exploration, railway extensions, etc., brought the total cost of copper, in 1906, to 14.69 cents per pound, and in 1907 to 20.26 cents per pound.

The company began 1907 with a balance of assets of $772,592.99, and ended with a balance of $501,157.64. Based on figures of shrinkage of assets alone, 1907 was the worst year that the company has experienced, but, taking into consideration the progress made in opening three new shafts on the Isle Royale bed, the year was one of the most satisfactory in the company's history, but an even better mining showing was made in 1908, with continued developments of a satisfactory nature in the new Isle Royale shafts, and the location of the northern extension of the Baltic bed, on the Hussey-Howe tract. The company has ample resources, including a very large cash surplus and magnificent equipment, and has a courageous management, which is entitled to great credit for its persistent search for mineral values, and the prospects of the company seem brighter than at any time in the past.

ISLE ROYALE LAND CORPORATION, LTD. **MICHIGAN.**

Office: 24 North John St., Liverpool, Eng. Local office: care of Fred W. Nichols, agent, Houghton, Houghton Co., Mich. W. J. Thompson, J. P., chairman; John Tibbs, secretary. Organized June 21, 1890, as Wendigo Copper Co., Ltd., and name changed to present title July, 1901. Capitalization £225,000, shares £5 par, in 2,000 first preference, 1,089 second preference and 41,911 ordinary shares. Preference shares, all issued and fully paid; 34,504 ordinary shares issued, £4 paid in. Last published accounts, of date Dec. 31, 1905, showed a debit balance of £7,348. Lands, 83,720 acres, mainly copper-bearing, upon the northern fold of the Keweenawan syncline, on Isle Royale, Lake Superior, Michigan, comprising the major portion of the area of this, the largest fresh-water island of the globe. Considerable mining, of a rather desultory nature, has been done upon these lands, at various periods in the past, and some copper secured. Idle since 1892.

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SOCIETÀ METALLURGICA ITALIANA. **ITALY.**

Works office: Leghorn, Tuscany, Italy. Organized 1887, and capitalization since increased to 10,000,000 lire. Net profits, 1904, were 641,067 lire, and a dividend of 7.5% was paid for that year. Property includes 3 plants, the largest, at Leghorn, occupying about 25 acres, with a smaller plant at Limestri.

Smelter, in connection with the works, has 4 blast-furnaces, of about 70 tons aggregate daily capacity, and 4 reverberatory furnaces casting refined copper as anodes, plates, ingots, etc. The smelter treats about 20,000 tons of ore yearly, partly native but largely imported from Spain, America and elsewhere. In connection with the smelter there is an electrolytic refinery, built 1900, which turns out copper of very great purity.

The power plant of the works has 16 engines, with about 1,800 aggregate h. p., and a very complete electric plant, furnishing power, light and energy for the electrolytic refinery. The shops are extensive, including rolling mills, tube mills, wire-drawing shops, wire-rope shops and miscellaneous shops for the manufacture of copper into a great variety of forms. There is a special alloy foundry having 28 crucible furnaces, for fusion of the principal copper alloys, the products of these works enjoying an excellent reputation. There also is an extensive acid plant for the manufacture of sulphuric acid. The company turns out nearly 10,000 metric tons of manufactured copper yearly, in almost an infinite variety of forms, and employs about 1,300 men.

ITMAY MINE. **WYOMING.**

Office: care of I. C. Miller, Rawlins, Wyo. Mine office: Rambler, Carbon Co., Wyo. Albert Bryle, superintendent. Is not an incorporated company. Lands, circa 4 miles south of Rambler, have a drainage tunnel and a 350′ shaft, showing a vein up to 8′ in width, carrying occasional native copper and sulphide ore, formerly claimed to average 30% copper and 4 to 5% lead, but actually averaging about 8% copper only. Lands are said also to have a 20′ vein carrying a 3′ paystreak of high grade ore. It was claimed, June, 1906, that a 200-ton reduction plant had been bought, and was to be installed, but this apparently was a pipe-dream.

IT MINING CO. **ALASKA.**

Mine office: Ketchikan, Alaska. Lands, on Kasaan Bay, showing auriferous copper ore, are opened by a crosscut tunnel. Plans a one-mile tram, with a 1,200′ gravity section leading to a 1,200′ wharf, on tidewater.

ITSUKI MINE. **JAPAN.**

Mine office: Itsuki-mura, Kuma-gori, Higo, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 5 to 6% copper, in veins interbedded in clay-slates. Production, 1900, was 1,080,163 lbs., falling to 441,407 lbs. in 1906 and to 330,262 lbs. in 1907.

IVANHOE MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. A. P. Abell, president; Jas. Johnson, vice-president and general manager. Capitalization $750,000, shares $50 par. Lands, 12 claims, 4 miles southwest of Patagonia, opened by tunnel, with about 500′ of workings, showing highly argentiferous lead and copper ores. Presumably idle.

IVANHOE MINING CO. **UTAH.**

Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Is in litigation with the United States Smelting & Refining Co., but otherwise idle.

IVANPAH CONSOLIDATED SMELTING CO. **CALIFORNIA.**

Dead. Property passed to Cocopah Copper Co. Formerly at Manvel, San Bernardino Co., Cal.

IVANPAH MAMMOTH GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: San Diego, Cal. Letter returned unclaimed from former mine

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office, Ivanpah, San Bernardino Co., Cal. Capitalization $2,000,000, shares $1 par. Lands, 22 claims, 11 freehold and 10 held under option, area 435 acres, 12 miles west of Ivanpah, formerly claimed to show a ledge 300′ wide and 6,000′ long, which, at last accounts, had shrunk, most unaccountably, to 8′ width, of which 6′ is said to carry argentiferous and auriferous copper and lead sulphides, formerly claimed to give surface assays of $9 to $105 per ton. Idle and apparently moribund.

JACK POT MINING & MILLING CO. **WYOMING.**

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Coppertown, Carbon Co., Wyo. Employs 4 men. Ole Granberg, president and general manager; H. Thorsgaard, vice-president; H. O. Granberg, secretary and treasurer; J. M. Riggs, superintendent. Organized Dec. 23, 1903, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 9 patented claims, area 180 acres, in the Battle Lake district, showing fissure veins in diorite and chloritic schist, and 2 contact veins, between diorite and porphyry, carrying carbonate and sulphide ores. Two veins under development are said to average 14′ and 60′ width. The smaller vein has given average assays of 8% copper and $3 to $12 gold per ton, the larger vein showing very low grade copper ore, apparently not of commercial tenor. Development is by a 75′ tunnel, 100′ shaft and 8 pits of 20′ to 36′ depth, with 411′ of workings. Idle.

JACK TAR COPPER CO. **ARIZONA.**

Dead. Was a swindle, perpetrated by the Wm. F. Wernse gang, of St. Louis. Formerly at Pima, Graham Co., Ariz.

JACQUA COPPER MINING CO., N. L. **AUSTRALIA.**

Office: 113 Pitt St., Sidney, N. S. W., Australia. Mine office: Jacqua Creek, Argyle Co., N. S. W., Australia. Organized, early 1907, under laws of New South Wales, with capitalization £2,000, shares £1 par. Presumably idle.

JALISCO COPPER MINING CO. **ARIZONA.**

Dead. Was a stock-jobbing enterprise. Formerly at Oro Blanco, Pima Co., Ariz. Described Vol. III.

JALISCO COPPER MINING & SMELTING CO. **MEXICO.**

Dead. Delaware charter repealed, 1903. Formerly in state of Jalisco, Mexico.

JALISCO MINING & DEVELOPMENT CO. **MEXICO.**

Office: care of Dennis Ryan, St. Paul, Minn. Mine office: Ahualulco, Jalisco, Mex. Organized, circa 1906, to take over property of Altamira Mining Co. Idle.

JALISCO (MEXICAN) MINING SYNDICATE, LTD. **MEXICO.**

Office: 54 New Broad St., London, E. C., Eng. A. Firth, Chairman; M. P. Gosset, agent in Mexico; G. V. Mitchell, mine superintendent; Alfred Hays, secretary. Organized Jan. 18, 1906, under laws of Great Britain, with capitalization £25,000, shares £1 par; issued, £16,000. Company claims to possess 80 pertenencias, area 198 acres, carrying ores of gold, silver and copper, at Malpillas, Jalisco, Mexico, but there is no postoffice by the name of Malpillas, Melpillas or Milpillas in Jalisco, or elsewhere in Mexico. Regarded with suspicion.

JAMAICA CONSOLIDATED COPPER CO. **JAMAICA.**

Office: 262 Washington St., Boston, Mass. Mine office: May Pen, Clarendon, Jamaica. T. I. Hogan, president; E. F. Gowell, Clerk; R. W. Goss, treasurer; W. S. Baker, general manager; Cyril Abraham, superintendent. Organized circa September, 1907, under laws of Maine, with capitalization $6,000,000, shares $1 par.

Lands, 2,276 acres, held on 99-year lease, 15 miles from the coast, in the Clarendon Hills. Property includes the Congo Hill mine, having a 455′ tunnel showing a small vein carrying chalcopyrite and bornite; the Copper Wood

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mine, having a 270′ tunnel, showing a small stringer of bornite; the Sylvia mine, having a 75′ tunnel showing bornite and chalcocite, said to assay 7% copper; the Elma mine, having a 240′ tunnel, and the Iva mine, having a 90′ tunnel. Wages for labor are 18d. per day.

Small shipments of ore were made from this property, 1854-1857, and company estimates that it can place copper in New York for 6.5 cents per pound, and that it will be mining 200 tons of ore daily by middle of 1909, neither of which estimates seem warranted. Is regarded with suspicion.

JAMAICA COPPER CO. **JAMAICA.**

Dead. A stock-jobbing enterprise. Formerly in Jamaica. Described Vol. V.

JANIE MINING CO. **MEXICO.**

Dead. Lands sold, 1907, to Mexican Mines Corporation. Formerly at Baca, Hidalgo, Chihuahua, Mex.

JANOS MINING CO. **MEXICO.**

Dead. A swindle. Formerly at Casas Grandes, Galeana, Chihuahua, Mex. Described Vol. VI.

JAPAN-FLORA MINES & TUNNEL CO. **COLORADO.**

Office: 310 Colorado Bldg., Denver, Colo. Mine office: Telluride, San Miguel Co., Colo. J. J. Fisher, president; Col. A. G. Brownlee, vice-president and general manager; J. H. Cunningham, treasurer; Wm. E. Humphrey, secretary. Organized Aug. 22, 1903, under laws of Colorado, with capitalization $2,000,000, shares $1 par.

Lands, 35 patented claims, area 317 acres, in the upper San Miguel district, showing 8 fissure veins, in brecciated andesite, carrying auriferous and argentiferous galena and iron pyrites, with quartz gangue, averaging about 0.5% copper, 10% lead, 8% zinc, 23.5 oz. silver and $10 gold per ton, opened by a 685′ shaft and 8 crosscut tunnels, two longest 1,600′ and and 2,752′, with 19,665′ of underground openings, estimated to give 150,000 tons of ore blocked out for stoping. Has steam and electric power, with a 45-h. p. hoist, 2 Leyner air-compressors, power drills and shops. Property has produced considerable ore. Closed down, October, 1905, but shipped a little ore, 1907. Presumably idle.

JARILLA COPPER CO. **NEW MEXICO.**

Dead. Reorganized, 1903, as Three Bears Copper Co. Formerly at Jarilla, Otero Co., N. M.

JARILLA MINING & SMELTING CO. **NEW MEXICO.**

Mine office: Jarilla, Otero Co., N. M. Lands, 20 claims, held under 5-year bond and lease, expiring 1909. Idle and apparently moribund.

JASPER COPPER CO. **ONTARIO.**

Office: 716 Torrey Bldg., Duluth, Minn. Letter returned unclaimed from former mine office, Port Arthur, Thunder Bay district, Ont. Geo. W. Clayton, president; E. K. Corbett, vice-president; Edwin C. Jordan, secretary and treasurer; preceding officers, S. Enborg, David Dickie, Robt. Ferguson, Geo. Bell and St. John Schulte, directors. Organized under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands, circa 400 acres, about 40 miles east of Port Arthur, on the Black Bay peninsula, having lake frontage. Property is said by company to show a jasper-conglomerate, carrying values in copper, silver and gold, and an amygdaloid of 900′ to 1,000′ width carrying an average of 2.5% copper and $3.50 per ton in combined silver and gold values, which is absolutely untrue, and shows the company to be managed either by people who do not know the truth, or who will not tell it. Property is said to have a 40′ shaft and a 75′ tunnel. Company formerly was promoted from 22 Lewis Blk., Buffalo, N. Y., from which address letters were returned unclaimed. Is regarded with suspicion.

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JASPER MOUNTAIN COPPER CO. **WYOMING.**

Mine office: Douglas, Converse Co., Wyo. Idle since circa 1904.

J. BENNETT SMITH MINING CO. **MINNESOTA.**

Office: 280 Chestnut St., Kingston, Pa. J. Bennett Smith, president; Herbert Conyngham, secretary; Edw. Hilles, treasurer; Henry Hoefler, general manager. Lands, on the Lower Snake River, in Pine County, Minnesota, carry the extension of the Keweenawan copper beds of Lake Superior. Mine has pits and shafts of 20′, 40′, 110′, 150′ and 560′, on amygdaloidal and conglomerate strata carrying native copper. Company reports having expended about $50,000 on development, since 1879.

J. D. VORIS COPPER MINING CO. **COLORADO.**

Mine office: Hillside, Frémont Co., Colo. Idle several years and apparently moribund.

JEDWAY COPPER CO. **BRITISH COLUMBIA.**

Mine office: Heriot Pay, Queen Charlotte Island, B. C. Property, sundry claims held under $125,000 bond and lease, produced some ore of fair grade in 1907. Presumably idle.

JEFFERSON-CALHOUN MINING CO. **COLORADO.**

Office: Chicago, Ills. Mine office: Russell Gulch, Gilpin Co., Colo. Louis D. McCall, president; Alfred M. Stearns, vice-president; W. S. Caldor, secretary. Organized under laws of Colorado, with capitalization, $3,000,000, shares $1 par, apparently as a reorganization of the Wabash Consolidated company. Lands, 7 patented claims, reached by the Newhouse tunnel. Plans sinking a 1,800′ shaft.

JEFFERSON COPPER CO.

Dead. Was a swindle, promoted by the notorious Wm. F. Wernse gang, of St. Louis. Had a name, but never enjoyed a local habitation, property being purely imaginary.

JEFFERSON COPPER-GOLD MINING CO. **COLORADO.**

Office: 1419 Schofield Bldg., Cleveland, Ohio. R. A. Gurley, president and general manager; S. Bender, vice-president; F. E. Carr, secretary; E. A. Kemen, treasurer; preceding officers, Francis L. Judd, W. E. Hayes, C. S. Carr, E. Grove and E. E. Carr, directors. Organized under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands, 180 acres, in the Bear Creek district of Jefferson County, Colorado, showing 6 veins, reported as fissures in labradorite, of 21′ average width, carrying chalcopyrite with 1.5 oz. silver and $2 to $14 gold per ton, opened by a 78′ shaft. Company states that veins carry about 2% copper down to the 125′ level, followed by average values of about 7% to the 350′ level, there reaching the base zone, carrying 3 to 4% copper.

JEFFERSON COPPER MINING CO. **COLORADO.**

Dead. Was a swindle, perpetrated 1900, by the notorious W. C. Calhoun, of Denver. Merged into the Zanesville company, circa 1901, latter merged, circa 1902, in the Wabash Consolidated. Formerly at Golden, Jefferson Co., Colo.

JEFFERSON COUNTY MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Basin, Jefferson Co., Mont. Was organized for the purpose of leasing the mine of the Basin & Bay State Mining Co. Seems complicated, somehow, with La France Copper Co. Idle and apparently moribund.

JEFFERSON-MONTANA COPPER MINES CO. **MONTANA.**

Office: care of Clarence K. McCornick, vice-president and general manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Corbin, Jefferson Co., Mont. Arthur H. S. Bird, president and superintendent; C. H. Post, secretary and treasurer; preceding officers, H. A. Mc-

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Cornick and B. T. King, directors. Organized, 1904, under laws of Utah. Is a twin of the Corbin-Montana Mines Co. Lands, circa 20 claims, showing 2 veins and having a 310′ shaft. Did some diamond drilling, 1905. Company said to have given a 3-year bond and lease, circa June, 1908, to Chas. Hughes, Alfred Cribben and L. C. Cribben, of Denver.

JEFFS LAND CO. **MICHIGAN.**

Office and mine: Rockland, Ontonagon Co., Mich. Lands, 800 acres, north and west of Rockland, on which some exploring was done, 1899-1900. Fully described Vol. I.

JELDNESS COPPER CO. **NEVADA.**

Dead. Organized circa 1906, with capitalization $1,000,000, shares $5 par. Formerly at Ely, White Pine Co., Nev.

JELM TOWNSITE & MINING CO. **WYOMING.**

Dead. Formerly at Jelm, Albany Co., Wyo. Described Vol. VII.

SOCIEDAD MINERA JENERAL LAS HERAS DE CABEZA DE VACA. **CHILE.**

Office: Santiago de Chile. Mine office: Copiapó, Copiapó, Chile. Organized Jan. 14, 1907, under laws of Chile, with capitalization 240,000 pesos, shares 100 pesos par.

JENNIE DELL MINING CO. **MONTANA.**

Dead. Succeeded, 1905, by Columbus-Butte Mining Co. Formerly at Butte, Silver Bow Co., Mont.

JEROME-ARIZONA COPPER CO. **ARIZONA.**

Office: care of Hon. Reese M. Ling, Prescott, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Organized June, 1907, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands are 4 miles northeast of Jerome.

JEROME CAÑON COPPER CO. **ARIZONA.**

Office: 106½ South Broadway, Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. J. W. Tibot, president; G. B. Tibot, secretary; Jos. S. Smith, superintendent. Organized 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 16 claims, including the Copper Glance group, 14 miles northwest of Jerome, showing a vein ranging from 2′ to 7′ width, with circa 1,500′ of openings, with ore assaying up to 28% copper, 60 oz. silver and $110 gold per ton. Had steam power, air-compressor, power drills, hoist and pumps. Information refused and company apparently moribund.

JEROME COPPER CO. **ARIZONA.**

Dead. Succeeded, 1902, by Cleopatra Copper Co. Formerly at Jerome, Yavapai Co., Ariz.

JEROME MINES DEVELOPMENT CO. **ARIZONA.**

Dead. Succeeded the Verde Chief Copper Co., and was succeeded, 1907, by Haynes Copper Co. Formerly at Jerome, Yavapai Co., Ariz. Described Vol. VI.

JEROME SILVER-COPPER MINES CORPORATION. **ARIZONA.**

Dead. Formerly at Jerome, Yavapai Co., Ariz.

JEROME VERDE COPPER CO. **ARIZONA.**

Office: 804 Flatiron Bldg., New York, N. Y. Mine office: Jerome, Yavapai Co., Ariz. Wm. Welles Bosworth, president; Thos. E. Campbell, vice-president; Leland S. Stillman, secretary; I. Mabbet Sutton, treasurer; preceding officers and Thos. E. Campbell, directors; Dr. Ernest A. Haggott, consulting engineer; Eli Barrett, superintendent. Organized circa January, 1907, under laws of Arizona, with capitalization $5,000,000, shares $1 par, as successor of the Verde Queen Copper Co., giving old shareholders of the Verde Queen $2,501,000 escrowed stock of the new company, this amount being a control.

Lands, 28 claims, patented, area 486 acres, said to be encumbered by a

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small mortgage, lying northeast of the United Verde and adjoining the United Verde Extension, showing an iron gossan with outcrops of copper ore on the Verde and Columbia claims. The Columbia has a 475′ two-compartment shaft, with about 2,000′ of workings, showing mainly copper carbonates, with small quantities of oxide and silicate ores, average assays from which are reported at 8.5% copper, but a mine, if found, will be at greater depth. Has a number of buildings and a 35-ton smelter, out of commission since 1904, which produced 3 carloads of matte, when operated by the Verde Queen. Property was idle for several years, until taken over by present company. Company was promoted by the General Securities Co., Los Angeles, Cal., and Wm. V. Holley & Co., New York, former offering the stock as absolutely guaranteed, which necessarily causes it to be looked upon with suspicion. Company has been criticised severely in Jerome because of the extravagant nature of its advertising. Company claimed, July, 1907, to have about $35,000 in its treasury, in cash and securities. The questions naturally arise as to what proportion may have been in cash, and the value of the securities. Company is not regarded favorably.

JESSIE BELLE MINING, MILLING & SMELTING CO. **CALIFORNIA.**

Office: 302 Lankershim Bldg., Los Angeles, Cal. Mine office: Daulton, Madera Co., Cal. W. H. Sallada, president; W. T. Carter, secretary; D. J. Carpenter, lessee. Organized 1902, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 3 patented claims, area 40 acres, with a 200′ main shaft showing 4 fissure veins, carrying oxide, carbonate and sulphide ores, assaying 15 to 20% copper, 6 oz. to 10 oz. silver and $8 to $15 gold per ton. Has steam power, air-compressor and a 30-ton concentrator. Has shipped concentrates of about $40 per ton average gross value.

JESSIE COPPER MINING CO. **UTAH.**

Office: care of Clark L. Whitney, secretary, Salt Lake City, Utah. Mine office: Dixie, Washington Co., Utah. Wm. Scowcroft, president; Andrew Sorensen, vice-president; John Q. Critchlow, treasurer; preceding officers, Robt. G. McQuarrie, J. H. Garrett and Albert Scowcroft, directors. Organized 1907, under laws of Utah, with capitalization $60,000, shares 10 cents par. Lands, 5 claims, in the Tutsagubet district, having a few feet of openings showing ore up to 68% in copper tenor.

JESSIE MINES CO. **ARIZONA.**

Mine office: Poland, Yavapai Co., Ariz. John S. Jones, president and general manager; Harry Brisley, vice-president; Allan Hill, secretary; E. J. F. Horne, treasurer; preceding officers, Jesse T. Jones, J. J. Shaw, L. W. Smith, Smiley Caldwell and Nelson Dresbach, directors. Organized under laws of Arizona, with capitalization $2,500,000, shares $1 par. Mine has a 667′ shaft, and is claimed to have produced upwards of $750,000 in gold, under former ownership. Receiver was appointed October, 1905, and discharged June, 1906. Company claimed to have 150,000 tons of ore blocked out for mining, worth at a conservative estimate, $2,000,000, which, of course, was untrue, and paid quarterly dividends of 3% while peddling shares. President Jones and F. D. Fuller, agent for the company, were indicted for using the mails to defraud, but cases were nolle prossed, and the management considers this a vindication. Management is said to plan building a 50-ton reduction plant. Is viewed with deep suspicion as a mere bit of stock-jobbery, notwithstanding the success of its promoters in escaping jail.

JESSIE WEIMER MINING CO. **UTAH.**

Mine office: Callao, Juab Co., Utah. Presumably idle.

MINA JESÚS MARIA DE BAQUERÁCHIC. **MEXICO.**

Mine office: Lluvia de Oro, Batopilas, Chihuahua, Mex. Is an old property,

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once important, having copper sulphides carrying circa 5 oz. silver and $2 gold per ton. Presumably idle.

JICARILLA MINING & REDUCTION CO. **NEW MEXICO.**

Letter returned unclaimed from former office, 108 La Salle St., Chicago, Ills. Mine office: Jicarilla, Lincoln Co., N. M. Geo. E. Emery, president; H. G. W. Reinhardt, secretary; Wm. A. Franklin, manager; J. L. Walsh, mill superintendent. Lands are developed by a shaft showing gold-silver-copper ores. Has steam power and a 15-stamp mill. Idle and apparently moribund.

J. I. C. MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. G. D. B. Turner, general manager; N. A. McLean, superintendent. Is controlled, through stock ownership, by the West Quincy Mining Co. Lands, near Daly-West and Daly-Judge, have a 625′ shaft.

JIMULCO MINING CO. **MEXICO.**

Office: care of City Brewery, San Antonio, Tex. Mine office: Otto, Viesca, Coahuila, Mex. Otto Wahrmund, president; O. S. Newell, vice-president; S. G. Newton, secretary; John J. Stevens, treasurer; S. D. Bridge, general manager; Arthur L. Tuttle, general superintendent; John B. Moore, superintendent; Sidney P. Tyler, mine superintendent.

Organized 1901, under laws of Texas, with capitalization $500,000, shares $50 par, increased March, 1906, and reduced, 1908, to $1,000,000. Is said to have declared 6 dividends, aggregating 27% on capitalization, in 1906, and is said to have paid 6 dividends in 1907.

Lands, 111 hectares, including the Guadalupe, Casita, Reforma and Alfaris mines, opened by a 300′ shaft and 5 tunnels of circa one mile aggregate length, mine having an extreme depth of 500′, with about 6 miles of workings. Ores, mainly oxidized, are shipped to the Aguascalientes smelter for reduction, and are said to give average returns of 15% copper, 9 oz. silver and $2 gold per ton, which figures seem unduly high.

Mine has gasoline power, and is connected, by a 5-mile narrow gauge railway, costing $40,000, with the Mexican Central railway, at Jimulco. Production was 1,693,957 lbs. fine copper in 1904, and 3,413,735 lbs. fine copper in 1905. Was mining circa 75 tons daily, of high grade copper ore, until closed down October, 1907, but resumed June 1, 1908, with a force of about 150 men, again shipping ores to the Aguascalientes smelter. Property considered valuable.

JOAQUINA GOLD MINING CO. **MEXICO.**

Office: 327 Douglas Bldg., Los Angeles, Cal. Mine office: Real del Castillo, Norte, Baja California, Mex. L. H. Mitchell, superintendent. Has auriferous copper ores and steam plant, employing circa 25 men at last accounts.

JOHN D. COPPER MINING CO. **WASHINGTON.**

Dead. Merged, 1902, in Ethel Consolidated Mines Co. Formerly at Index, Snohomish Co., Wash.

JOHN DIAS MINE. **CALIFORNIA.**

Owned by Owl Copper Mining Co.

JOHNNIE BULL COPPER MINING CO. **NEW MEXICO.**

Dead. West Virginia charter forfeited 1902. Formerly at Steins, Grant Co., N. M.

JOHNNIE COPPER CO. **NEVADA.**

Mine office: Johnnie, Nye Co., Nev. Presumably idle.

JOHNNIE-GREENWATER CONSOLIDATED COPPER CO. **CALIFORNIA & NEVADA.**

Mine offices: Greenwater, Inyo Co., Cal., and Johnnie, Nye Co., Nev. B. T. Hickman, president and general manager; M. H. Smith, vice-president; B. H. Cook, secretary; E. H. Meuschke, treasurer. Organized under laws of Ari-

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zona, with capitalization $3,000,000, shares $1 par. Lands, 23 claims, area 460 acres, in 5 groups. The Greenwater group, 4 claims, is undeveloped. The Elko group, 4 claims, circa 3 miles south of Manhattan, Nye County, Nevada, has 33′ of surface trenching, said to show ore giving good assays. The Blackhawk group, 8 claims, near Johnnie, has 60′ of openings, claimed to show ore assaying well in copper and gold. Is not favorably regarded.

JOHN OWEN MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Has auriferous and argentiferous silver-lead ores, with steam power.

JOHNSON COPPER DEVELOPMENT CO. **ARIZONA.**

Dead. First company of this name was promoted, 1906, by the Wallace H. Hopkins Co., of Chicago, with capitalization $3,000,000, shares $3 par. Formerly at Johnson, Cochise Co., Ariz.

JOHNSON COPPER DEVELOPMENT CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Organized circa December, 1907, with capitalization $2,000,000, by Ralph R. Wilson and E. K. Elliott, as successor of company of same name promoted by the Wallace H. Hopkins Co., which came to grief. Lands, 5 claims, known as the Climax group, held under bond and lease, on which it is planned sinking a shaft.

JOHNSON MINES. **WASHINGTON.**

Mine office: Cle Elum, Kittitas Co., Wash. Property, in the Teanaway district, shipped a little high grade gold-copper ore, 1903, to Puget Sound smelters. Presumably idle.

JOHNSTOWN MINE. **MONTANA.**

Owned by Butte Coalition Mining Co.

JOHNSTOWN MINING CO. **MONTANA.**

Dead. Property sold, 1906, to Butte Coalition Mining Co. Formerly at Butte, Silver Bow Co., Mont.

JOSEPHINE COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Saltese, Missoula Co., Mont. Robt. H. Fraser, president; John R. Lattimer, vice-president; Chas. Schroge, secretary and treasurer; Richard Daxton, manager. Organized 1907, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, sundry patented claims, circa 14 miles from Houston railway station, having an old 65′ shaft showing ore said to give average assays of 21% copper, 3 oz. silver and $2 gold per ton.

JOSEPHINE COPPER MINING & SMELTING CO. **MONTANA.**

Mine office: Chouteau, Teton Co., Mont. Organized 1903, to develop claims in the Blackfoot ceded strip. Idle and apparently moribund.

JOSEPHINE GOLD & COPPER MINING CO. **ARIZONA & UTAH.**

Office: 203 Mining Exchange, Denver, Colo. Mine office: Basin, Grand Co., Utah. O. B. Price, president; Herbert S. Shaw, secretary. Capitalization $15,000, shares 1 cent par, and company has an indebtedness of $17,000, exceeding its capitalization. Lands, 7 claims, area 140 acres, on Contact Mountain, in the La Sal district, claimed to show surface croppings carrying 4 to 10% copper and $6 and upwards in gold per ton, with very slight development. Had lands in Yavapai county, Arizona, described in Vol. V, but apparently has abandoned same. Was prolific of stock-selling literature but barren of results. Moribund.

JOSIE GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Houghton, King Co., Wash. Described Vol. VI.

MINA LE JOYA. **SPAIN.**

Office: care of D. Manuel Vázquez López, owner, Huelva, Spain. Mine office: El Cerro, Huelva, Spain. Lands, 53 hectares, showing large quantities

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of cupriferous pyrite, averaging 48% sulphur. Has a 10-kilometre tram, and was developing and producing on a small scale in 1906. Presumably idle.

JUANITA MINING & MILLING CO. ARIZONA.

Office: care of Joseph Swan, secretary, Phœnix, Ariz. Dana A. Seaman, president; Curtis Miller, vice-president; Rufus W. Seaman, treasurer; C. E. Warren, superintendent. Organized March 29, 1905, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 11 claims, in the Crook Cañon district, circa 17 miles south of Prescott, opened by a 100′ shaft, said to show a 14′ vein of ore averaging 6% copper and $4 gold per ton. Presumably idle.

JUKES PROPRIETARY MINES. TASMANIA.

Mine office: Mt. Jukes, Montagu Co., Tasmania. H. S. Muir, mine manager. Sent block samples, 1906, to the Mt. Lyell smelter. Presumably idle.

JULIA DEANE MINING CO. UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. David Clay, manager, at last accounts. Has a tunnel showing gold-copper ores. Has steam power. Idle some years.

COMPAÑIA MINERA JULIA DE COLLAHUASI. CHILE.

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized Feb. 14, 1907, under laws of Chile, with capitalization 400,000 pesos, shares 100 pesos par.

JOSÉ BRUNO GONZALEZ JULIO. CHILE.

Mine office: Cajon de Maipó, Santiago, Chile. Property is La Poderosa group, carrying a vein paralleling veins of the Compañía Minera de Maipó, situated a short distance therefrom, and of the same general character. Copper ores carry cobalt in connection, and are refractory, production being small, at last accounts.

JULIUS CAESAR COPPER MINING CO. MEXICO.

Mine office: Santa Catarina, Norte, Baja California, Mex. W. Wright, manager. Has electric power and employed circa 30 men early in 1907.

JUMBO GOLD MINING CO. BRITISH COLUMBIA.

Mine office: Rossland, Trail district, B. C. Mine shows a vein ranging up to 30′ or more in width, developed both underground and open-cast, with ores carrying from $7 to $20 per ton in gross values. Has steam and electric power, air-compressor, etc. Shipped circa 12,000 tons of ore to the Granby smelter, 1904, but since idle.

JUNCTION DEVELOPMENT CO. ARIZONA.

Dead. Succeeded, October, 1905, by Junction Mining Co. Formerly at Bisbee, Cochise Co., Ariz.

JUNCTION MINE. ARIZONA.

Owned by Superior & Pittsburg Mining Co.

JUNCTION MINING CO. ARIZONA.

Dead. Merged, circa 1907, in Superior & Pittsburg Mining Co. Formerly at Bisbee, Cochise Co., Ariz. Very fully described Vol. VI.

JUNIATA GOLD & COPPER CO. ARIZONA.

Office: 225 Laughlin Bldg., Los Angeles, Cal. Mine office: Quartz King, Yuma Co., Ariz. Employs 5 men. P. W. Powers, president; E. S. Field, vice-president; Dalton S. Patterson, secretary; T. W. Phelps, treasurer; H. B. Ailman, superintendent. Organized Oct. 29, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $679,000. Lands, 10 claims, area 200 acres, in the Seneca district, opened by shafts of 20′, 50′ and 150′, showing ore said to give average assays of 14.47% copper and 26.84 oz. silver per ton. Company plans deepening main shaft to 300′.

JUPITER MINING CO. WYOMING.

Office: Tomah, Wis. Mine office: Holmes, Albany Co., Wyo. Dr. C.

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E. Quigg, president; J. A. McKay, vice-president; J. W. Hancock, secretary and treasurer. Lands, sundry claims, adjoining the New Rambler, on the southwest. Idle.

JURA-TRIAS COPPER CO. **NEW MEXICO.**

Dead. Became bankrupt, and property was sold, 1907, to J. T. McLaughlin, proceeds being insufficient to pay the company's debts. Formerly at Señorito, Sandoval Co., N. M. Described Vol. VII.

JURY COPPER MINES, LTD. **ONTARIO.**

Office: Sault Ste. Marie, Ont. Mine office: Dean Lake, Algoma, Ont. Organized Dec. 5, 1906, under laws of Ontario, with capitalization $1,000,000. Lands, in vicinity of Dean Lake, have a 46′ shaft, showing chalcopyrite. Presumably idle.

JUSTICE MINING CO. **COLORADO.**

Dead. Formerly at Central City, Gilpin Co., Colo.

KAFUE COPPER DEVELOPMENT CO., LTD. **RHODESIA.**

Office: Salisbury House, London, E. C., Eng. Mine office: Bulawayo, Rhodesia. Herbert L. Stokes, chairman; Lord Gifford, vice-chairman; Tom Donald, secretary. Organized May 31, 1905, with capitalization £350,000, shares £1 par; issued, £200,007. Is affiliated with the Rhodesia Copper Co., Ltd., and the Northern Copper (B. S. A.) Co., Ltd., all three having the same officers and being part owners directly, or through share interests, in the Hippo mine. *Lands* include the Hippo mine, area 160 claims, 2 farms, area 3,000 acres, and 3 areas of 10 square miles each, all on the Kafue river, in northern Rhodesia.

KAFUE COPPER SYNDICATE, LTD. **RHODESIA.**

Dead. Absorbed, 1904, by Rhodesia Copper Co., Ltd. Formerly at Bulawayo, Rhodesia.

KALAMAZOO COPPER MINING CO. **COLORADO.**

Office: 232 West Cedar St., Kalamazoo, Mich. Letter returned unclaimed from former mine office, Encampment, Wyo. H. E. Brown, president; E. S. Drury, vice-president; Edwin Gillis, secretary and general manager; W. C. Carson, treasurer. Organized Apr. 11, 1902, under laws of Wyoming, with *capitalization* $1,000,000, shares $1 par. Lands, 10 patented claims, area 95 acres, in the Pearl district of Larimer county, Colorado, carrying 2 fissure veins, opened by 28′ and 40′ shafts, showing oxide and sulphide ores assaying 2 to 50% copper, with variable values in gold, silver, nickel and zinc. Is under same management as Coldwater mine, adjoining, and is permitting later to develop to boundary line. Idle since circa 1904, and apparently moribund.

KAMIOKA MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi Kwaisha.

KAMLOOPS MINES, LTD. **BRITISH COLUMBIA.**

Office: 18 Leadenhall St., London, E. C., Eng. Mine office: Kamloops, Yale district, B. C. F. V. Marment, chairman; W. J. Webb, secretary; Jos. Argall, general manager. Organized Feb. 22, 1905, as successor of British Columbia Exploration, Ltd., with capitalization £135,000, shares £1 par. Debentures, £30,000 at 6%; debenture interest in arrears. Lands, 7 claims, in the Kamloops district, and 5 claims in the Frederick Arms district. Property is the Iron Mask mine, having a 600′ main shaft, with circa 1 mile of workings, showing a considerable body of chalcopyrite, associated with magnetite, mainly of concentrating grade, carrying fair values in copper, silver and gold. Equipment includes a 250-h. p. tandem-compound condensing engine.

Reduction plant includes a 160-ton mill and a smelter, mill receiving ore by aerial tram. Ore is screened on grizzlies, and coarse stuff passed through a 10x16″ Jenckes-Farrel crusher, going thence to ore-bins, whence crushed ore is fed to coarse rolls by 2 automatic feeders, going thence through interme-

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diate rolls and being elevated to 2 series of trommels. Sized material from the trommels is concentrated on Hartz jigs. Tailings from finer sizes are run to waste, while tailings from coarse jigs and oversize from trommels are recrushed by fine rolls and returned to the elevators. Fines from trommels pass through 3 magnetic separators, for removal of the magnetite gangue. Sands are concentrated on 3 Buss tables, and middlings from these go to Overstrom tables. Slimes run to a series of settling tanks, products of which are concentrated on 6 Luhrig vanners, arranged in pairs. The 50-ton smelter was planned as first unit of a large plant. Employs circa 75 men.

KANE COPPER CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. F. P. Pingree, manager. Organized, 1907, under laws of Arizona, with capitalization $1,000,000. Lands, 6 miles west of Needles, are said to show good ore.

KANGAROO HILLS MINING & SMELTING CO. **AUSTRALIA.**

Dead. Lands forfeited, 1907. Formerly at Kangaroo Hills, Queensland, Australia.

KAN-HSIEN MINE. **CHINA.**

Mine office: Kan-Hsien, Kiang-Hsi, China. Tuan Fang, viceroy of the Liang-Kiang provinces, general manager. Was under development, 1907-1908, a fund of 400,000 taels having been furnished for the purpose in equal amounts by the provinces of Kiang-Hsi and Kiang-Su.

KANSAS-BURROUGHS CONSOLIDATED MINING CO. **COLORADO.**

Dead. Became bankrupt 1904. Formerly at Central City, Gilpin Co., Colo.

KANSAS-CANANEA COPPER CO. **MEXICO.**

Office: Chicago, Ills. Mine office: La Cananea, Arizpe, Sonora, Mex. David Miller, president; A. B. Wadleigh, general manager. Organized circa August, 1908, with capitalization $1,000,000, as a merger of the Ortega Mining Co., Southwestern Mining Co., Red Cloud Copper Co., Consolidated Gold-Copper Co. and Miller Mining Co.

The Southwestern lands were 342 hectares, known as the Huerfano group, 6 miles southeast of La Cananea, said to carry an 800′ ore zone, opened by a 150′ shaft showing ores giving good assay values in copper, lead and silver.

Lands taken from the Consolidated Gold & Copper Co. were 1,729 acres, including the Chapultepec mine, area 879 acres, and the Corregidor, area 741 acres, adjoining properties, circa 6 miles southwest of Cananea, said to show a formation similar to the Capote mines of the Greene-Cananea.

KANSAS CITY COPPER MINING & SMELTING CO. **COLORADO.**

Office: Eighth St. & Broadway, Kansas City, Mo. Mine office: Oneco, Routt Co., Colo. Oliver W. Kroll, superintendent. Has steam and electric power, and is said to have a 40-ton smelter. Presumably idle.

KANSAS CITY DEVELOPMENT CO. **MEXICO.**

Office and mine: care of Geo. Woodward, secretary, Moctezuma, Sonora, Mex. Tobias Crane, general manager. Lands, 20 pertenencias, known as the Credo Liberal, having an 80′ shaft showing ore assaying up to 20% lead, 2% copper, 200 oz. silver and $7 gold. Presumably idle.

KANSAS CITY FIREMEN'S COPPER MINING & SMELTING CO.

Office: 310 Kemper Bldg., Kansas City, Mo. Location of lands, if any, unknown. Presumably moribund.

KANSAS CITY GOLD & COPPER MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Crestone, Saguache Co., Colo.

KANSAS CITY & SONORA MINING & MILLING CO. **MEXICO.**

Dead. Property sold, 1903, to Ures Consolidated Mining Co. Formerly at Ures, Sonora, Mex.

KAP-SAN MINE. **KOREA.**

Mine office: Ko-chin-don, Kap-San, Hamgyeng, Korea. Mine was dis-

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covered and opened more than 1,000 years ago, by a Chinaman, ownership passing eventually to the Korean throne. Formerly was of great importance, and is said to have employed several thousand workmen, as recently as 1883. Ore occurs as large irregular masses of sulphides, mainly chalcopyrite, with a mixture of arsenopyrite and pyrrhotite, but without other gangue or contact minerals, in limestone. The district shows alternations of limestone and marl, with interbedded clay-slate and sandstone, frequently metamorphosed by intrusive granite, and overlaid by basalt flows or intruded by basaltic dykes. Deposit now worked is the third that has been found, having an extreme thickness of 20′ and known length of about 80′, with fairly defined walls. Ore as mined is assorted into two grades, rich ore averaging about 20% copper and poor ore being of 5 to 6% copper tenor, the average of both classes being 12.07% copper, 45.44% iron, 37.40% sulphur and only 0.66% silica. Production, 1906, is estimated at 625,000 lbs. fine copper.

KAPUNDA COPPER MINE, LTD. **AUSTRALIA.**

Dead. Was abortive. Formerly at Kapunda, Light Co., South Australia.

KAPUNDA COPPER MINES, N. L. **SOUTH AUSTRALIA.**

Office: Melbourne, Australia. Mine office: Kapunda, Light Co., South Australia. Troubles over title to mine apparently have been straightened out. Mine, 50 miles north of Adelaide, opened 1842, and worked circa 1879-1901, by tributors, has 8 shafts, 2 deepest being about 450′ each. Both country rock and vein matter are very soft, requiring heavy timbering, and the oxidized zone is only about 50′ in depth. Ores are oxides, carbonates and occasional native copper in the shallow oxidized zone, succeeded by high-grade sulphides. Selected ore has returned 12 to 25% copper, and second grade ore 8 to 12% copper, but some shipments, 1906, ranged above 40% in copper tenor. Mine is said to have produced upwards of $1,000,000 in the past. Suspended operations late 1907.

KARANKULSKI MINE. **TURKESTAN.**

Office, mine and works: Tashkent, Turkestan. Is a small property, worked on very primitive lines, and was a small producer at last accounts.

KARGALINSKI WORKS. **RUSSIA.**

Office and works: Orenburg, Russia. B. A. Pashkoff, owner; E. O. Terner, manager. Mine, 24 miles from Orenburg, is a very ancient property, having been worked in prehistoric times, and ores now produced are said to average circa 3% only in copper tenor. Latest reported production, 1899, was 686,674 lbs. fine copper. Smelter closed down, 1906, and mine and works presumably idle.

KARTA BAY MINING CO. **ALASKA.**

Office: care of Hon. H. W. Mellen, Coppermount, Alaska. Organized, 1907, under laws of Washington, with capitalization $12,000.

COMPAGNIE DU KATANGA. **CONGO FREE STATE.**

Office: 13 Rue Brederode, Brussels, Belgium. Edouard Despret, chairman; Col. A. Thys, managing director; Major A. Cambier, manager; Victor van Achter, secretary. Organized Apr. 15, 1901, under laws of Belgium, as a subsidiary corporation of the Belgium Congo Company, with capitalization 3,000,000 francs. Lands, 50,000,000 acres, freehold, with sundry preferential mining and railway rights. Mining property is 3 groups, known as the Katanga, Kazemba and Pala, located on the left bank of the upper Lualaba River, showing auriferous copper ores. Development, in charge of Grey & Holland, African managers of the Tanganyika Concessions, Ltd., has not advanced beyond an exploratory stage, but the showing is said to be promising.

KATARSKI MINE. **RUSSIA.**

Office and mine: care of H. Lorenz, Elizabethopol, Russia. Production,

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1899, was officially reported by the Russian Government as approximately 4,765,000 lbs. fine coppur.

KATHARINE ELIZABETH CONSOLIDATED MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Geo. O. Ford, president and general manager; L. O. Ford, secretary and treasurer. Organized 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, in 2 groups, near Jerome Junction, in the Mineral Point district, opened by a 175′ tunnel and several shafts of 25′ to 125′ depth. Out of funds and idle several years.

KAWADAYAMA MINE. **JAPAN.**

Mine office: Sanyama-mura, Oe-gori, Awa, Japan. Ore is chalcopyrite, associated with pyrite, averaging 4% copper, in a 2′ to 4′ vein in amphibolite. Production, 1900, was only 14,834 lbs. fine copper. Presumably idle.

KAY MINE SMELTING CO. **VIRGINIA.**

Letter returned refused from former office, 1102-79 Fifth Ave., New York, N. Y. Mine office: Omega, Halifax Co., Va. Z. L. Kay, president and general manager. J. R. Wilbourne, vice-president; W. R. Wilbourne, secretary and treasurer. Organized Aug. 8, 1905, under laws of South Dakota, with capitalization $1,000,000. Lands, 261 acres, freehold, 9 miles from South Boston, Virginia. Company's prospectus states that mine is in a slate formation similar to Butte, which will be news in Butte, as the people there imagine the formation to be granite. Company reports 7 veins, up to 42′ in width, with aggregate width of 82′, veins being reported as 3 quarts and 4 copper glance. Any mine with 3 quarts in its overalls seems in line for a glance from the copper. Company claims an average of 8% copper in its prospectus, and claims 6% in a direct report to the Copper Handbook, and claims to have secured assays up to 50% copper. Has 2 shallow shafts, depth not reported, and, by figuring value of ore to depth of 2,500′, the management gravely estimates values "in sight" at $20,403,575, which either is sheer ignorance or intentional deception, presumably a little of each. Is not regarded favorably.

KEARNS CONSOLIDATED COPPER MINES CO. **WYOMING.**

Dead. Succeeded Apr. 18, 1904, by Keystone Mining & Development Co. Formerly at Downington, Carbon Co., Wyo. Described Vol. V.

KEARSARGE MINING CO. **MICHIGAN.**

Dead. Absorbed, 1897, by Osceola Consolidated Mining Co. Formerly at Kearsarge, Houghton Co., Mich.

BERG- UND HÜTTENWERKE KEDABEG. **RUSSIA.**

Office: care of Gebrüder Siemens, owners, Berlin, Germany. Mine office: Kedabeg, Elizabethopol, Russia. Works office: Kalakent, Elizabethopol, Russia.

Property is an old mine, reopened 1864, by present owners, and is variously termed the Kedabeg, Kiadebek and Kedabenski mine. Lands are on the flank of Miodagh or Copper Mountain, 26 miles from and 450′ above Dalliar, the nearest railway station on the Baku line. Ore bodies are lenticular, flanked by diorite on the east and diabase on the west, latter occurring as dykes cutting quartz and diabase porphyrite, with considerable tufa. There are 16 known ore bodies, ranging in size from 6′ to 165′ in width, and from 33′ to 820′ in length. Lenses do not outcrop, apexing at depths of 120′ to 400′ below surface. The lenses shade gradually into the walls, with very indistinct partings, richest ore favoring the hanging-wall, as a rule. The ore is mainly chalcopyrite, associated with covellite, sphalerite, pyrite and pyrrhotite, with occasional galena, chalcocite and magnetite, slightly auriferous and argentiferous, with gangue of quartz-porphyry, carrying considerable barium sulphate. The ore ranges 3 to 5% in average copper tenor.

Development is almost exclusively by tunnels, and the caving system is employed to some extent. The ore, broken by Siemans & Halske electric drills,

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is assorted on surface into 3 grades, first being smelting ore of 7% tenor, all ores of 5% or upwards being smelted; second grade ore, of 2 to 5% copper tenor, is leached, and third grade ore, carrying less than 2% copper, is sold to the petroleum refineries at Baku, for making sulphuric acid, which is used extensively in the refining of illuminating oils. Wages are low, ranging from 36 to 62 cents daily for miners, and only 26 to 32 per diem for trammers.

There are two smelters, the larger being at the mines and the smaller at Kalakent, 8 miles from Kedabeg and circa 40 miles from Elizabethopol. The works have no roofs, which seems a doubtful economy, as there are occasional explosions in times of rain. Ore reaches the works about 40% in lumps and 60% in fines. Lumps are kiln-roasted, and raggings, of ¼" to ½" size, are roasted in reverberatory furnaces, while ores under ¼" size are roasted in Gerstenhöfer kilns. Smelting is done exclusively in reverberatory furnaces, of which there are 6, circular in form, instead of oval, as formerly, 7 metres in diameter, with a depth of charge of 1 to 1.2 metres. Hearths are laid of quartz, in layers, or crushed quartz worked into a paste with water. The first-fusion product is a matte of 25 to 30% copper tenor, an average matte carrying 28.6% copper, 36.7% iron, 19.7% sulphur, 4.06% zinc, 0.85% nickel and cobalt combined, 0.10% lead, 0.05% arsenic, 0.025% silver and 0.0014% gold, with small quantities of silica, aluminum sesquioxide and barium sulphate. The first-fusion matte is broken into lumps, roasted, and blown up to blister copper of low grade, averaging 88 to 90% copper, 25 oz. silver and 1.2 oz. gold per ton, which is refined at Kalakent, product being a homogeneous copper, largely used for sheets, but less desirable for brass.

Fuel is mainly petroleum, of which circa 20,000 tons are burned annually. This is piped 29 miles, from Dalliar, on the Trans-Caucasian railway, to Kalakent and Kedabeg. Petroleum is used for general steaming purposes, for burning bricks, and for roasting, smelting and refining copper, 2,700 lbs. of crude oil being required to produce 3,600 lbs. fine copper from ore, while weight for weight of petroleum is required to refine precipitate to blister copper. The oil burned has a specific gravity of 0.882, and contains 87.4% carbon, 12.5% hydrogen and 0.1% oxygen, with a heating value of 11,700 calories. In practice it is assumed that 54 parts of petroleum, by weight, are equivalent in heating value to 100 parts of bituminous coal, or 250 parts of wood. Petroleum is sprayed into the reverberatories under high pressure.

The electrolytic refinery, at the Kalakent works, is of about 3,000 lbs. daily capacity, having two 24-kw. generators and 102 tanks, with multiple arrangement of electrodes.

The mine has not held its own as a producer during the new century, old ore bodies having been exhausted more rapidly than new lenses were opened. Production, 1900, was circa 4,500,000 lbs. fine copper, and for 1904 was only 2,966,720 lbs., while the 1907 output is estimated at 2,750,000 lbs.

KUPFERKIESBERGBAU KELCHALPE. AUSTRIA.

Mine office: Kelchalpe, Tyrol, Austria. Was a very small producer at last accounts. Presumably idle.

KELLER & INDIANA CONSOLIDATED SMELTING CO. WASHINGTON.

Office: Greensburg, Ind. Mine and works office: Keller, Ferry Co., Wash. Robt. L. Boyle, president and general manager; J. S. Badger, vice-president; Ira J. Hollensbe, secretary and treasurer; M C Smith, superintendent; W. J. Elmendorf, consulting engineer.

Organized Aug. 7, 1903, under laws of Washington, with capitalization $1,500,000, shares $5 par; issued, $1,100,000. Is closely allied, through stock ownership, with the Silver Creek Mining & Milling Co. Annual meeting, first Saturday of February.

Lands include the Manila mine, 4 claims, 26 miles from a railroad, appar-

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ently held under a $60,000 bond and lease, on a $500 payment; also a 20-acre reservoir and millsite, all well timbered, with a 20,000′ sawmill at the reservoir. Lands are in the San Poil district, 7 miles above the Columbia River and 23 miles from Wilbur, the nearest railroad station, but surveys have been made for 2 railroads, through Keller. The Manila mine is said to have a vein of 70′ to 100′ width, traceable circa 1,000′, opened by 2 crosscut tunnels showing ore averaging about 4.5% copper and 4 oz. silver per ton.

Power is furnished by a dydro-electric installation, claimed to be capable of developing 1,480 h. p., having a 150-kw. Bullock generator.

The smelter, 5 miles from the mine and connected therewith by wagon road, was built by R. L. Boyle & Co., under contract, Mr. Boyle being both the president of the company and the head of the firm contracting therewith, which seems a peculiar arrangement. The reduction plant has a small sampling mill and two 100-ton Allis-Chalmers blast-furnaces, one for lead and one for copper. Various dates for blowing in were given, followed by postponements, last date given for blowing in being Nov. 1, 1908, for which purpose ore was being accumulated in October.

The company's prospectus states that Mr. Boyle's estimate, "which seems to be ultra-conservative, provides for $270,000 yearly profit on the present smelter," and that provision has been made for another 350-ton furnace, to treble the present capacity. These figures indicate that the company is inclined to be reckless in its estimates, but the property is considered not devoid of merit.

KELLY SMELTING & REFINING CO. **MONTANA & NEW MEXICO.**

Mine offices: Corbin, Jefferson Co., Mont., and Kelly, Socorro Co., N. M. Samuel W. Traylor, president; Louis O. Hedden, vice-president; Edgar Williams, secretary; John W. Dundee, treasurer; preceding officers, Warren Curtis, Sr., Marcus L. Hewett and Samuel T. Houser, directors. Organized 1908, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands include the Kelly group in Socorro county, New Mexico, and the Alta group, 8 claims, near Corbin, latter carrying ore with fair copper values. Company is said to plan two 1,000′ shafts, old workings being comparatively shallow, and is said to plan a 400-ton concentrator for the Alta group.

KELVIN-ARIZONA COPPER CO. **ARIZONA.**

Office and mine: Kelvin, Pinal Co., Ariz. Organized circa 1907, by R. B. Dickinson, et al.

KELVIN-CALUMET COPPER MINING CO. **ARIZONA.**

Office: 985 Drexel Bldg., Philadelphia, Pa. Mine office: Ray, Pinal Co., Ariz. W. E. Sharpe, president and general manager; Edwin L. Taylor, vice-president; Chas. W. Gouert, secretary and treasurer; O. A. Turner, general manager; Wm. B. Twitchell, superintendent. Organized circa July, 1907, under laws of Delaware, as a merger of the Calumet Copper Mining Co. and Big Lead Mining Co., and also absorbed the Kelvin-Reduction Co.

Lands include a group near the Christmas, and holdings near the Ray mine, on Mineral Creek, 6 miles from Kelvin, showing limestone and porphyry contacts with conglomerate capping, carrying carbonates at surface and sulphides at depth, former apparently amenable to leaching. The mine has shafts of 80′ and 300′, latter, the Madeline, showing high grade ores and native copper, oxidized ores being said to average circa 3.5% copper, with small gold and silver values. Shaft is bottomed in sulphide ore.

A 4-stamp mill, on the Big Lead property, is idle. There is a 60-ton concentrator, planned to be increased to 125 tons capacity, which includes a 35-ton leaching plant, built and operated on a secret process invented by H. P. McIntosh. It was claimed that this process would do in minutes what other processes require hours to accomplish, but the process seems to have

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taken years to do what mills planned on regular lines do daily. Only carbonate ores have been treated, but sulphides are said to be amenable to the McIntosh process, after roasting. The mill is terraced, all material being handled by gravity, and equipment includes a 125-h. p. engine and air-compressor.

Production by the new process was begun September, 1906, and recovery October, 1907, from 1,118 tons of ore treated, was 41,521 lbs. fine copper, or 37.14 lbs. per ton, from ore assaying 68.6 lbs. per ton, which does not speak highly for the McIntosh process. The company claimed to have made copper for less than 7 cents per pound, which is considered poor figuring. Notwithstanding the great claims of the company for the new process, production, 1907, was only 178,516 lbs. fine copper.

KELVIN COPPER MINING CO. **ARIZONA.**

Office: 43-89 State St., Boston, Mass. Mine office: Kelvin, Pinal Co., Ariz. Idle and apparently moribund.

KELVIN REDUCTION CO. **ARIZONA.**

Dead. Lease was sold, circa 1907, to Bay Consolidated Copper Co., and mill sold, 1907, to Kelvin-Calumet Copper Mining Co. Formerly at Kelvin, Pinal Co., Ariz. Fully described Vol. VII.

KELYNACK TIN MINE, LTD. **ENGLAND.**

Office: 7 Great Winchester St., London, E. C., Eng. Mine office: Redruth, Cornwall, Eng. E. W. Gundry, chairman; A. J. Kingston, secretary. Organized Nov. 21, 1906, under laws of Great Britain, with capitalization £50,000, shares £1 par, as Western Tin & Copper Syndicate, Ltd.; name changed July, 1907, to present title. Lands include 7 setts of tin and copper lands, area 923 acres, near Redruth, and the Kelynack tin mine near St. Just, Cornwall. Copper property considered promising.

KEMP-KOMAR COPPER MINING CO. **WASHINGTON.**

Mine office: Loon Lake, Stevens Co., Wash. A. W. Kemp, manager. Has a 200′ shaft, showing oxidized ores above and sulphides in lower workings, carrying small gold and silver values, in a 12′ vein with paystreak of 6″ to 5′. Carload shipments have returned 16 to 20% copper. Idle several years.

KEMPLAND COPPER CO. **CALIFORNIA.**

Office: care of H. L. Percy, secretary, Los Angeles, Cal. Mine office: Greenwater, Inyo Co., Cal. J. P. Harvey, general manager. Organized under laws of Arizona, with capitalization $1,250,000, shares $5 par. Lands, 22 claims, area 440 acres, including 13 claims known as the Brady-Kempland group, about 1 mile west of the Furnace Valley Copper Co. Lands show a prominent gossan, one of the best in the district, and have a tunnel of circa 250′ length. Presumably idle.

KEMPTON MINE. **UTAH.**

Office: care of Col. Enos A. Wall, owner, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Fred Bemis, superintendent. Lands, in the West Mountain district, carry argentiferous and auriferous lead and copper sulphides, values being mainly in lead. Has a 125-ton mill, rebuilt 1905, which is unique, inasmuch as practically all the machinery was designed by the owner. The equipment includes a set of Wall corrugated rolls, a set of steel rolls for middlings, also invented by Col. Wall, 3 sets of Wall jigs, 2 Wall tables for concentrates, and 2 Wilfley tables.

KENDRICK & GELDER SMELTING CO. **COLORADO.**

Dead. Succeeded, 1903, by San Juan Smelting & Refining Co. Formerly at Silverton, San Juan Co., Colo.

KENNEBEC MINING CO. **UTAH.**

Office: care of W. J. Craig, Salt Lake City, Utah. Mine office: Brighton,

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Salt Lake Co., Utah. S. M. Levy, general manager. Lands, circa 400 acres, in the Big Cottonwood district, slightly developed by tunnel, and considered well located. Presumably idle.

KENNETT MINING CO. **MONTANA.**

Mine office: Virginia City, Madison Co., Mont. Ores carry gold and copper. Has steam power and a 60-ton stampmill. Idle.

KENNICOTT MINES CO. **ALASKA.**

Office: 146-45 Broadway, New York, N. Y. Mine office: Valdez, Alaska. Norman Schultz, president; Stephen Birch, general manager; Geo. E. Baldwin, superintendent. Organized circa 1907, apparently as successor of Alaska Copper & Coal Co., or as a holding company. It is understood that this company was formed in order to give the Guggenheim interests a 40% holding in the property of the Alaska Copper & Coal Co., on account of the construction of a railroad. Property is described under title of Alaska Copper & Coal Co.

KENTUCKY-ARIZONA CONSOLIDATED MINING, SMELTING & DEVELOPMENT CO. **ARIZONA.**

Dead. Reorganized, 1906, as Kentucky-Arizona Copper Co. Formerly at Cave Creek, Maucopa Co., Ariz. Fully described Vol. VI.

KENTUCKY-ARIZONA COPPER CO. **ARIZONA.**

Office: 504 Kentucky Title Bldg., Louisville, Ky. Mine office: Cave Creek, Maricopa Co., Ariz. Wm. Vottler, vice-president; Shirley M. Crawford, secretary; Coleman R. Robinson, treasurer; Jas. D. Marlar, managing director; Wm. A. Burr, superintendent. Organized Feb. 28, 1905, under laws of Arizona, with capitalization $2,500,000, shares $1 par, as successor of Kentucky-Arizona Consolidated Mining, Smelting & Development Co. Lands, circa 1,200 acres, include the Copper Top mine, opened by several shafts and tunnels, with about 1,000′ of workings, showing numerous small veins of ore of rather low grade. Has shipped some ore averaging 17% copper and $3 combined gold and silver values per ton, latter values being mainly in gold.

KENTUCKY GULCH MINING CO. **COLORADO.**

Mine office: Tin Cup, Gunnison Co., Colo. Ores carry gold, silver and copper. Has steam power. Idle.

KEREMOS COPPER MINES, LTD. **BRITISH COLUMBIA.**

Dead. Reorganized, August, 1903, as Keremos-Pontiac Mines, Ltd. Formerly at Olalla, East Yale district, B. C. Described Vol. IV.

KEREMOS-PONTIAC MINES, LTD. **BRITISH COLUMBIA.**

Office: 32 Broadway, New York, N. Y. Mine office: Olalla, East Yale district, B. C. Dr. A. C. Sinclair, president; G. H. Wheeler, vice-president; W. H. Danby, secretary; R. W. Northey, treasurer and superintendent; preceding officers and Phil. Allen, Jr., directors. Organized August, 1903, under laws of British Columbia, with capitalization $2,500,000, shares $1 par. Lands, 16 claims, area 800 acres, in 2 groups, 1 having a ledge of 300′ claimed width, which probably is an overestimate. Another authority states that property has a 6′ vein with an 18″ paystreak of mispickel carrying 5 to 13% copper. Has a 185′ shaft and several short tunnels, with about 1,000′ of workings, giving ore assaying 2 to 4% copper, 2 to 4 oz. silver and $2 to $5 gold per ton. Was promoted by Wheeler & Co., of New York, who have foisted on the public a number of unsuccessful and dubious promotions. Property considered promising, but company not regarded favorably.

KEREMOS SMELTING & REFINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Olalla, East Yale district, B. C.

KESWICK SMELTER. **CALIFORNIA.**

Owned by Mountain Copper Co., Ltd.

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KETCHIKAN CONSOLIDATED MINES CO. **ALASKA.**

Office and mine: Ketchikan, Alaska. Jas. A. Davis, president. Organized 1907, under laws of Maine, with capitalization $5,000,000. Lands, 36 claims, on Revillagigedo Island.

KETCHIKAN COPPER CO. **ALASKA.**

Dead. Formerly at Ketchikan, Alaska. Described Vol. VII.

KEWEENAW ASSOCIATION. **MICHIGAN.**

Office: 33-87 Milk St., Boston, Mass. Local office: Marquette, Mich. John M. Longyear, agent. Is a land corporation, owning large tracts of lands, in the Upper Peninsula of Michigan, that are partly on the Keweenawan copper belt.

KEWEENAW COPPER CO. **MICHIGAN.**

Dead. Had no connection with present day Keweenaw Copper Co. Organized 1863; allowed charter to expire 1893; wound up, 1899, and lands sold to W. K. Prudden, Lansing, Mich., and by him transferred, 1905, to present Keweenaw Copper Co. Old company owned Section 13 and East ½ Section 24, Town 58 North, Range 28 West. Raised and expended circa $100,000. Formerly at Delaware Mine, Keweenaw Co., Mich.

KEWEENAW COPPER CO. **MICHIGAN.**

Office: 42 Broadway, New York, N. Y. Operating office: Hancock, Mich. Mine office: Mandan, Keeweenaw Co., Mich. Chas. A. Wright, president and treasurer; Spencer R. Hill, vice-president; Capt. Thos. Hoatson, second vice-president and mining director; preceding officers, Thos. F. Cole and Capt. Jas. Hoatson, directors; Chas. A. Wright, Jr., secretary; Arthur H. Sawyer, mine superintendent; Howard G. Wright, mill superintendent; John C. Shields, railway superintendent; Jas. T. Bryant, mining captain; W. W. Stockley, engineer.

Organized March 13, 1906, under laws of Michigan, with capitalization $10,000,000, shares $25 par; issued, $5,000,000, paid in, $13. Controls, through stock ownership, the Keweenaw Central R. R. Co., Phœnix Consolidated Copper Co. and Washington Copper Mining Co. Adams Trust Co., Boston, registrar; City Trust Co., Boston, transfer agent. Has circa 2,300 shareholders. Annual meeting, second Tuesday in February.

Company's capitalization was purposely made much larger than immediate requirements, to provide for future growth, the plans of the corporation providing for the absorption of large tracts of mineral lands, railroad construction, erection of mills and smelters, and other work. A very considerable part of the purchase price of lands acquired was paid in shares. In 1907 the company purchased a majority of the outstanding stock of the Washington Copper Mining Co., and is supposed to have an option, from Dr. Léon Estivant, on the Clark mine, which is separately described. Company ended 1907 with $97,945 cash and $30,671 accounts receivable, with accounts payable of $13,851.

Lands originally were 12,855 acres, including 11,550 acres of mining lands to which various other tracts have been added, 1,021 acres having been acquired in 1907, giving total holdings, at end of 1908, of circa 17,000 acres, mainly mineral lands, carrying considerable timber. The tracts are in 3 main groups, carrying the strike of the Keweenawan mineral belt for about 14 miles, including practically all of the amygdaloidal and conglomerate cupriferous beds of the district, as well as numerous copper-bearing cross-fissures. Lands are in Town 58 North of Ranges 27, 28 and 29 West, and include the tracts formerly owned by the Ætna, Copper Harbor, Empire, Girard, Hanover, Keweenaw, Mandan, Medora, Pennsylvania & Boston, Resolute and Vulcan companies, in addition to lands controlled through stock ownership in subsidiary corporations. In addition to strictly mineral lands, the company has secured sundry tracts of value carrying extensive water-frontages on

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available harbors, and undeveloped water-powers of great prospective value.

The company's lands include nearly 2 miles of water frontage on either side of the Montreal river, including Fish Cove, one mile east of the river's mouth, which might be made a fair harbor at comparatively small expense. This frontage will be available for mills, and as the site of a power plant and railroad terminal. Lands also include 5 miles of the course of the river, on both banks, and, with other holdings, give the company the entire water-frontage of Mosquito Lake, which the company has rechristened Lake Medora. It would be possible to use Mosquito Lake for a storage reservoir, by throwing a dam across its outlet, and developing a great water power, with a power installation at the mouth of the river.

The company also owns the Lac La Belle, or Mendota, ship canal, one mile in length, connecting Lac La Belle with Lake Superior. This canal has a 14′ channel, which should be deepened by the federal government, as it leads to a splendid haven, which should be made a harbor of refuge.

The company owns a diamond drill outfit, and has made extensive borings, including about 20 drill-holes giving a cross section of the Resolute, Mandan, Medora and Empire tracts.

Most of the old properties secured by the company were prospects only, but the Ætna has a recorded production of 140,881 lbs. fine copper, secured 1863-1873, and the Resolute mine has a 379′ shaft, with circa 2,000′ of workings.

The Medora mine, opened about 1860, has 3 old shafts, about 100′ apart, deepest 140′, and has been reopened on an extensive scale. The Medora bed traverses the Keweenaw lands for about 4 miles, outcropping several hundred feet north of the Montreal River lode. The Medora bed, averaging about 12′ in width, is a soft chocolate-colored amygdaloid, carrying considerable prehnite, calcite and quartz, in connection with fine stamp-copper and occasional heavy copper, a 30″ streak along the footwall carrying some barrel work. The lode, as a whole, is bunchy.

No. 1 shaft is 7x18′, inside measurement, with 2 hoisting compartments, each 7x6′4″, and a 7x2′8″ compartment for ladderway and pipes. The shaft is sunk partly in the bed, and partly in the trap footwall, at an angle of 23°, and the skipway is laid with 40-lb rails. Levels are opened at 150′ intervals, with sub-levels, these being required to facilitate the moving of rock, owing to the flat pitch. The shaft was 1,160′ deep, September, 1908, with 13 levels, and about 2 miles of workings. It is planned to sink the shaft 1,000′ deeper.

A site for No. 2 Medora shaft was selected, 1907, at a point 1,900′ west of No. 1, which location was changed to a point circa 1,200′ west of No. 1, when No. 2 shaft was started, July, 1908.

In addition to the Medora amygdaloid the property carries other cupriferous beds, among these being the Medora fissure vein, which outcrops circa 225′ east of No. 1 shaft, but makes into the shaft with depth. About 100′ south of the Medora is another amygdaloidal bed, carrying copper in small quantities, and to the northward is the Wolverine amygdaloid and Allouez conglomerate. The latter was reached, 1908, by a 230′ north crosscut from No. 1 shaft, the conglomerate lying about 280′ north of the Medora, with drifting in progress, September, 1908, on an amygdaloid, presumably the Wolverine bed, of about 15′ width, from which it is expected to make a mill-test.

Equipment at No. 1 shaft includes a shaft-rockhouse with Blake crusher and Lake Shore engine. There is a 24x30′ engine-house, with a 14x18″ Lidgerwood reversible link-motion hoist, good for 1,000′ depth, also 10-drill and 18-drill Ingersoll-Sergeant straight-line compound air-compressors, and a 24x48′ boiler-house.

Buildings at the Medora include a 22x28′ machine-shop, 20x30′ smithy, 24x30′ office, 26x42′ changing-house and about 20 dwellings. Water is supplied

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through a 4" pipe-line, leading from Mosquito Lake to a tank at the mine. The mine and location have a telephone system.

The Empire mine also carries the Medora bed, circa 3 miles east of No. 1 shaft, and some trenching and test-pitting, done 1906-1907, on the Empire tract, showed a bed of about 15' width, carrying some copper at surface. The Empire also carries the Montreal River lode, on which the Manitou has done considerable work.

The Keweenaw Copper Co. secured control of the old Lac La Belle & Calumet railroad, which was reorganized as the Keweenaw Central R. R. Co. The entire stock issue of the Keweenaw Central, $350,000, is owned by the Keweenaw Copper Co. The old Lac La Belle line, only 8 miles in length, was rebuilt, and the road was extended southwest to Calumet. The line has about 33 miles of spurs and branches, and cost about $800,000. The line ends just south of Centennial, a suburb of Calumet, where connection is had with the Copper Range railroad. Equipment includes 4 locomotives, 7 passenger cars and 82 freight cars, rock-cars being of 25 tons capacity each. Railroad revenue, 1907, was $31,806, with net earnings of $3,326.

Rock is stamped at the mill of the Phœnix Consolidated Copper Co., which is separatly described, under the title of the owner. A branch of the Keweenaw Central has been built to the mill.

Production was begun July 28, 1908, on the basis of 225 tons daily, about half of the rock being sent from the stockpile, and half from the underground workings, apparently little or no selection being attempted. The company has made no official statement as to returns secured, and estimates vary from 10 lbs. to 16 lbs. of mineral per ton. Apparently a fair estimate of returns would be 11 lbs. fine copper per ton, as the mineral is dressed to an unusually high metallic percentage. In September, 1908, production was cut to about 125 tons daily, working the mill on day-shift only. The Medora operates 12 power drills, and the company employs about 100 men.

Apparently the Keweenaw Copper Co. has not yet obtained an assured mine in the Medora, though the prospects of the property seem fair, given further development. The management is strong and experienced, and the company owns an immense acreage of mineral lands, on which it scarcely can be questioned that paying mines will be developed, in time.

KEY CITY COPPER CO. **BRITISH COLUMBIA.**

Office: care of Capt. Andrew Wasson, president and general manager, Sacramento, Cal. Mine office: Mt. Sicker, Vancouver Island, B. C. F. W. McCrady, superintendent. Property adjoins the Tyee and Lenora, and is opened by tunnel. Has steam power. Idle.

KEYSTONE COPPER CO. **ARIZONA.**

Office: Bank of Commerce Bldg., St. Louis, Mo. Mine office: Globe, Gila Co., Ariz. G. S. Maddox, president; A. A. Aal, vice-president; Geo. A. Biddle, secretary; J. R. Finletter, general manager; preceding officers, L. B. Wightman, J. N. Porter, J. J. Keehan, F. S. Sullenberger, L. L. Henry, H. P. Wightman, H. H. Harvey and S. A. Arkills, directors.

Lands, 12 claims, 8 miles west of Globe, lying next east of the Live Oak and near the Inspiration and Miami mines. Property shows granite and quartz-porphyry, with occasional schists. East of the main workings there are surface deposits of chrysocolla, said to assay 3 to 7% copper, and a conglomerate bed of 4' to 12' thickness, said to be impregnated with copper to the extent of 3 to 6%, from which values apparently could be recovered by leaching. Ore, as developed, is mainly chrysocolla, with disseminated carbonates and occasional sulphides, latter including chalcocite of 40 to 60% copper tenor. Principal ore body is a 12' vein carrying a 15" paystreak said to average circa

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22% copper and 2 to 5 oz. silver per ton, balance of vein carrying ore of 3 to 5% copper tenor, which has been left standing, for extraction later.

Development is by 3 tunnels, with about one-half mile of workings, and it is planned to sink a 3-compartment 500′ shaft, for large production. No. 2 tunnel, of 570′ length, shows chrysocolla and carbonate ores of 4 to 24% tenor, and No. 3 tunnel, circa 600′ long, also shows good ore.

A 25-ton experimental plant was built in 1905. The system used is a modification of the Hoepfner sulphide process, and is designed for leaching chrysocolla, as well as carbonate ores, and can include sulphide ores after roasting. Ore is reduced to fines, pulped, and leached for three hours in a slowly revolving chlorination barrel. The leaching solution is cupric chloride, which is changed to cuprous chloride by the absorption of one atom of copper. The enriched solution goes to precipitation tanks, where the extra molecule of copper is precipitated upon large copper sheets, and the solution, thus regenerated to cupric chloride, is returned to the storage tank, for further use.

Some grading was done, 1906, for a 100-ton roasting furnace, to enable the mine to treat sulphide ore, but the furnace was not built.

The Keystone has been a shipper for 10 years, and production, 1899-1904, was 1,067 tons of ore, netting $37,276.98. Ores smelted gave returns of 22 to 27% copper, in addition to lower grade silicious ores of 3 to 5% copper tenor, sent to the Old Dominion smelter for converter linings.

The company came to grief in 1907, and control of the property has been shifted several times. The Old Dominion Mining & Smelting Co. planned taking over the property, 1908, under foreclosure proceedings based on a $65,000 mortgage, but the stockholders voted, May, 1908, to accept the offer of Nathan L. Amster to pay the $65,000 mortgage and expend $50,000 on development and afterwards reorganize the company. Although this agreement was ratified it was not carried out, and the Amster option was transferred, apparently without Amster's sanction, to J. B. Newman, who paid the $65,000 judgment and agreed to expend $4,000 monthly on development, with the proviso that he may acquire title by paying $400,000 to the company.

Production, 1907, was 208,801 lbs. fine copper. Property is considered decidedly promising.

KEYSTONE COPPER & GOLD MINING CO. **ARIZONA.**

Office: 502 Park Bldg., Pittsburg, Pa. Letter returned unclaimed from former mine office, Wickenburg, Maricopa Co., Ariz. C. B. McLean, president; W. J. Strassburger, secretary and general manager; W. W. Wilson, treasurer. Organized 1900, under laws of Arizona, with capitalization $1,250,000, shares $10 par. Lands, 24 claims, in the Blue Tank and Black Rock districts, showing sulphide ore bodies. Idle for several years and apparently moribund.

KEYSTONE COPPER MINING CO. **NEW MEXICO.**

Office: Bloomsburg, Pa. Mine office: Tres Piedras, Taos Co., N. M. Lands, 18 claims, known as the Payroll mine, in the Bromide district, opened to depth of about 250′ and showing a vein of sulphide ore said to be 20′ wide and to assay 6 to 12% copper, with fair gold values. Has steam power and a 50-ton concentrator. Idle several years and apparently moribund.

KEYSTONE COPPER SMELTER CO. **MEXICO.**

Office: 330 Drexel Bldg., Philadelphia, Pa. General Mexican office: Apartado 22, Guadalajara, Mexico. Mine office: Tapalpa, Sayula, Jalisco, Mex. Robert P. Molten, president; Edward E. Cattel, vice-president and chairman of executive committee; Aubrey F. Lee, secretary; Daniel Lamont, Jr., treasurer; Theo. Breidenbach, general manager. Organized under laws of New Jersey, with capitalization $300,000, increased, July 6, 1905, to $500,000,

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shares $1 par. Has authorized an issue of $100,000 certificates of indebtedness, at 6% interest, redeemable Dec. 10, 1908.

Lands, circa 100 hectares, in 5 groups including the Mexicana, America and Palma groups, also timber rights to circa 50,000 acres of adjoining lands. Principal development is on La Mexicana group, area 82 hectares, 15 miles west of Tapalpa, mine being developed by a 200-metre crosscut tunnel, cutting 4 veins, with about one mile of workings. Veins are fissures in porphyry, averaging 5′ width, and carrying auriferous and argentiferous chalcopyrite, sphalerite and pyrite.

Equipment includes steam and electric power. There is a 30-ton mill, having 2 crushers, 2 rolls and 3 concentrating tables. A small smelter, built circa 1902, had a 75-ton reverberatory furnace, making matte of 30 to 48% copper tenor, when operated, which was for a short time only, and the smelter was abandoned several years ago. It was planned to add a cyanide plant for treatment of gold ores, but apparently this was not done. Early 1908 company bought the Etzatlán smelter, of 30 tons daily capacity, and is said to plan removing same to Talpalpa. The reduction plant was remodeled and put in operation early 1908. The company is said to employ about 100 men.

KEYSTONE-MERRITT COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Clifton, Graham Co., Ariz. Was to have been absorbed, 1907, by Copper Co. of Arizona, since succeeded by Coppermines Co. of Arizona. Idle and apparently moribund.

KEYSTONE MINING & DEVELOPMENT CO. **COLORADO & WYOMING.**

Office: 839 Equitable Bldg., Denver, Colo. Mine offices: Downington, Carbon Co., Wyo., and Boulder, Boulder Co., Colo. Dr. E. T. Ettinger, president and general manager; Wm. R. Klein, secretary; G. C. Aschbach, treasurer. Organized Apr. 18, 1904, under laws of Wyoming, with capitalization $2,000,000, shares $1 par, as successor of Kearns Consolidated Copper Mines Co. Has lands in Colorado and Wyoming. Former, carrying gold only, include the Smoky Hill mine, area 20 acres; Dirigo mine, area 60 acres, patented, and the Norumbega mine, area 40 acres, all in Boulder county. Principal development seems to be on the Colorado gold properties. The Wyoming lands, area 206 acres, are on Beaver Creek, circa 12 miles south of Encampment, including the Kearns mine, opened by a 600′ tunnel, and the 160-acre Downington townsite. Idle.

KEY TO SUCCESS COPPER MINING, SMELTING & EXPLORATION CO., LTD. **UTAH.**

Office: 213 Providence Bldg., Duluth, Minn. Letter returned unclaimed from former mine office, Frisco, Beaver Co., Utah. A. R. Merritt, president; C. E. Mylen, vice-president; Geo. F. Davis, secretary; J. S. Lane, treasurer; preceding officers, H. Brown and John L. McGilvery, directors. Organized 1902, under laws of South Dakota, with capitalization $1,500,000, shares $1 par. Lands, 12 claims, area 240 acres, also a 40-acre millsite, in the Beaver Lake district, opened by shafts of 25′, 75′ and 105′, showing ore carrying 3 to 6% copper, with gold and silver values. Idle, and August, 1908, planned reorganization.

KEY WEST MINING CO. **NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. Ores said to carry copper, nickel and platinum. Idle.

KHAYYAM COPPER CO. **ALASKA.**

Dead. Merged, circa 1904, in Omar Mining Co. Formerly at Kiam, Alaska.

KIADEBEK MINE. **RUSSIA.**

Owned by Berg- und Hüttenwerke Kedabeg.

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KILLINGDAL KOBBERVAERK. **NORWAY.**

Owned by Bede Metal & Chemical Co.

KIMBALL CREEK MINING CO. **WASHINGTON.**

Dead. Formerly at Berlin, King Co., Wash.

KIMBERLEY SYNDICATE. **WESTERN AUSTRALIA.**

Office: Adelaide, South Australia. Mine office: Derby, Western Australia. Lands adjoin the Derby Copper Syndicate, of which the Kimberley is a twin. Has surface ore of high grade with country rocks of slate and schist. Made a small shipment of 20% ore to smelter at Moonta, South Australia, late 1906.

KIN-E-CHY MINING & MILLING CO. **ARIZONA.**

Office: 1112 Majestic Bldg., Detroit, Mich. Mine office: Willcox, Cochise Co., Ariz. J. Geo. Zink, president; Dr. W. E. Burtless, vice-president; Fred P. Obenauer, secretary and treasurer; Gust. Becker, manager; preceding officers and Herman Knorr, directors. Organized 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 33 claims, area 660 acres, in 5 groups, in the Aravaipa district, showing several fair sized veins carrying variable values in copper, lead, silver and gold. The copper group, of 14 claims, has a 72′ shaft and a 150′ tunnel. The gold group, of 6 claims, is said to show a considerable body of low grade gold ore. Equipment includes steam power and a small stamp-mill, built 1903. Idle, unable to pay its bills and apparently moribund.

KING COPPER MINING CO. OF NEVADA. **NEVADA.**

Office: 431-53 State St., Boston, Mass. Letter returned unclaimed from former mine office, Lovelock, Humboldt Co., Nev. Property was the Anderson mine, carrying auriferous and argentiferous copper ores, slightly developed. Long idle and apparently moribund.

KING DAVID MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. David Evans, manager. Organized circa August, 1908, and said to have begun business with $50,000 in the treasury. Lands are circa 70 claims, near the Horn Silver mine. Company plans a 2-compartment 1,000′ shaft, on the supposed extension of the Horn Silver vein, and is said to have ordered a hoist good for 1,500′ depth. Has a 5-mile pipe-line for water, and begun work vigorously, with a force of about 60 men.

KING DEVELOPMENT CO. **ARIZONA.**

Dead. Merged, circa 1904, in Consolidated King Development & Columbia Copper Mining Co. Formerly at Jerome, Yavapai Co., Ariz.

KING EDWARD MINES, LTD. **BRITISH COLUMBIA.**

Office and mine: Fairview, Boundary district, B. C. R. H. Parkinson, president; H. Jones, vice-president; D. Braithwaite, secretary and treasurer; preceding officers, D. A. Carmichael and W. A. Hainig, directors. Organized January, 1904, under laws of British Columbia, with capitalization $500,000, shares $1 par. Lands, 10 claims, area 500 acres, in the Similkameen division of the Osoyoos district, opened by 350′ of workings, show a sulphide ore body of 6′ to 10′ width, estimated to average 5% copper and about $1.50 per ton in combined gold and silver values.

KING EDWARD MINING CO. **ONTARIO.**

Dead. Lost lands. Formerly at Thessalon, Algoma Ont. Fully described Vol. VII.

KING GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Davenport, Wash. Mine office: Springdale, Stevens Co., Wash. J. B. Tuttle, Sr., president and general manager; J. T. McAviney, vice-president; J. B. Tuttle, Jr., secretary and treasurer; preceding officers, A. M. Camp-

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bell and G. B. M. Seager, directors. Organized June, 1900, under laws of Washington, with capitalization $2,000,000, shares $1 par.

Lands, 9 miles west of Springdale, known as the Edna-Gladiator group, carry a contact vein between diorite and quartz, opened by a 370′ shaft, showing low-grade melaconite and chalcocite, with silicious gangue. Equipment includes a 350-h. p. boiler, 10x11″ friction hoist, 8-drill air-compressor, power drills, steam pumps, electric light plant and various engine-houses, shaft-houses, bunk-houses and ore-bins.

Suit brought by dissatisfied shareholders, alleging mismanagement, was dismissed September, 1905, the court holding that allegations were not proven. *Not* regarded favorably. Presumably idle.

KING GOLD & COPPER MINING & MILLING CO. **CALIFORNIA.**

Dead. Was a swindle. Formerly at Victor, San Bernardino Co., Cal. Fully described Vol. V.

KING KENDALL MINING CO. **NEW MEXICO.**

Dead. Formerly at Steins, Grant Co., N. M.

KINGMAN SMELTING & REFINING CO. **ARIZONA.**

Dead. Was succeeded by Union Smelting Co. Formerly at Kingman, Mohave Co., Ariz.

KING MINING CO. **WYOMING.**

Dead. Was a twin of the Isabel Copper Mining Co. Lands were sold, 1902, to Rambler Mining & Smelting Co. Formerly at Riverside, Carbon Co., Wyo. Described Vol. VI.

KING MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Reorganized, circa 1903, as Denoro Mines, Ltd. Formerly at Eholt, Yale district, B. C.

KING PHILIP COPPER CO. **MICHIGAN.**

Office: 701-199 Washington St., Boston, Mass. Operating office. Houghton, Mich. Mine office: Winona, Houghton Co., Mich. Chas. J. Paine, Jr., president; Geo. P. Gardner, vice-president; preceding officers, Walter Hunnewell, Rufus R. Goodell, Nathaniel H. Stone and Nathaniel Thayer, directors; Edward B. O'Connor, secretary and treasurer; Dr. L. L. Hubbard, manager; Rex R. Seeber, superintendent; Frank G. Lukey, clerk.

Organized Nov. 13, 1905, under laws of Michigan, with capitalization $2,500,000, fully issued; $7 paid in. Is controlled, through ownership of 83,767 shares, by St. Mary's Mineral Land Co. City Trust Co., Boston, registrar. A $1 assessment was levied circa August, 1908. Company ended 1907 with $20,167 cash and accounts receivable, and $16,545 accounts payable.

Lands, 1,040 acres, in Houghton and Ontonagon counties, Michigan, main tract lying about one mile south of the Winona mine. Company exchanged parcels of 5 acres with the Winona Copper Co. to rectify boundary lines, permitting each to work to better advantage in shafts nearest the boundary. The lands have been quite thoroughly probed by diamond drill borings.

The Winona lode averages about 20′ in width, as opened on King Philip lands, and shafts are sunk in the footwall, which is a wise precaution. The mine is to be connected, eventually, with the Winona, levels being opened on the same planes. Ten power drills are worked. Rock filling is used underground. Frames for drifts are built of heavy transverse horizontal stulls, covered with light lagging, after which waste-rock is dumped on either side and above the lagging, leaving drifts with timber walls 8′ wide and 7′ high.

The first shaft was started 1,500′ from the northwest corner of the tract, but struck quicksand at 32′ depth, hence was changed to a drainage shaft, and a new shaft started 75′ distant, latter being known as No. 1. This shaft was started vertically, of size 14x25′, and was bottomed in rock at a depth of 50′, after which the shaft is deflected to an angle of 70° to correspond with

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the dip of the bed, though about 85° in the footwall. No. 1 was bottomed August, 1908, at the tenth level, and crosscuts have been driven to the Winona bed on the fifth to ninth levels, inclusive, showing fair ground.

No. 2 shaft, circa 2,800′ southwest of No. 1, is on the south side of Sleeping River, and was 360′ deep August, 1908, with a crosscut on the fourth level to the Winona bed, which gave about the same showing as in No. 1.

Equipment includes a 12x20″ hoist with 5′ drum, good for 1,200′ depth, and a powerful electric hoist. The King Philip will take electric power from the Winona, and in return will furnish compressed air. The 28x40′ powerhouse contains a battery of two 200-h. p. Parker tubular boilers, 6-drill and 15-drill air-compressors and a powerful Nordberg triple expansion 3-stage air-compressor. Coal is drawn to the boiler-house through a concrete tunnel under a coal-trestle surmounted by a railroad track.

Buildings include a 34x40′ power-house, 15x24′ smithy, 26x36′ warehouse, 24x62′ bunk-house, 20x50′ cook-house, 16x30′ change-house, 24x36′ office and about a dozen other structures.

Little attention has been paid to the character of copper-bearing bed, efforts being centered on sinking and equipping the shafts, hence little can be said as to the company's prospects, but it is to be presumed that the company, which has an excellent and experienced management, possesses accurate data upon which to predicate its extensive development.

KING & QUEEN COPPER CO. **NEW MEXICO.**

Mine office: Steins, Grant Co., N. M. Lands, sundry claims near the King Kendall and Johnny Bull mines. At last accounts contemplated development.

KING & QUEEN MINING CO. **MONTANA.**

Office: 1007 Bessemer Bldg., Pittsburg, Pa. Mine office: Superior, Missoula Co., Mont. Nelson Weddle, Jr., president; Chas. J. Rieger, vice-president; J. F. Hinckley, secretary; H. A. Spangler, treasurer; preceding officers, B. H. Howard, J. L. Armstrong, R. W. Judkins and Dr. G. T. McCullough, directors; T. E. Wood, superintendent. Organized Feb. 22, 1905, under laws of Montana, with capitalization $1,000,000, shares $1 par, practically as a reconstruction of the Montana Mining & Development Co.

Lands, 15 claims, partly patented, area 188 acres, and a 20-acre millsite, well timbered, 3½ miles from the Northern Pacific railway, in the Spring Gulch district, showing limestone, quartzite and shale, with 5 contact deposits between quartzite and limestone, of which one, under development, of 8′ estimated average width, formerly was reported as giving average assays of 6.5% copper, 16% lead, and 16 oz. silver per ton, from malachite, chalcocite and chalcopyrite, and is now said to average about 4.5% copper and 12 oz. silver per ton, with gold values ranging up to 8 oz. per ton. Development is by a 1,200′ tunnel and a 600′ shaft, mine having about 3,000′ of workings, showing considerable ore.

Equipment includes an 80-h. p. boiler, 25-h. p. hoist, 6-drill duplex air-compressor, a sawmill of 6,000 feet daily capacity, and several small buildings. Property was a small producer, for about 10 years, before bought by present owners. Was idle September, 1908, but planned early resumption.

KING SOLOMON MINES. **BRITISH COLUMBIA.**

Office: care of J. S. H. Matson, Victoria, B. C. Mine office: Cowichan, Vancouver Island, B. C. Wm. Lewis, superintendent. Organized 1904, with capitalization $15,000, shares $1,500 par. Lands, 4 miles from the Esquimault & Nanaimo Railroad, on Copper Mountain, in the Helmken district, include the King Solomon and Queen of Sheba claims. Has made several 40 and 50-ton shipments to Tyee smelter that returned 8 to 9% copper.

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KING SOLOMON MINING CO. **BRITISH COLUMBIA.**

Office: care of D. C. Corbin, owner, Spokane, Wash. Letter returned unclaimed from former mine office, Greenwood, Boundary district, B. C. Lands, near the Montreal & Boston claims of the Dominion Copper Co., Ltd., produced, 1902, circa 700 tons of ore. Idle some years.

KING SOLOMON'S COPPER MINES. **TRANSVAAL.**

Mine office: Zeerust, Transvaal.

KING SOLOMON TUNNEL & DEVELOPMENT CO. **COLORADO.**

Office: care of Samuel H. Alexander, secretary, Madison, Wis. Mine office: Frisco, Summit Co., Colo. F. C. Dinsmore, president; W. W. Theobald, treasurer. Jas. H. Myers, superintendent. Organized under laws of South Dakota, with capitalization $2,500,000, shares $1 par, as successor of King Solomon Tunnel Mining Co. Lands, 50 lode claims and sundry placer claims. Has an air-compressor.

KING SOLOMON TUNNEL MINING CO. **COLORADO.**

Dead. Reorganized as King Solomon Tunnel & Development Co. Formerly at Frisco, Summit Co., Colo.

KINGSTON GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Mine office: Hedley, Boundary district, B. C. Lands, 4 claims, 1 fractional, showing slightly auriferous and argentiferous chalcopyrite and galena, partially developed by open-cuts and several short tunnels.

KING WILLIAM MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Chas. H. Blanchard, president; J. H. Rouse, vice-president; A. C. Ellis, Jr., secretary; L. H. Farnsworth, treasurer. Organized under laws of Nevada, with capitalization $1,250,000, shares $1.25 par. Lands are near the Eagle & Blue Bell, and it is planned developing the King William from the workings of that property.

KIRK LEASING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Morris P. Kirk, general manager. Organized circa October, 1908, to operate property leased from the Boston Consolidated Mining Co.

KISHORN MINE. **SCOTLAND.**

Office and mine: care Mrs. M. M. H. Stewart, Kishorn, Loch Carron, Rosshire, Scotland. Mine was worked about the close of the Eighteenth or opening of the Nineteenth Century, but since idle, except for development work, with circa 80 men, for a short time in 1904.

KITANNING COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Index, Snohomish Co., Wash.

KITTICOOLA GOLD-COPPER MINE, LTD. **SOUTH AUSTRALIA.**

Dead. Lands sold, 1906, to Port Lincoln Copper Co., Ltd. Formerly at Reedy Creek, Robe Co., South Australia. Described Vol. VI.

KITTICOOLA MINE. **AUSTRALIA.**

Owned by Port Lincoln Copper Co., Ltd.

KJOLI MINES, LTD. **NORWAY.**

Dead. Formerly at Reitan, Aalen, Guldalen, Trondhjem, Norway. Described Vol. VI.

BERGVERWALTUNG KLAUSEN. **AUSTRIA.**

Mine office: Klausen Pfunderberg, Tyrol, Austria. Presumably idle.

KLEIN LETABA COPPER MINES, LTD. **TRANSVAAL.**

Office: 70 Queen Victoria St., London, E. C., Eng. Robt. S. Simpson, chairman; Victor Thomasset, secretary. Organized March 4, 1907, under laws of Great Britain, with capitalization £60,000, shares £1 par; issued, £45,157. Lands, 444 copper claims, in the Klein Letaba district, bought for £500 cash and £40,000 in shares.

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GEWERKSCHAFT KLINGENTHAL-GRASLITZER KUPFERBERGBAU. **GERMANY.**

Mine office: Klingenthal, Saxony, Germany. Erhart August Schiedt, manager. Has a 100-metre main shaft, developing chalcopyrite, employing about 100 men.

KLIPKOP (NAMAQUALAND) COPPER SYNDICATE, LTD. **CAPE COLONY.**

Dead. Voluntarily liquidated, 1904. Formerly at O'okiep, Little Namaqualand, Cape Colony.

KNAPP MINING CO. **COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Is controlled, through stock ownership, by National Mining & Milling Co. Lands, 9 claims, area 80 acres, known as the Big Horn group, carrying 2 fissure veins in gneiss and diorite, opened by shafts of 65′ and 85′, showing chalcopyrite and occasional bornite. Has a 25-h. p. steam hoist. Idle.

KNICKERBOCKER DEVELOPMENT CO. **MONTANA.**

Dead. Formerly at Helena, Lewis & Clark Co., Mont. Described Vol. VII.

KNICKERBOCKER MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized 1906, with capitalization $5,000,000, shares $5 par, to take over the Jennie Dell and adjoining claims.

KNIGHT COPPER CO. **ARIZONA**

Mine office: Humboldt, Yavapai Co., Ariz. W. H. Knight, president and general manager; W. F. Whitney, vice-president; J. E. Russell, secretary; F. C. Moore, treasurer. Organized 1907, under laws of Arizona, with capitalization $1,500,000. Lands, 5 claims, area 100 acres, about a mile south of the Humboldt smelter, having a 25′ shaft and a 175′ tunnel, said to show 2 ledges, of 15′ to 75′ width, carrying ore average about 4% copper, with high grade pay-streaks.

KNIGHT INVESTMENT CO. **UTAH.**

Office: Knight Blk., Provo, Utah. Jesse Knight, president; Amanda M. Knight, vice-president; R. Eugene Allen, secretary and treasurer; preceding officers, Raymond Knight, W. Lester Mangum, J. William Knight and Iona Knight, directors. This company controls a large number of properties, of considerable promise, in the Tintic district of Juab county, Utah.

KNIGHT'S ISLAND-ALASKA COPPER CO. **ALASKA.**

Office: 902 Lowman St., Seattle, Wash. Mine office: Valdez, Prince William Sound, Alaska. Jas. J. Godfrey, secretary; William Egan, superintendent. Lands, 17 claims, on Dryer Bay, Knight's Island, in the Prince William Sound district, having a 280′ tunnel showing a vein up to 25′ in width.

KNIGHT'S ISLAND CONSOLIDATED COPPER CO. **ALASKA.**

Office: 1115 Stock Exchange, Chicago, Ills. Mine office: Valdez, Alaska. H. Curtis Elliott, president; H. P. Elliott, first vice-president; Chas. G. Hubbard, second vice-president and general manager; A. J. Elliott, secretary; J. E. Slocum, treasurer. Organized Sept. 12, 1906, under laws of Washington, with capitalization $1,000,000, shares $1 par. Is controlled, through ownership of $505,480 in stock, by Hubbard-Elliott Copper Mines Development Co. Lands, 60 claims, area 1,200 acres, in 5 groups, having a 128′ tunnel showing chalcopyrite, associated with pyrite and pyrrhotite, giving assays of 6 to 19% copper. Has electric power, wharf, ore-bunkers and a sawmill with daily capacity of 20,000′, board measure. Mine and wharf are connected by a 3,400′ Riblet aerial tram, of 600 tons daily capacity.

KNIGHT'S ISLAND COPPER CO. **ALASKA.**

Mine office: Valdez, Alaska. J. C. Dieringer, secretary; Wm. Page, super-

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intendent. Capitalization, presumably $1,500,000. Lands, on Dryer Bay, Knight's Island, near tidewater, show a promising gossan carrying copper stains. Mine has 3 tunnels, showing ore estimated to average 21.32% copper, which is too high. Made a trial shipment, July, 1907, but a tram-line is necessary for regular production.

KNIGHT'S ISLAND MINING & DEVELOPMENT CO. **ALASKA.**

Office: 1267 Lexington Ave., New York, N. Y. Mine office: Valdez, Alaska. W. C. Rothkranz, president and general manager; Jesse Miller, vice-president and secretary; Robert Kutschinski, superintendent. Lands, 28 claims, on Louis Bay, said to show several veins of 12′ average width, carrying 12% chalcopyrite, which probably is an overestimate. Has a small power plant and sawmill.

KNOCKMAHON MINES. **IRELAND.**

Owned by Bonmahon Copper Mines Development Syndicate, Ltd.

KNOWLTON MINING CO. **MICHIGAN.**

Dead. Organized 1853, with capitalization $500,000. Levied circa $160,000 in assessments, to 1872. Merged, circa 1898, in Adventure Consolidated Copper Co. Formerly at Greenland, Ontonagon Co., Mich.

KOEI MINE. **JAPAN.**

Mine office: Tsunekanemaru-mura, Ashina-gori, Bingo, Japan. Is an old property, reopened 1893. Ore is chalcopyrite, associated with sphalerite, pyrite and micaceous hematite, all argentiferous, in a fissure vein 4′ to 8′ wide, with gangue of talc and hornblende. Country rock is hornblende-granite. Concentrated ore averages 13.4% copper and 4% silver. Production, 1900, was 88,495 lbs. fine copper. No production of copper reported recently, and presumably idle.

KOKOMO-PIONEER MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Dumont, Clear Creek Co., Colo.

KOKUSEI MINE. **JAPAN.**

Mine office: Kawabe-mura, Shonan-gori, Mimasaka, Japan. Mine, opened 1882, carries chalcopyrite, associated with pyrite and small quantities of sphalerite, ore occurring in lenses, largest 60′ in diameter, with clay gouge, in sandstone and clay-slate. Production, 1903, was 232,882 lbs. fine copper, a decline from 348,497 lbs. in 1899. No later official returns received, and probably idle.

KOMAKI MINE. **JAPAN.**

Mine office: Hamawa, Kazuno, Rikuchu, Japan. Mine, which is very ancient, lies partly in the province of Ugo, and once produced circa 1,000,000 lbs. fine copper year, with considerable gold as a by-product, but in 1903 made only 167,833 lbs. fine copper, and presumably is idle.

KOOTENAI COPPER MINING & SMELTING CO. **IDAHO.**

Dead. Formerly at Port Hill, Bonner Co., Idaho.

KOOTENAI COUNTY MINING CO. **IDAHO.**

Office: Detroit, Mich. Mine office: Priest River, Bonner Co., Idaho. Capitalization $2,000,000, shares $1 par. Lands are at the eastern end of Priest Lake. Idle.

KOOTENAI MINING & MILLING CO., NO. 2. **IDAHO.**

Mine office: Priest River, Bonner Co., Idaho. Lands, 7 claims, at the head of Priest Lake, opened by tunnels of 30′ and 40′, showing ore giving good average assays in copper and silver.

KOOTENAY COPPER-GOLD MINING CO.

Office: 15 Exchange Pl., Jersey City, N. J. Incorporated November, 1902, under laws of New Jersey, with capitalization $500,000, by Horace B. Gould, John R. Turner and Louis B. Dailey. Location of lands, if any, unknown. Apparently abortive.

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KOOTENAY COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Spokane, Wash. Mine office: Creston, West Kootenay, British Columbia. O. J. Wiggins, agent. Organized circa 1906, with capitalization $50,000, shares 5 cents par.

KOPERMYN (TRANSVAAL), LTD. **TRANSVAAL.**

Office: 237 Finsbury Pavement House, London, E. C., Eng. Mine office: Pietersburg, Zoutpansberg, Transvaal. E. C. C. Smith, secretary. Organized Oct. 19, 1905, under laws of Great Britain, with capitalization £120,000, in 100,000 shares of £1 par and 2,000 shares of £10 par; issued, £110,383. Lands, 860 acres, 19 miles southeast of Pietersburg. Estimated reserves are 45,000 long tons of ore averaging 6% copper and 2 dwts. gold, which seems excessive, in view of the extremely limited development secured.

KOPPER KROWN MINING CO. **WYOMING.**

Letter returned unclaimed from former office, 56 Fifth Ave., Chicago, Ills. Mine office: Hecla, Laramie Co., Wyo. Henry Schwartz, Sr., president; Ed. E. Hartwell, vice-president; J. May, treasurer; Alonzo Hastings, secretary; preceding officers and Henry Schwartz, Jr., directors. Organized under laws of Wyoming, with capitalization $1,500,000, shares 50 cents par. Lands, 154 acres, having 413′ of workings, claimed to show 10,000 tons of sulphide ore blocked out for stoping. Company advertised that it planned building a smelter, and was ready to ship on a moment's notice, but seems to have failed to receive the notice. Presumably idle.

KOSAKA MINE. **JAPAN.**

Owned by Fujita-Kumi & Co.

KOTSINA COPPER CO. **ALASKA.**

Office: 1007-160 Washington St., Chicago, Ills. Mine office: Valdez, Alaska. Chas. A. McKenzie, president. Organized 1906, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 110 claims, area 2,200 acres, in 6 groups, including the Craford & Ammon group, in the Kotsina River Valley, circa 85 miles northeast of Valdez.

KREMLIN MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Has a 300′ shaft, and is drained through the main tunnel of the Bingham Consolidated. Is said to show a large body of concentrating ore, on the 300′ level. Idle.

KRUG GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Lands, known as the Hartford group, 7 miles northwest of Chewelah, have a 108′ tunnel, said to show ore giving good assays in copper, silver and gold.

KRUGER COPPER & SILVER MINING CO. **MEXICO.**

Dead. Formerly at Cusihuiriáchic, Iturbide, Chihuahua. Fully described Vol. VII.

KUNE MINE. **JAPAN.**

Owned by Furukawa Mining Co.

GEWERKSCHAFT KUPFERBERG. **GERMANY.**

Dead. Formerly at Kupférberg, Bavaria, Germany.

KUPFERKIESBERGBAU KUPFERPLATTE. **AUSTRIA.**

Mine office: Kitzbühel, Tyrol, Austria. Ore is chalcopyrite, with quartz gangue, occurring as horizontal beds in Silurian slates. Is an old mine and was a small producer at last accounts.

KURILLA MINE. **AUSTRALIA.**

Owned by Wallaroo & Moonta Mining & Smelting Co., Ltd.

KUROTAKI MINE. **JAPAN.**

Mine office: Motokawa-mura, Tosa-gori, Tosa, Japan. Is a short distance only from the famous Besshi mine. Ore is chalcopyrite, first quality averaging 10% and second grade 2 to 4% copper. Beds are much contorted, principal

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widths and values being found in the saddles and troughs, which average about 10′ thickness. Production, 1900, was 151,890 lbs. fine copper. Presumably idle.

KURTZ-CHATTERTON COPPER MINING CO. **WYOMING.**

Dead. Succeeded by Chatterton Mining Co. Formerly at Encampment, Carbon Co., Wyo.

KUSAKURA MINE. **JAPAN.**

Owned by Furukawa Mining Co.

KUYKENDAL MINING CO. **NEW MEXICO.**

Mine office: Carlsbad, Eddy Co., N. M. Dr. J. Odd, manager. Lands are 13 miles from Carlsbad. Presumably idle.

KVANANGENS KOBBERGRUBER. **NORWAY.**

Owned by Altens Kobbergruber.

KWAGGAFONTEIN SYNDICATE, LTD. **TRANSVAAL.**

Mine office: Waterberg, Transvaal. Organized 1907, under laws of Transvaal, with capitalization £12,000, shares £1 par. Property is an option on the Farm Kwaggafontein No. 996.

KYLOE COPPER MINING CO. **AUSTRALIA.**

Office: Sydney, Australia. Mine office: Adaminaby, N. S. W., Australia. J. W. Ashcroft, chairman; preceding officer, Dr. Taylor Young, A. G. de Lauret and J. T. Toohey, directors. Mine, opened by a 175′ shaft, shows ore in a main vein said to range 14 to 20% copper, with a footwall vein of 4′ to 6′ width giving 7% copper assays. Reduction works include a concentrator with Crook ball mill and jigs, and a smelter having a small reverberatory furnace, producing 45% matte.

LA BUFA MINING & SMELTING CO. **MEXICO.**

Office: 709 Lankershim Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, La Bufa Sahuaripa, Sonora, Mex. Organized 1906, with capitalization $6,000,000, apparently as a holding company for La Bufa Mining, Milling & Smelting Co. and La Dura Mill & Mining Co.

LABORERS' COÖPERATIVE GOLD, SILVER & COPPER MINING CO. **BRITISH COLUMBIA.**

Office: 99 Washington St., Chicago, Ills. Mine office: Golden, Kootenay district, B. C. Gust. L. Yount, president; N. N. Strandberg, vice-president; Chas. E. Sweiberg, secretary; John W. Turnquist, treasurer; "Rev." C. E. Nylin, general agent and liar-in-chief. Organized under laws of British Columbia, with capitalization $150,000, shares 10 cents par; capitalization apparently increased to $500,000, shares 10 cents par. Lands include the Shining Beauty group, having tunnels of circa 200′ and 400′. Built a smelter, which was not a success, having no mine to feed it. Present officers apparently are a new lot, hence it is uncertain whether they are victims or victimizers, but Parson Nylin, a renegade Baptist preacher, who is a disgrace to the cloth, remains as boss grafter.

LA CANANEAS COPPER CO. **MEXICO.**

Letter returned unclaimed from former office, 10 Wall St., New York, N. Y. Mine office: La Cananea, Arizpe, Sonora, Mex. Fred A. Trittle, president; Ehud N. Darling, secretary. Organized, circa 1901, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Was promoted by Henry B. Clifford & Co., but management said later to be in hands of P. Sandoval & Co., substantial bankers of Nogales, Arizona, and Nogales, Sonora, Mexico. Lands, 230 acres, including La Libertad and El Ultimatum groups, near the Greene Consolidated, having a 150′ shaft, with circa 300′ of workings, said to show a 15′ vein of ore similar to the Puertecitos ores of the Greene Consolidated. Property considered promising, but long idle and company apparently moribund.

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MINA LA CARIDAD. **MEXICO.**

Mine office: Pilares de Terns, Moctezuma, Sonora, Mex. Lands, slightly developed, show ore assaying 8 to 55% copper.

LAC LA BELLE MINING CO. **MICHIGAN.**

Dead. Sold lands, 1905, for $250,000, to Manitou Mining Co. Formerly at Delaware Mine, Keweenaw Co., Mich.

LA CLEDE GOLD & COPPER MINING CO. **COLORADO.**

Dead. Formerly at Dumont, Clear Creek Co., Colo. Fully described Vol. VI.

LA COBRIZA MINING CO. **MEXICO.**

Mine office: Noria, Altar, Sonora, Mex. Employs 50 men. Fred C. Emery, president and general manager; W. T. Stewart, vice-president; E. B. Sharpe, secretary and treasurer; preceding officers and Geo. Miller, directors; C. W. Tonkin, superintendent. Organized June 5, 1905, under laws of Arizona, with capitalization $250,000, shares $1 par, and is protocolized in Mexico.

Lands, 51 pertenencias, reported as of 230 acres area, with miscellaneous holdings in the Altar and Magdalena districts, showing contact deposits between limestone, quartzite and granite, of nearly vertical dip, one ore body under development, reported as 80′ wide and traceable 1,500′, carrying carbonates to depth of about 100′, succeeded by chalcopyrite estimated to average 6 to 8% copper, 4 to 6 oz. silver and $1.50 to $3 gold per ton. Mine is opened by shafts of 150′ to 500′, with circa 2,500′ of workings. Has a 100-h. p. steam plant, with an 8x10″ hoist and 6-drill Sullivan air-compressor. Has several small mine buildings, store, office and about 15 dwellings.

One carload of ore, shipped to El Paso smelter, returned 13% copper, 3 oz. silver and $1.50 gold per ton. Company plans installing a 100-ton MacDonald sulphide smelting furnace.

LA CORONA COPPER MINING CO., LTD. **SPAIN.**

Office: Clock House, Arundel St., Strand, London, W. C., Eng. Mine office: Fuencaliente, Cuidad Real, Spain. Edw. E. Fernandez, chairman; Harold Cossins, secretary; John W. Richmond Lee, consulting engineer; John E. Marshall Hall, engineer; G. T. Vivian, mine manager. Organized Oct. 31, 1905, under laws of Great Britain, with capitalization £20,000, shares £1 par, in 4,000 ordinary and 16,000 deferred shares; issued, £16,500. Lands, 20 hectares, including 3 mines, known as Corona I, Corona II and Los Azores. Presumably idle.

LADD METALS CO. **IDAHO.**

Office: Canterbury Bldg., Portland, Ore. Mine offices: Mineral, Washington Co., Idaho, and Landore, Washington Co., Idaho. Chas. E. Ladd, president; Samuel Peacock, vice-president and general manager; John Snow, secretary and treasurer; Geo. D. Rich, general superintendent.

Lands, 2 groups, both in the Seven Devils district. First group, 4 claims, at Mineral, bought of Consolidated Copper Co., has shipped some ore, averaging 5% copper and up to 350 oz. silver per ton. The property at Landore has shipped a little ore averaging 35% copper, and ore of much lower grade has been smelted on the ground.

Company has smelters at both Mineral and Landore. The Mineral smelter has a small water-jacket blast-furnace, burning coke. The smelter at Landore, of 60 tons daily capacity, has a 50-ton combination reverberatory and water-jacket blast-furnace, former burning wood and latter burning coke. This anomalous furnace was devised on a novel and absolutely unsuccessful plan, combining in a double stack blast and reverberatory furnaces, with a downward blast and a moist updraft, charging being in both furnaces, and between the two. Fuel was to have been furnished by a gas-producer consuming wet, rotten white fir wood. The theory and practice did not correlate, hence the plant was remodeled along more common lines.

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Smelters were closed down November, 1905, on account of poor transportation facilities, rendering it difficult to secure flux and fuel. Property, while poorly located as to facilities for transport, is considered promising. Idle.

LA DEMOCRATA MINING CO. **MEXICO.**

Office: 17 East 4th St., Cincinnati, Ohio. Mine office: La Cananea, Arizpe, Sonora, Mex. Organized 1905, under laws of Arizona, with capitalization $50,000, shares $10 par. Apparently is related to the Democrata Cananea Sonora Copper Co.

LA DICHA MINING & SMELTING CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Mitchell Mining Co.

LA DURA MILL & MINING CO. **MEXICO.**

Office: 709 Lankershim Bldg., Los Angeles, Cal. Mine office: La Bufa, Sahnaripa, Sonora, Mex. Is under the same management as the Bufa Mining, Milling & Smelting Co., with lands adjoining, on the Yaqui River, and is said to have considerable development.

LA DURA MINING CO. **MEXICO.**

Mine office: care of Hartmann & Groff, managers, Torres, Hermosillo, Sonora, Mex. Ores carry gold, silver, copper and lead. Has steam power and turns out product as silver-lead-copper concentrates, when working. Idle.

LADY CHELAN COPPER CO. **WASHINGTON.**

Dead. Formerly at Chelan, Chelan Co., Wash.

LADY ELGIN COPPER MINING CO. **MAINE.**

Dead. Operated briefly, circa 1880. Formerly at Blue Hill, Hancock Co., Maine.

LADY HELEN COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Pima, Graham Co., Ariz. Described Vol. II.

LADY POND COPPER CO. **NEWFOUNDLAND.**

Dead. Lands sold to Carmen Copper Mines, Ltd. Formerly at Lady Pond, Newfoundland.

LADYSMITH COPPER MINING CO. **MONTANA.**

Office: 259 La Salle St., Chicago, Ills. Mine office: Elliston, Powell Co., Mont. Arthur J. Bamford, president; V. W. Hemala, secretary; G. F. Neuberg, treasurer. Organized 1905, under laws of South Dakota, with capitalization $400,000. Lands, 4 claims, 12 miles from Elliston, well timbered and watered. Development is by two 110′ shafts, said to show ore averaging 22.5% copper. Company alleged, in its prospectus, that dividends should be paid during 1906, which is ample evidence that the company was rotten before it was ripe. Idle and presumably moribund.

LA ESTRELLA COPPER MINES, LTD. **SPAIN.**

Office: 31 Budge Row, London, E. C., Eng. Mine office: Los Martires, Granada, Spain. G. B. Elkington, J. P., chairman; F. A. Bagnall, secretary. Organized July 18, 1906, under laws of Great Britain, with capitalization £160,000, shares £1 par; issued, £150,000. Lands, 3 groups, area 1,222 acres, including La Jerezana, El Elsueño and others. Equipment includes a small smelter. Erection of a concentrator and 25-stamp mill is under consideration. Property considered promising, but development has been hampered by lack of adequate facilities and by high freight rates on the Ferrocarriles del Sur de España.

LAFAYETTE MINING CO. **MICHIGAN.**

Dead. Wound up 1906. Formerly at Matchwood, Ontonagon Co., Mich.

LA FLEUR MINING & SMELTING CO. **WASHINGTON.**

Office and mine: Danville, Ferry Co., Wash. Gust Peterson, president and general manager; A. E. Fennel, vice-president; J. C. Stutz, secretary; John Bell, treasurer; preceding officers, H. M. Genin, Chas. Nelson and Chas. T.

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Bennett, directors. Organized March 18, 1908, under laws of Washington, with capitalization $1,500,000, shares $1 par. Annual meeting, first Monday in June.

Lands, 8 claims, area 150 acres, in 2 groups, in the Curlew district, on the northeastern slope of La Fleur Mountain, in the northern part of Ferry county, showing diorite, andesite and quartzite, carrying a fissure vein in diabase and a contact deposit between diabase and andesite, of which one ore body, on the Cuba group, of 8′ estimated average width, traceable 800′, shows chalcopyrite estimated to average 1% copper, 2 oz. silver and $3.50 gold per ton, and has given assays of 2.5 to 5% copper, 2 to 3 oz. silver and $4 to $5 gold per ton. Development is by a 90′ shaft and a 600′ tunnel. Property is served by two railroads within a mile. Company plans lengthening the tunnel.

LA FLORENCIA GOLD & COPPER CO. **MEXICO.**

Office: 30 South Ninth St., Richmond, Va. Mine office: Cos, Moctezuma, Sonora, Mex. D. A. Ainslie, president; R. F. Hudson, secretary; Tom L. West, general manager. Organized 1902, under laws of West Virginia, with capitalization $1,000,000, shares $1 par. Lands, 134 pertenencias, area circa 330 acres, 25 miles from nearest railroad, showing a wide mineralized belt with heavy iron capping, traceable 2 miles. Main shaft, 250′, with a 50′ crosscut in ore assaying 5 to 9% copper, with fair gold and silver values. Property considered promising, but idle several years and company apparently moribund.

LA FLORIDA MINING, MILLING & DEVELOPING CO. **MEXICO.**

Dead. A twin of La Florencia Gold & Copper Co., Formerly at Cos, Moctezuma, Sonora, Mex.

LA FORTUNA MINING CO. **MEXICO.**

Office: 416-27 William St., New York, N. Y. Mine office: Ahualuleo, Jalisco, Mex. W. B. Stewart, president; Frank E. Lloyd, manager. Lands, 40 pertenencias, 5 miles northwest of Ahualuleo, showing a 5′ to 20′ vein, carrying auriferous and argentiferous copper and lead ores, with quartz gangue. Mine is opened by tunnels, with about one-half mile of workings, showing circa 10,000 tons of ore. Has a small mill. Presumably idle.

LA FORTUNA MINING CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Fortuna Mining Co.

LA FRANCE COPPER CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Works office: Basin, Jefferson Co., Mont. Robt. S. Walker, president; preceding officer, F. Augustus Heinze, Frederick Eckstein, Russell Hopkins and Stanley Gifford, directors; Wm. A. Kidney, general manager. Organized April, 1905, under laws of New York, with capitalization $7,000,000, shares $25 par, in $1,000,000 preferred 6% stock and $6,000,000 common shares. Authorized, Nov. 2, 1906, an issue of $2,000,000 first-mortgage 25-year 6% convertible bonds, to be issued in exchange for a like amount of debentures outstanding. Defaulted interest on coupon bonds due January and July, 1908. Is controlled, through stock ownership and otherwise, by United Copper Co., or some of its subsidiary corporations, and $2,000,000 worth of common stock is said to be owned by Copper Securities Co. Reported net earnings of circa $491,000, for year ending June 1, 1907, with a small loss on operations for year ending June 1, 1908.

Lands, 8 fractional claims, area 32 acres, known as the Lexington mine, held from the French owners under a $250,000 bond and lease, running in the name of Louis Girard, assigned to La France Copper Co. Dispute over lands with Butte & Boston was settled during 1907. Mine is at Walkerville, in the northern part of the Butte camp.

The Lexington mine has a 3-compartment, 1,450′ main shaft, connected

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on the 600′ level with the Alice mine, and has several miles of workings. The mine was worked many years ago, for gold and silver, but below the 1,400′ *level* has a 30′ vein, with granitic gangue, carrying stringers of sulphide ore assaying 3 to 4% copper, and is claimed also to have a vein of 14′ average width carrying chalcopyrite associated with considerable sphalerite and a little galena, giving average returns of 2.75% copper, 6 to 7 oz. silver and $5 gold per ton, which figures are considered exaggerated. It is also claimed that the *zinc* had disappeared on the 800′ level, but neither statement is credited. The mine was unwatered, 1907, to depth of about 1,000′.

Equipment includes a 15x30″ Ottumwa hoist raising a single-deck cage, 2 electric mine pumps and a 50-drill air-compressor.

The mine has an old mill, idle since circa 1903, with about 100,000 tons of auriferous zinc tailings, which perhaps could be cyanided at a profit.

A 200-ton mill was built, 1907, near the mine, between Walkerville and Centerville. This mill uses the magnetic separation process of Sutton, Steele & Steele, and to May 1, 1908, was claimed, by the company, to have cost $301,501. In actual operation the mill, which uses no water, apparently treated about 125 tons of ore daily, and made such an insufferable quantity of dust that it was closed down by the courts, an injunction having been sued out by the city of Walkerville. No great efforts were made by the company to prevent the issuance of this injunction, and it is probable that it came at a convenient time, as it is doubtful if the plant was profitable.

The reduction plant, at Basin, is the old Basin & Bay State concentrator, supposedly held under a $600,000 bond and lease. The plant is rated at 1,500 tons nominal daily capacity, equipment including 2 crushers, 8 sets of rolls, 4 *Huntington* mills, 90 Hartz jigs, 60 Wilfley tables and 80 Callow slime settling tanks.

Production, for year ending June 1, 1907, was 34,336 tons of ore, giving a gross yield of $14.18 per ton, and costing $6.35 per ton to mine. Maximum production in 1907 was circa 150 tons daily. The company is understood to be *trying* to sell the reduction plant. Company collected poll taxes from its employes, for the city of Butte, but at last accounts had not turned the taxes over to the city authorities. Property was sold for taxes, amounting to about $5,000, circa August, 1908, but is redeemable within one year, under a lump penalty of $500, plus 1% monthly on the amount delinquent.

LA GLORIA MINING CO. **MEXICO.**

Dead. Formerly at La Bufa, Sahuaripa, Sonora, Mex.

LAKE CITY MINING & SMELTING CO. **COLORADO.**

Mine and works office: Lake City, Hinsdale Co., Colo. Mine is developed by tunnels. Plant is a 50-ton smelter.

LAKE COPPER CO. **MICHIGAN.**

Office: Houghton, Mich. Mine office: Belt, Ontonagon Co., Mich. Reginald C. Pryor, president; Wm. D. Calverley, secretary; preceding officers, John H. Rice, Richard M. Edwards, Benj. F. Chynoweth, Linus Stannard and Allen F. Rees, directors; Wm. Wearne, superintendent.

Organized Nov. 28, 1905, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,000,000. Shares are listed on the Boston stock exchange. Federal Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agent.

Company began business with $45,000 cash, of which corporation fees, legal expenses and other expenditures preliminary to actual work took $7,000, leaving $38,000, of which $14,000 was spent for drilling and $5,000 for preliminary surface work. For $14,000 that was expended on actual mining, to March 1, 1908, the company sunk a 300′ shaft on the Knowlton bed, did 600′ of drifting, with 3 months' stoping at various points, to determine the average

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contents, and sunk a 100′ shaft on the Lake bed, which constitutes a most creditable record of work done at minimum cost. Cash on hand, May 15, 1908, was $58,571.31.

Lands, 740 acres, being the SE. ¼ of Section 29, SE. ¼ of Section 30, NW. ¼ of Section 32, and E. ½ of Section 31, T. 51 N., R. 37 W. All but 40 acres carries the underlay of the Lake bed. This property formerly was a part of the Belt mine, opened 1848, and taken over, 1882, by the Belt Mines Co., Ltd., which corporation, by utter incompetence and the worst of bad management, sunk about £250,000, in 3 years, without securing as much as a half-mile of underground openings. The Belt Mines Co., Ltd., secured about 2,500′ of workings for $1,250,000, which was at the rate of $500 per foot, while the Lake Copper Co. secured 1,000′ of openings for $14,000, or at the rate of $14 per foot. It is obvious that the managements of these two corporations differed in some essential respects. Some exploratory work was done on the Belt, 1901, by Nathan F. Leopold, with Capt. Wm. A. Dunn in charge.

The first work of the present company was done on the Knowlton and Butler beds, with a little work on a lode formerly supposed to be the Evergreen, principal work being on the Knowlton amygdaloid, on which there were old shafts of 170′ and 300′, latter being deepened to 600′ by the present company. Considerable copper was taken from the Knowlton bed, sold for $3,800, but it was thought wise to transfer work to virgin territory, at the southern end of the property, and the wisdom of this move was demonstrated by the outcome. There also is a 90′ shaft on the Tresidder lode, 1,000′ east of the Knowlton bed, which was sunk circa 1865, and is said to have paid for sinking from the copper extracted.

Considerable diamond drilling has been done, and it is probable that further holes will be bored, in search of the copper-bearing beds from which the Adventure secured rich drill cores in 1908. The borings of the Adventure, on adjoining lands, indicate that the Lake should have several other rich amygdaloids, in the same general horizon as the Lake bed.

Work was begun, late 1906, on an amygdaloidal bed hitherto untouched in the district, but which possibly is a southerly continuation of the Baltic amygdaloid. About 500′ of trenching was done before starting the shaft, this exposing the Lake bed for a width of fully 60′ on surface. The Lake shaft has 3 compartments, and was 300′ deep, October, 1908, with north and south drifts showing heavy copper and stamp-rock of excellent grade throughout. Enough copper was taken from the first 100′ of the shaft to pay for sinking. The Lake bed carries an exceptionally rich paystreak along the hanging-wall, but is above average grade throughout, and the showing of the shaft can be compared only to that of the Wolverine, and the best stopes of the Champion and Baltic, among the amygdaloid mines of the Lake Superior district. First level is opened at 160′, and levels will be opened at 150′ intervals, with sub-levels if necessary.

The Lake bed possibly is a continuation of the Baltic lode, as it occupies about the same geological horizon, though about 20 miles distant from the Baltic mine. The strike of the Lake amygdaloid and parallel beds is most unusual, being, so far as determined, about North 6° East, whereas the general strike of the Keweenawan series, in Ontonagon county, is more nearly east and west than north and south. That the Lake bed is not a fissure is proven conclusively by parallel strata, including a conglomerate lying about 400′ under the Lake bed, all of which have a similar strike. Some confusion was caused, at first, by the unusual strike of the Lake lode, but it is evident that this is due to one of the flexures in the Keweenawan series, of which instances are noted at the Section 16 mine of the Atlantic, and in the vicinity of the Mass

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mine. In the case of the Lake, the flexure is more marked than at any other point yet noted in the district.

The north drift of the Lake is cut off, at a short distance from the shaft, by the boundary line of St. Mary's Mineral Land Co., which owns a tract carrying about 15 acres of the underlay of the Lake bed, jutting into the southeastern corner of the Lake tract, but the Lake has the entire underlay, and a continuation of the outcrop for about one-fourth mile northeast of the boundary of the canal lands, in addition to an extensive tract to the westward, which can be reached from the present shaft, or by additional shafts sunk to the west.

Equipment includes a 12x15" duplex hoist, good for 500' depth, which will be replaced by a hoist good for one-half mile depth, bought of the Champion mine, and air-compressors of 6-drill and 15-drill capacities, taken from the equipment of the old Belt mine. Buildings include a number of old structures at the Belt location, and at the new shaft there is a 3-acre clearing having a wooden shafthouse and combined engine and boiler house, with machinery installed on concrete foundations.

The property is served by the main line of the Copper Range railway, which passes through the old Belt location, and the new shaft is reached by a 1¼-mile spur.

The copper showing of the Lake has excited more interest in the district than any mining development since the discovery of the great Baltic lode, in 1897, which led to the opening of the Baltic, Trimountain, Champion and Superior mines, with other properties developing on the same bed. The showing of the Lake is materially the best ever made on any amygdaloidal bed in Ontonagon county, for a similar amount of work, and in view of the great width of the bed, and its remarkable mineralization, so far as opened, it is reasonably safe to predict the making, in time, of one of the great amygdaloidal mines of the district. The management is excellent, both technically and financially.

LAKE COPPER MINING CO., LTD. **NOVA SCOTIA.**

Office: Eastern Harbour, N. S. Mine office: Polson's Brook, Antigonishe Co., N. S. H. G. Dunbar, secretary and treasurer; A. G. Baillie, general agent. Organized circa January, 1908, with capitalization $2,500,000, shares $1 par. Lands, circa 6,400 acres, on Polson Lake, showing auriferous and argentiferous copper ore, opened by a 103' shaft, with about 550' of workings.

LAKE COPPER PROPRIETARY CO., LTD. **SWEDEN.**

Office. 40 Queen Victoria St., London, E. C., Eng. Col. A. H. C. Lynch, chairman; M. Schreiter, mine manager; C. Maurice Champness, secretary. Organized March 10, 1906, under laws of Great Britain, with capitalization £300,000, in 298,000 ordinary shares of £1 par, and 40,000 deferred shares of 1s. par. Holds lands through Lake Copper Syndicate Aktiebolag, organized under laws of Sweden. Lands, on Lakes Animmen and Arr, circa 90 miles north of Gothenberg, Sweden, include the Stora Strand and Vingnäs mines, said to show outcrops traceable circa 10 miles. These mines have 13 shafts, mostly shallow, deepest circa 800', showing ores giving assays of slightly better than 2% copper, with small gold and silver values. Ore reserves of Stora Strand mine estimated, Jan. 1, 1908, at 100,000 tons. Is said to plan erecting a smelter.

LAKE GEORGE MINE. **AUSTRALIA.**

Mine office: Bungendore, Murray Co., N. S. W., Australia. W. J. Channon and J. Plun, owners. Lands, 172 acres, freehold, at Captain's Flat, Lake George. The mine, circa 600' deep, was opened 1882, on a main vein of 22' to 30' width, having a meridional strike and vertical dip, in Silurian slates, ore occurring as replacements along fault-lines, as a compact, fine-grained mixture

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of chalcopyrite, sphalerite, galena and pyrite, with aluminous quartzose gangue, carrying an average of only about 1.5% copper, with small gold and silver values. Ore, from its nature, is very refractory in smelting, and average returns, 1898, were only 1.45% copper.

The smelter has four 60-ton water-jacket blast-furnaces, and the ore requires heavy fluxing and fuel charges. Pyritic smelting was tried, but proved unsuccessful.

Maximum production of the mine was circa 500 tons fine copper yearly, sold as matte carrying 30 to 35% copper, 65 oz. silver and 1 oz. 12 dwts. gold per ton. Several successive companies have been wrecked in attempting to operate the mine. Production, 1907, was only 40 tons of ore, which remained untreated.

LAKE GEORGE MINES, LTD. **AUSTRALIA.**

Dead. Reorganized, 1904, as Lake George Successors, Ltd. Formerly at Bungendore, Murray Co., N. S. W., Australia.

LAKE GEORGE SUCCESSORS, LTD. **AUSTRALIA.**

Dead. Formerly at Bungendore, Murray Co., N. S. W., Australia. Fully described Vol. VI.

LAKE HURON COPPER SYNDICATE, LTD. **ONTARIO.**

Dead. Voluntarily wound up, February, 1901.

LAKE JUKES COPPER CO., N. L. **TASMANIA.**

Offices: 103 Gresham House, London, E. C., Eng., and Prells Bldgs., Melbourne, Australia. Mine office: Crotty, Tasmania. J. P. Madden, chairman; H. S. Muir, mine manager; N. Madden, Melbourne secretary; W. W. Futcher, London secretary. Organized Oct. 8, 1900, under laws of Victoria, with capitalization £150,000, shares £1 par. Lands, 2 leases, area 120 acres, on Mount Jukes, on the west coast of Tasmania. Has a 5-stamp mill.

LAKE MILLING, SMELTING & REFINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Works office: Point Mills, Houghton Co., Mich. H. F. Fay, president. Organized under laws of Michigan, with capitalization $400,000. Receipts, 1907, were $100,000 raised by assessment and $126,383 received from stamping 414,760 tons of rock. Stamping costs, 1907, were 20.839 cents per ton. Balance on hand, Jan. 1, 1908, was $61,619.

The millsite, 406 acres, carrying more than 1¼ miles frontage on Portage Lake, adjoins the Franklin millsite. The mill was built by the Arcadian, and was bought, circa 1904, by the Centennial, and was transferred to the present corporation, stock of which is owned jointly by the Centennial and Allouez.

The mill is 132x104', of steel frame, having 3 Nordberg stamps, with foundations built for 3 additional heads. Foundations under the old heads were in bad shape, hence a new 12' concrete foundation was built under one head, which was compounded, giving it a daily capacity of about 700 tons, and a second simple head has been overhauled. The mill has crushing rolls, to treat oversize material.

The mill has a 15,000,000-gallon Nordberg pump, and a wharf running 675' into deep water, fitted with a modern coal-hoist and coal-shed. Miscellaneous buildings include a machine-shop, smithy, cooper-shop and a number of dwellings for employes.

LAKE SHORE MINING CO. **MICHIGAN**

Office: 990 West Kensington Road, Los Angeles, Cal. Mine office: Green, Ontonagon Co., Mich. W. H. Garlick, president. Organized under laws of Michigan, with capitalization $500,000, shares $25 par. Lands, 773 acres, patented, on the shore of Lake Superior, in Town 51 North, Range 44 West, reported to carry bedded deposits, between slate walls, of 5' and 12' width, showing copper oxides and chalcocite giving average assays of 1.5% copper, 0.5 oz.

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silver and 40 to 80 cents gold per ton. Has been but slightly prospected, and is idle.

LAKESIDE COPPER CO. **UTAH.**

Office: care of Howard S. Stowe, vice-president, Salt Lake City, Utah. *Mine office:* Promontory, Box Elder Co., Utah. H. E. Baker, president. Lands, 27 claims, near the Lucin cut-off, showing what apparently is a blanket vein of 15′ to 50′ width, traceable circa 300′, proven by shallow trenches showing ore assaying up to 40% copper.

LAKESIDE GOLD-COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Index, Snohomish Co., Wash. Described Vol. VII.

LAKE SUPERIOR & ARIZONA MINING CO. **ARIZONA.**

Dead. Title changed, 1904, to Lake Superior & Arizona Mining & Smelting Co. Formerly at Florence, Pinal Co., Ariz.

LAKE SUPERIOR & ARIZONA MINING & SMELTING CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Superior, Pinal Co., Ariz. Employs circa 60 men. John D. Cuddihy, president; Dr. W. A. Holt, vice-president; A. E. Petermann, secretary; Wm. B. Anderson, treasurer; preceding officers, J. T. Reeder, Wm. Thielman, Angus W. Kerr, Edward Ulseth, Henry L. Baer and Capt. Thos. Maslin, directors; Fred W. Hoar, superintendent; Geo. N. Bell, mine superintendent; Dugald Stewart, clerk.

Organized Sept. 30, 1902, under laws of Arizona, as the Lake Superior & Arizona Mining Co., with capitalization $200,000, shares $1 par, and reorganized, 1904, under present title, with capitalization $2,500,000, shares $20 par; $19 paid in, to end of 1908. Levied $1 assessments, payable in installments, in 1906, 1907 and 1908. Under old territorial laws of Arizona the corporation was unable to sell stock delinquent on the 1907 assessment, but a change in the laws made is possible to do this, to the great relief of the company, which was badly hampered by neglect of many of the shareholders to pay the 1907 assessment, until compulsion was employed.

Lands, 11 claims, area 110 acres, freehold, in the Pioneer district, 3 miles south of the Silver King mine, 30 miles west of Globe and 28 miles east of Florence. Litigation over 2 claims, instituted by F. Pheby, was decided in the company's favor, in all courts. The property, formerly known as the Gold Eagle mine, was worked for gold, by the Gem Gold Mining Co., which went out of business, 1895, after paying considerable dividends. The old workings include many shallow shafts and short tunnels, opened at random, from which the former owners extracted rich surface ores.

The property shows limestone, quartzite and diabase, with 3 ore bodies, of which 2, under development, occur as contact deposits between quartzite and limestone, and in limestone, these having a quartzite footwall and limestone hanging, with average width of circa 6′ The main ore body, of 6′ to 7′ width, has a north and south strike, with dip of 26° 30′, and shows a prominent outcrop. Ores are silicious oxides and carbonates, associated with iron and manganese, and should be valuable for fluxing the base ores likely to be opened at greater depth. Shipments of 13 carloads, 1905, from the Anderson tunnel, gave average returns of 31.6% copper, 2.2 oz. silver and $2.67 gold per ton, netting $24,649.81.

Development is by 2 shafts and 4 tunnels. The ground is not especially heavy, and little timber is required, except for openings in occasional soft places. The mine has circa 7,000′ of workings, not including the old openings made by former owners.

The 375′ Vivian shaft is sunk vertically, in low ground, to depth of 279′, and cut diagonally through about 30′ of ore.

The Holt tunnel, of circa 500′ length, cuts a 16′ ore body, at approximately right angles, with a back of 216′.

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The Holt shaft is a 2-compartment blind shaft, starting from the breast of the Holt tunnel; at 216′ depth from surface, and was sunk, 1908, to depth of 850′ from surface, and is planned to be sunk to 1,000′. This shaft has a hoist good for 1,000′, and is said to show, on the 850′ level crosscut, ore assaying up to 50% copper and $28 gold per ton, with a quartz footwall carrying up to $28 gold per ton, but the gold figures are considered excessive.

The Carlton tunnel, circa 100′ below the Holt tunnel, is connected with the latter by a 165′ winze on the dip of the ore body, and is driven, in the ore, for circa 3,000′ length, showing ore assaying up to 30% copper.

Equipment includes a steam plant with a 175-h. p. water-tube boiler, and a 16-drill Rand 2-stage air-compressor. Petroleum is used for fuel, and there are 5 storage tanks at the mine and 2 at Florence, each holding 2 carloads of oil.

Buildings include a power house, smithy and bunk-house at the mine, and an office and dwelling at Florence, 28 miles distant.

The Arizona Midland R. R. Co. has been organized, by shareholders of the Lake Superior & Arizona Mining & Smelting Co., with capitalization $500,000, shares $1 par, for the purpose of building a railroad from the mine to Florence, to connect with the Gila Valley, Globe & Northern railway. This line would traverse 19 miles of easy rolling country, and 9 miles of hills, and would cost from $300,000 to $500,000 for construction and equipment.

Operations were suspended circa November, 1907, and resumed July, 1908, with a force of about 60 men. Production, 1907, was 92,120 lbs. fine copper, 1,040 oz. silver and 188 oz. gold. The property is considered promising, and the management has shown persistence in its work, but the mine cannot be placed on a profitable productive basis until rail connections are secured.

LAKE SUPERIOR & BISBEE DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz.

LAKE SUPERIOR CONCENTRATING CO. **MICHIGAN.**

Dead. Liquidated 1905, and practically succeeded by Copper Concentrating Co. Formerly at Hancock, Houghton Co., Mich.

LAKE SUPERIOR COPPER CO. **MICHIGAN.**

Mine office: Rockland, Ontonagon Co., Mich. Organized July, 1853, under laws of Michigan, with capitalization $500,000, shares $25 par. Was set off by Minesota Mining Co. Lands, 640 acres, in Sections 13 and 14, Town 50 N., Range 39 W., carrying the northeasterly extension of the parallel cupriferous beds of the Evergreen Belt, opened in the Mass and Adventure mines. Expended about $40,000 in assessments and made 14,821 lbs. fine copper. Idle since 1874.

LAKE SUPERIOR COPPER CO. **ONTARIO.**

Office: care of Lewis Brittan, president, 45 Milk St., Boston, Mass. Mine office: Port Arthur, Thunder Bay, Ont. Gustave E. Wolters, vice-president; Jas. A. Tirrell, secretary and treasurer; Capt. Walpole Roland, consulting engineer. Organized January, 1907, under laws of Maine, with capitalization $3,000,000, shares $25 par, and is registered under laws of Ontario. Lands, 480 acres, known as the Cloud Lake mines, in the township of Crooks, 3 miles from mouth of Cloud River, opposite Isle Royale, and 25 miles south of Port Arthur. Property shows amygdaloidal and conglomerate strata carrying native copper, principal bed being an amygdaloid of about 20′ average width.

LAKE SUPERIOR COPPER & ZINC CO. **ONTARIO.**

Dead. Charter forfeited, 1902. Formerly at Wolf River, Thunder Bay district, Ontario.

LAKE SUPERIOR COSO DEVELOPMENT CO. **CALIFORNIA.**

Office: care of John Kiiskila, president, Hancock, Mich. Mine office: Darwin, Inyo Co., Cal. Nels Majhannu, vice-president; Jacob Jarvis, secre

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tary; Peter Strolberg, treasurer. Organized 1907, with capitalization $50,000, shares $25 par. Lands, 1,200 acres, stretching along a distance of about 13 miles, showing ore giving good assay values in lead, copper, silver and gold.

LAKE SUPERIOR GOLD MINING & MILLING CO. **MEXICO.**

Office: Marquette, Mich. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. F. H. Begole, treasurer. Capitalization $3,500,000, shares $5 par. Lands first held, 1,200 acres, near Magdalena, were abandoned, and operations transferred to a group of copper claims, area 900 acres, lying in the Cananea Mountains. Idle several years and apparently moribund.

LAKE SUPERIOR & PITTSBURG DEVELOPMENT CO. **ARIZONA.**

Dead. Wound up and merged, circa 1907, in Superior & Pittsburg Copper Co. Formerly at Bisbee, Cochise Co., Ariz. Very fully described Vol. VI.

LAKE SUPERIOR POWER CO. **ONTARIO.**

Office: Sault Ste. Marie, Ont. Mine office: Gertrude Mine, Algoma, Ontario. C. D. Warren, president; A. B. Willmott, superintendent. Lands, 7 claims, area circa 2,000 acres, including the Gertrude and Elsie nickel-copper mines, in Creighton township, showing 4 contact veins, of which 2, slightly developed, carry cupriferous and nickeliferous pyrrhotite, returning an average of 0.5% copper and 3% nickel. Has shafts of 60′ and 120′, with circa 1,000′ of underground openings, estimated by previous management to show 500,000 tons of ore, with 50,000 tons blocked out, obviously an overestimate. Has a steam plant with tubular boilers, 2 hoists and a 12-drill air-compressor.

Smelter, one-half mile from mine, and connected therewith by the Manitoulin & North Shore railway, has a 100-ton Herreshoff water-jacket blast-furnace, making, when in operation, matte with a combined copper and nickel tenor of 25%. Idle since circa 1904.

LAKE SUPERIOR SMELTING CO. **MICHIGAN.**

Office: 303-199 Washington St., Boston, Mass. Operating office: Post-office Block, Houghton, Mich. Works office: Dollar Bay, Houghton Co., Mich. Norman W. Haire, manager; Harry B. Conant, superintendent; Joseph Thebo, assistant superintendent; Hon. J. C. Dunstan and James McRae, clerks; E. Kneeland, chemist; H. M. Germberger, assistant chemist. Capitalization $1,200,000, shares $25 par. Stock is owned jointly by the Detroit & Lake Superior Copper Co., of Waterbury, Conn., and the Tamarack-Osceola Copper Mfg. Co.

Plant is a smelter at Dollar Bay, closely connected with the works of the Tamarack-Osceola Copper Mfg. Co. Works have 11 reverberatory furnaces, four of 17x30′ size and seven of 11x16′ size each, having mechanical ladling and casting devices. The mechanical ladling and casting device has a 1,100-lb. ladle and a casting machine with molds linked into an endless belt, dumping over sprockets into cooling tanks, whence the ingots are removed mechanically by cleat elevators, which deliver the ingots to inspection and loading platforms. On the return of the molds, while inverted, they pass over a rosin fire, which coats them with lampblack, to prevent sticking. In a test run a single machine cast 34,700 pounds of ingots in 58 minutes. Company also owns a dismantled smelting plant at Hancock. Employs circa 300 men.

COMPAÑIA MINERA LA LAGUNA, S. A. **MEXICO.**

Office: care of Juan Castillon, president, Torreón, Chihuahua, Mex. Miguel Torres, vice-president; Mauro da La Pena, treasurer; José Marie Garza-Aldave, secretary and mine superintendent; Jesus A. Fernandez, attorney. Property is 4 groups of antiguas, in the state of Durango, carrying mainly silver and lead values, idle for about a century.

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MINA LA LAPILLA. **SPAIN.**

Mine office: Alosno, Huelva, Spain. Wm. Guthrie Bowie, manager. Is a group of government concessions, adjoining the Tharsis mine, showing a very wide lense of cupriferous pyrite assaying 2.5 to 8% copper and 47 to 50% sulphur. Was operated formerly by pillar-and-stall, leaving large quantities of ore in floors and pillars. Has about 1,200,000 tons of ore available underground, and much more if worked open-cast. Has poor ventilation. Property shows enormous quantities of scoria, left from smelting operations of the Romans. Is well equipped with machinery. Presumably idle.

LA MANGIARDE, LTD. **FRANCE.**

Office: 5 Clements Inn, Strand, London, W. C., Eng. Letter returned unclaimed from former mine office, La Tour-sur-Tinée, Alpes Maritimes, France. T. Cowperthwaite, chairman. Organized Oct. 30, 1903, with capitalization £4,000, shares £1 par; issued, £3,000. Lands, sundry coal mines and undeveloped mineral lands carrying indications of copper, in the neighborhood of Nice. Idle and apparently moribund.

SUCESIÓN C. J. LAMBERT. **CHILE.**

Office, mine and works: La Compañia, La Serena, Coquimbo, Chile. Property includes El Brillador and San Antonio mines, area 93 hectares, which, in 1903, with a force of 38 men, produced 4,500 metric tons of 8% ore. Country rock is porphyry, carrying veins of about 90′ extreme width, with dip of 60°, sulphides appearing at depth of circa 100 meters. The Fortuna and Placeres mines employ circa 150 men. Los Bronces mine, formerly owned, has been sold to Sociedad Minera de Los Bronces.

Reduction plant, 16 miles from Coquimbo, with rail connection, includes a 100-ton concentrator and a smelter that was the first modern plant in Chile, using the Welsh system. Smelter has four 21′ reverberatory furnaces and 2 calciners. Machinery equipment includes two 100-h. p. boilers, two 80-h. p. engines and a small hydraulic turbine, fuel being Australian coke, costing 20 pesos per ton, laid down. Production formerly was copper sulphate, consumed mainly by smelting plants using the Kröhnke process, but latterly this business has been lost, and smelter now produces Chile bars of about 95% copper tenor, with slags averaging 0.7% copper, employing an average force of 100 men, at wages of 1.3 pesos daily. Production, 1903, was 8,600 tons of ore, of 9.5% average copper tenor, with fuel consumption of about 6,000 metric tons of coke, making 1,481,491 lbs. fine copper.

CHAS. LAMBERT & CO. **WALES.**

Works office: Swansea, Glamorganshire, Wales. Property is extensive copper reduction works, including smelters and an electrolytic plant.

LA MINA COBRE CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. M. T. Brown, president; O. Z. Kane, secretary and treasurer. Capitalization $2,000,000, shares $1 par. Lands, 12 claims, circa 35 miles southwest of Tucson and 8 miles from Sasco, having about 300′ of workings. Has a gasoline hoist.

ERZBERGWERK LAMPERTUS. **GERMANY.**

Mine office: Hohenstein-Ernsthal, Saxony, Germany. Friederich Wilhelm Feltzner, president. Property carries auriferous and argentiferous arsenical ores of copper. Presumably idle.

LA NATIVIDAD MINING CO. **MEXICO.**

Dead. Was a swindle. Formerly at Coapa, Morelia Michoacán, Mex. Described Vol. V.

LANCASTER GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Apparently is successor of

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Pyramid Gold & Copper Mining Co., of doubtful reputation, which formerly owned the property.

Lands, 12 claims, area circa 200 acres, 5 miles from Skull Valley station, showing a gossan opened by several shafts of 50′ to 100′ depth, carrying somewhat auriferous oxidized and sulphide ores. The Anna Bell claim was asserted by former owners to show a vein 150′ wide, which is something more than doubtful, giving average assays of 14.5% copper and $4.74 gold per ton from surface ores, which figures are their own refutation. Equipment includes a 10-stamp mill and the beginning of a 100-ton concentrator. Idle, except for annual assessment work.

LANCELOT FREEHOLD TIN & COPPER MINES, LTD. **AUSTRALIA.**

Office: 1 Bucklersbury, London, E. C., Eng. Mine office: Herberton, Cardwell Co., Queensland, Australia. F. E. Clotten, chairman and managing director; G. A. Waller, mine manager; F. J. Duck, secretary. Organized May 27, 1903, under laws of Great Britain, as a reconstruction of the Lancelot Tin Mining Co., Ltd., with capitalization £120,000, shares £1 par; issued, £97,641. Debentures, £20,000 authorized, £19,250 issued, at 10%. Lands, 60 acres freehold and 160 acres leasehold, carrying ores of copper, tin, bismuth and wolfram, opened by a 327′ main shaft and a 150′ tunnel. Has a concentrating mill, and is a small producer of tin and bismuth only, copper property being idle.

LANDLOCK BAY MINING CO. **ALASKA.**

Mine office: Landlock, Alaska. W. A. Dolan, manager. Lands, on a small peninsula, with tidewater on both sides, have 2 tunnels on the western side, showing copper ore of good tenor.

LA PALOMA MINING CO. **MEXICO.**

Letter returned unclaimed from former office, Springfield, Ills. Mine office: Ayutla, Autlán, Jalisco, Mex. J. Breckenridge, superintendent. Property shows auriferous and argentiferous copper ores, and is said to have a 25-ton concentrator.

COMPAÑIA MINERA LA PAZ. **MEXICO.**

Mine office: Cuatro Ciénegas, Monclova, Coahuila, Mex. Mine, known as La Paz, has argentiferous copper ores. Employed circa 40 men, at last accounts.

LA PLATA CONSOLIDATED MINING CO. **UTAH.**

Dead. Was a bad egg. Formerly at Ogden, Weber Co., Utah.

LARDEAU-DUNCAN MINES, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Duncans, Vancouver Island, B. C. Described Vol. VII.

LA RECOMPENSA MINING CO. **MEXICO.**

Mine office: Santa Maria del Oro, El Oro, Durango, Mex. P. J. Opperman, superintendent. Has auriferous and argentiferous copper and zinc ores, with steam and water power, and a 10-stamp mill.

LAREDO MINING CO. **MEXICO.**

Letter returned unclaimed from former mine office, Concepcion del Oro, Mazapil, Zacatecas, Mex. W. H. Banks, general manager. Organized 1907, with capitalization $600,000. Property is the General Escobedo mine. Idle.

LA RITA DEVELOPMENT CO. **ARIZONA.**

Office: Tombstone, Ariz. Letter returned unclaimed from former mine office, Fairbank, Cochise Co., Ariz. James Herron, president; preceding officer, Frank Hare and D. L. Cunningham, directors. Lands, 20 claims, near Mescal Springs, circa 16 miles west of Fairbank, having 6 pits and trenches, showing silver bromides and copper carbonates, giving average assays of 12% copper and 100 oz. silver per ton. Idle.

LA ROCA-NEGRITA MINING CO. **MEXICO.**

Dead. Lands sold, circa 1903, to American-Mexico Mining & Development Co. Formerly at San Lorenzo, Durango, Mex.

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JOSÉ LARRAGUIBEL. **CHILE.**

Mine office: Algarrobito, La Serena, Coquimbo, Chile. Property is the Pajalones mine, having a vein of one meter average width, opened to depth of 130 meters, with horizontal workings for 400 meters length. Production, 1903, was 400 metric tons of ore averaging 14% copper tenor, equal to 123,457 lbs. fine copper.

LAS ADARGAS MINING CO. **MEXICO.**

Office: 15 John St., New York, N. Y. Mine office: Jiménez, Chihuahua, Mex. E. G. Seiler, president; Geo. E. Crawford, secretary; W. A. Seamon, general manager, El Paso, Texas. Claims to be organized under laws of New York, with capitalization $1,000,000, shares $10 par. Declared a dividend of 25 cents per share, April, 1902. Property said to be held under a bond of $300,000, on which $15,000 was paid. Claimed to have a 300′ shaft. Regarded with much suspicion, and apparently moribund.

LA SAL COPPER MINING CO. **COLORADO.**

Dead. Succeeded, 1904, by Consolidated La Sal Mining & Smelting Co. Formerly at La Sal, Grand Co., Colo.

LA SAL COPPER-SILVER MINING CO. **COLORADO.**

Office: 1317-25 Broad St., New York, N. Y. Mine office: Cashin, Montrose Co., Colo. J. Ensign Fuller, president; Arthur C. Danielson, vice-president; Frank R. Allen, treasurer; John B. Overton, secretary. Apparently is a reorganization of Consolidated La Sal Mining & Smelting Co., which was a reorganization of La Sal Copper Mining Co. Lands, 7 patented claims and 3 millsites, area 150 acres, known as the Cashin mine, having a 1,540′ tunnel showing ore assaying up to 35% copper and 18 oz. silver per ton.

LA SALLE COPPER CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Quincy A. Shaw, Jr., president; Rodolphe L. Agassiz, vice-president; Geo. A. Flagg, secretary and treasurer; Jas. MacNaughton, general manager; preceding officers, Col. Thos. L. Livermore, Courtney C. Douglass and Francis W. Hunnewell, directors; Wm. Skewes and Josiah Bartell, mining captains.

Organized, circa December, 1906, under laws of Michigan, with capitalization $10,000,000, shares $25 par. Absorbed the Caldwell Copper Co., and controls, through ownership of practically entire stock issue, the Tecumseh Copper Co., holding, at last accounts, 54,249 shares, out of a total issue of 54,959 shares. Is controlled, through stock ownership, by the Calumet & Hecla Mining Co. Tecumseh shareholders received 1⅓ shares of La Salle for 1 of Tecumseh.

Of the capitalization of 400,000 shares, 302,977 were issued for various purposes, leaving 97,023 shares in the treasury. The Calumet & Hecla Mining Co. contributed $1,000,000 cash to the treasury, taking pay in shares, and has agreed to loan $750,000 cash, in addition, as needed. Annual report, as of date April 30, 1907, showed total cash resources of $942,272, with liabilities of $21,699, and a financial statement, as of date Aug. 19, 1908, gave $870,975 cash and accounts receivable, with accounts payable of $4,496.

Lands, 2,360 acres, also the Gregory millsite on Torch Lake, nearly opposite the Calumet & Hecla mills. The Tecumseh and Caldwell contributed 560 acres each, and 1,240 acres were furnished by the Calumet & Hecla, St. Mary's Mineral Land Co., Shelden & Douglass estate and other interests. These lands were put into the new company on a novel basis of valuation, figured upon zones of 2,500′, on the dip of the Kearsarge lode, allowance being made for decreased land values on tracts carrying the underlay at depth. The property has 4 shafts, 2 on the Tecumseh and 2 on the Caldwell, with room for 3 addi-

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tional shafts, giving 7 shafts at intervals of about 1,700′. The property carries the strike of the mineral formation for circa 2½ miles.

Considerable diamond drilling has been done on the tract, and development is exclusively on the Kearsarge amygdaloidal bed. In July, 1908, six power drills were running in the Tecumseh branch, and two in the Caldwell branch.

The Tecumseh property is a very irregular tract, lying next south of the Osceola mine proper, carrying circa 400 acres of the underlay of the Kearsarge lode. The first work on the Tecumseh was done on the Calumet conglomerate, where a shaft was sunk circa 1,000′, but found no payable copper. During the second era of activity, 1899-1902, a shaft was sunk 2,300′ on the Osceola amygdaloid, but this bed was found practically barren of copper, and work was abandoned, November, 1902. The old Osceola shaft may be reopened, however, for the reason that the southern drifts from No. 6 shaft of the Osceola, below the 4,000′ level, are among the best in the mine, and these are near the Tecumseh boundary.

Tecumseh shaft No. 1, sunk on the Kearsarge bed, is 6x18′, with 3 compartments, 1,400′ deep, with drifts on the twelfth, thirteenth and fourteenth levels, showing considerable good ground. The workings of No. 1 show typical Kearsarge amygdaloid, of about 15′ average width, with variable mineralization, though decidedly promising. The stockpile at No. 1 shaft contains circa 80,000 tons of stamp-rock, including some rock of very good grade, carrying considerable heavy copper.

No. 2 Tecumseh is about 1,000′ south of No. 1, old No. 2 shaft, which was too close to No. 1, having been abandoned. No. 2 is planned as a duplicate of No. 1, in size and equipment.

The Caldwell has 2 shafts, known as Nos. 1 and 2, which also are called the La Salle shafts. These probably will be renumbered eventually. No. 1 Caldwell shaft, sunk one mile south of Tecumseh No. 1, has a shaft-rockhouse, and was 500′ deep, October, 1908. No. 2 Caldwell is circa 1,500′ southwest of No. 1, and is of the same depth, shafts being duplicate, with hoists good for one-half mile each. The Caldwell shafts can be sunk to 9,000′ depth before reaching the boundary line. The Kearsarge bed, on the Caldwell tract, has been found considerably disturbed to the depth reached, and the showing is poor, but the shafts are not deep enough to give permanent results.

Equipment includes steam plants and compressors at each mine, the Caldwell having a 15-drill air-compressor at No. 1 shaft, with a 30x70′ boarding-house, barn and several dwellings.

Results at the La Salle have been somewhat disappointing, though a fair showing has been secured in Tecumseh No. 1, but it is obvious that the real value of the property can be determined only by further extensive development. This will be secured, as the company is exceedingly strong financially, with an excellent management.

LA SALLE COPPER MINING & MILLING CO. **NEW MEXICO.**

Mine office: Carrizozo, Lincoln Co., N. M. Geo. C. Hopkins, vice-president. Organized under laws of Arizona, with capitalization $1,000,000, shares $100 par. Lands, 3 claims, area 60 acres, 6 miles from Carrizozo, said to show a 12′ to 15′ vein of low-grade copper ore. Company is said to plan building a 50-ton concentrator.

LAS ANIMAS COPPER MINING & SMELTING CO., LTD. **CHILE.**

Office: 2 Rumford Place, Liverpool, Eng. Mine office: Chañaral, Atacama, Chile. Edwin Woodgate, chairman; Pedro Nicholas Schjölberg, managing director in Chile; F. E. Owens, secretary; Guillermo Sheriff, mine manager. Organized Jan. 3, 1902, under laws of Great Britain, with capitalization £20,000, shares £1 par, as successor of Copper Corporation of Chile, Ltd. Debentures, £54,500, at 6%. Lands, circa 125 acres, including La Fortunata

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mine, 430′ deep, opened 1855, and La Alena and El Progreso mines at Las Animas, in the Sierra Aspera.

Smelter, rebuilt 1895, has two 54″ circular blast-furnaces, with Connersville and Bocker blowers, employing circa 100 men, at average daily wages of 3 pesos. Fuel is coke and Australian coal, coke costing 32 pesos per ton, delivered, 1 ton of coke smelting 8 tons of ore, giving slags averaging 0.7% copper. Production, 1903, was 3,701,976 lbs. fine copper.

LAS ANIMAS GOLD-COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Hillsboro, Sierra Co., N. M. Fully described Vol. VII.

LAS ANIMAS MINING & SMELTING CO. **MEXICO.**

Mine office: Llano, Magdalena, Sonora, Mex. F. A. Huntington, mine manager. Property includes Las Animas, El Purgatorio and other mines, carrying auriferous and argentiferous copper and lead ores. Has a 40-ton mill and a 40-ton smelter, employing about 25 men, at last accounts.

LAS COCHES MINING CO. **MEXICO.**

Office: 1085 West 21st St., Chicago, Ills. Mine office: Ures, Sonora, Mex. Idle.

LAS CRUCES COPPER CO. **NEW MEXICO.**

Mine office: Organ, Donna Ana Co., N. M. J. F. Statley, president; Nicholas Gallus, vice-president; Fay Sperry, treasurer; D. F. Baker, secretary. Lands, 9 claims, known as the Green mine, in the Black Mountain district, 8 miles north of Organ. Said, 1908, to plan a small smelter.

LAS GORITAS MINING CO. **MEXICO.**

Letter returned unclaimed from former office, San Francisco, Cal. Mine office: La Bufa, Sahuaripa, Sonora, Mex. Idle.

LASKAWANDA GOLD & COPPER CO.

Office: 40 State St., Boston, Mass. Location of lands, if any, unknown.

COMPAÑIA MINERA DE COBRE "LAS MORAS," S. A. **MEXICO.**

Is the Mexican incorporation of Las Moras Copper Mining Co.

LAS MORAS COPPER CO. **MEXICO.**

Dead. Succeeded by Las Moras Copper Mining Co. Formerly at Ameca, Jalisco, Mex. Described Vol. VI.

LAS MORAS COPPER MINING CO. **MEXICO.**

Office: 2030 Land Title Bldg., Philadelphia, Pa. Mine office: Ameca, Jalisco, Mex. Employs circa 50 men. Paul W. Meyers, president; Albert St. Paul, vice-president; A. S. Robert, secretary; L. H. Taylor, Jr., treasurer; Geo. E. McCormick, comisario; preceding officers constitute the board of directors; Jas. P. Harvey, general manager; Jas. M. Campbell, superintendent.

Organized July 7, 1902, under laws of Mexico, with capitalization 5,000 pesos, and capitalization increased, July 17, 1906, to 10,000 pesos, shares 100 pesos par. Property is operated, under lease, by the American corporation, which is reported as having less than a half dozen shareholders, which, naturally, would include the five directors only. Annual meeting, third Monday in July.

Lands, 187 pertenencias, area 462 acres, circa 6 miles southwest of Ameca, on the Hacienda San Miguel.

The Magistral mine, 8 miles from the Mexican Central railway, has an ore body of 20′ to 30′ width, developed for circa 500′ in length by tunnels, with about 1,500′ of drifts and crosscuts, and a 112′ shaft. Ore is slightly auriferous and argentiferous chalcopyrite. The Magistral was worked many years ago, for production of bluestone, used by neighboring mines in the patio process of treating silver-lead ores.

La Fé, or Las Moras, mine, a newly opened property, has an ore body consisting of a breccia of altered limestone, with fragments cemented by chalcocite

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and chalcopyrite, in a crushed and mineralized contact zone of about 300′ width, traced for circa 2,000′, ore averaging 2 to 2.5% copper, with small silver and gold values. Development is by a 140′ shaft and circa 1,500′ of tunnels.

There is a steam plant with a 500′ hoist at the Magistral shaft, with a number of buildings, and roads have been built.

Management plans deepening both shafts. The property is held, under bond and lease, dated July 25, 1907, by Patrick Clark, H. L. Percy and Jos. P. Harvey.

LAS TABLAS COPPER CO. **MEXICO.**

Office: 84 Adams St., Chicago, Ills. Mine offices: Aguacaliente de Baca, Fuerte, Sinaloa, Mex., and Alamos, Sonora, Mex. Harry Austin Clapp, manager; Daniel H. Livingston, superintendent. Property at Aguacaliente de Baca has auriferous and argentiferous copper ores.

LAST CHANCE COPPER MINING CO. **MONTANA.**

Office: 202 North Main St., Butte, Mont. Mine office: Saltese, Missoula Co., Mont. W. H. Nichols, president; Geo. Champagne, vice-president; Dr. T. C. Witherspoon, treasurer; S. M. Burns, secretary. Capitalization $1,250,000, shares $1 par. Lands, 2 claims, known as the Last Chance group, 4 miles north of Saltese, said to show a 30′ vein, slightly developed by shafts and tunnels showing auriferous and argentiferous copper ore assaying up to 42% copper, 450 oz. silver and $8 gold, with a claimed average of 17% copper, 60 oz. silver and $4 gold per ton, which unquestionably is an overestimate. Mine is claimed to have produced about $150,000 worth of ore.

LAST CHANCE COPPER MINING CO. **WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. Idle some years and apparently moribund.

LAST CHANCE MINING CO. **ARIZONA.**

Dead. Succeeded, 1902, by Canyon Copper Co. Formerly at Williams, Coconino Co., Ariz.

LAS TUSAS MINING & MILLING CO. **NEW MEXICO.**

Mine office: Tres Piedras, Rio Arriba Co., N. M. Lon. L. Trout, general manager. Had steam power, electric light and sawmill, and planned building a small concentrator, at last accounts.

LAS VEGAS COPPER CO. **NEW MEXICO.**

Office: East Las Vegas, N. M. Mine office: Tecolote, San Miguel Co., N. M. F. A. Manzanares, president; J. M. Thompson, secretary; J. M. Allen, treasurer and general manager; Frank J. Buck, consulting engineer. Capitalization, $100,000, shares $1 par. Property is the Tecolote mine, showing auriferous and argentiferous copper ore, also a vein of bluestone or natural copper sulphate. Has steam and electric power, and a concentrator. Company claims to have developed about 5,000,000 tons of carbonate ore, but apparently has sunk under the excessive burden and is idle.

LAS VIGAS MINING CO. **MEXICO.**

Office: care of Geo. E. Voorhees, Jr., Santa Barbara, Cal. Mine office: San Sostenes, Coyame, Iturbide, Chihuahua, Mex. Property, leased to Compañia Minera Cuatro Señores, S. A., is described under title of that company.

LAS YAQUIS MINING CO. **MEXICO.**

Dead. Formerly at El Tiro, Ures, Sonora, Mex.

LATAH COPPER MINING CO. **IDAHO.**

Office: Latah, Wash. Property is one of the numerous Copper King mines, in Idaho.

LATHAM MINING & SMELTING CO. **NEVADA.**

Dead. Succeeded, circa 1905, by Ohio Lead Mining & Smelting Co. Formerly at Sprucemount, Elko Co., Nev.

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LATIMER COPPER MINING CO. **GEORGIA.**

Mine office: Pierceville, Fannin Co., Ga. Idle some years.

LATOUCHE CONSOLIDATED COPPER CO. **ALASKA.**

Office: Seattle, Wash. Mine office: Latouche, Latouche Island, Prince William Sound, Alaska. Organized 1907, under laws of Washington, with capitalization $1,000,000, shares $1 par, by Jas. Denny, W. B. Madison and others. Lands, 5 claims, on the southern end of Latouche Island, adjoining the Reynolds-Alaska, said to show a vein traceable 1½ miles, with a shallow shaft about one-half mile from tidewater.

LATOUCHE EXTENSION MINING CO. **ALASKA.**

Mine office: Latouche, Latouche Island, Alaska.

LATOUCHE ISLAND COPPER MINING CO., LTD. **ALASKA.**

Office: 49 Sullivan Bldg., Seattle, Wash. Mine office: Latouche, Latouche Island, Alaska. Jas. A. Murphy, president; Tenning Carlson, first vice-president; Winfield S. Jamison, second vice-president; C. E. Bogardus, treasurer; Gordon Everett, secretary; preceding officers, Dudley A. Tyng and Robt. Fay, directors; Philip C. Stoess, consulting engineer. Organized under laws of Washington, with capitalization $5,000,000, shares $5 par. Lands, 29 claims, well timbered, and a millsite carrying approximately 4 miles of tidewater frontage, on the northeastern shore of Latouche Island, Prince William Sound, Alaska, circa 60 miles south of Valdez. Property shows 3 practically parallel veins, of 8′ to 20′ width, proven by trenches at intervals for 3 miles. Has a shallow shaft and tunnels of 74′, 103′, 160′ and 180′, and claims to have in sight approximately 200,000 tons of ore of 5% average copper tenor. Has steam power. Company claims 3 first shipments, 1907, returned 4 to 6% copper, from surface ores without assortment. Is said to have expended circa $60,000 on development. Property considered promising.

LATOUCHE MINING CO. **ALASKA.**

Letter returned unclaimed from former office, 10 Wall St., New York, N. Y. Mine office: Latouche, Latouche Island, Alaska. Andrew K. Beatson, general manager, in whose name all operations are conducted. Organized 1902, under laws of New Jersey, with capitalization $100,000. Is operated as a close corporation.

Lands, 17 claims, patented, area 340 acres, known as the Bonanza mine, on the eastern side and circa 3 miles from the northern end of Latouche Island, within one-half mile of tidewater, where there is a good natural harbor. Country rock is slate, carrying chalcopyrite ranging in tenor up to 30% copper, and which averages about 10% copper, 2 oz. silver and 20 cents gold per ton. Ore occurs in the brecciated portions of the country rock, in irregular veins, and occasionally as impregnations or replacements of the country rock, along a shear zone, considerably brecciated.

The mine is developed by a big quarry, and by tunnels of 320′ and circa 900′, with about 1,800′ of underground workings. There are 5 upraises to surface, of 33′ to 43′ height, fitted with ore bins having steel gates, through which ore is milled down, giving cheap mining costs. Without power equipment the mine has extracted and loaded ore at a cost of only $2.25 per ton.

The property has a 300′ wharf, on a natural harbor, connected with the mine by a half-mile tramline of 24″ gauge, laid with 12-lb. steel rails. The freight rate to Tacoma, by water, is $2.75 per ton, and ore, being desirable for flux, is smelted at an average cost of $1.65 per ton. The company has a general store and employs about 30 men. Production, 1907, was 1,020,000 lbs. fine copper and 9,000 oz. silver. The property is one of unusual promise, and is developed and managed on sound lines.

LA UNION CONSOLIDATED COPPER CO. **MEXICO.**

Dead. Succeeded, 1907, by Central Consolidated Copper Co. Formerly at

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Fronteras, Arispe, Sonora, Mex. Described Vol. VI.

LA UNION COPPER MINING CO. **ARGENTINA.**

Mine and works office: Humahuaca, Jujui, Argentina. Has steam power and a small smelter. Employed, 1905, circa 100 men. Presumably idle.

COMPAÑIA MINERA LAURA DE HUANTAJAYA. **CHILE.**

Office: Iquique, Chile. Mine office: Huantajaya, Tarapacá, Chile. Organized Sept. 26, 1902, under laws of Chile, with capitalization 60,000 pesos, shares 300 pesos par.

LAURA-PEARL MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Newett, Chaffee Co., Colo.

SOCIÉTÉ DES MINES DE CUIVRE DE LAURIOLLE. **FRANCE.**

Mine office: Lauriolle, Basses-Pyrénées, France. Georges Caton, manager. Organized April, 1908, under laws of France, with capitalization 5,000,000 francs, shares 100 francs par.

LAURIUM MINING CO. **MICHIGAN.**

Office: 301-199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; preceding officers, Edward S. Grew and Walter A. S. Chrimes, directors; Wm. J. Uren, general superintendent. Organized under laws of Michigan, with capitalization $1,000,000, shares $25 par. Cash on hand, Jan. 1, 1908, was $88,652. Annual meeting, second Tuesday in June.

Lands originally were 640 acres, lying next east of the Calumet & Hecla, but a triangular tract of about 65 acres, carrying both surface and mineral rights, was sold, many years ago, to the Calumet & Hecla Mining Co., and circa 250 acres of surface rights have been disposed of since, as building lots, in the village of Larium, mineral rights being reserved, giving the company present holdings of approximately 325 acres of surface rights, with mineral rights to 575 acres. Was prospected slightly, 1904, by diamond drill borings, but since idle.

SOCIEDAD MINERA LAVINIA DE HUANTAJAYA. **CHILE.**

Office: Iquique, Chile. Mine office: Huantajaya, Tarapacá, Chile. Organized Oct. 29, 1906, under laws of Chile, with capitalization 100,000 pesos, shares 100 pesos par.

LEACLEDE CONSOLIDATED GOLD & COPPER MINING CO. **OREGON.**

Office: 518 Broadway, Albany, N. Y. Mine office: North Powder, Union Co., Ore. H. Earle Furman, president; Geo. Oliver, vice-president; W. J. Curtis, secretary; D. Keefer, treasurer; W. N. Gardner, mine manager. Organized June 10, 1900, under laws of Oregon, with capitalization $1,500,000, shares $1 par. Lands, 160 acres, well timbered, 3 miles from a railroad, in the foothills of the Blue Mountains. Development is by several hundred feet of shafts, tunnels and crosscuts, showing sundry parallel veins of 10″ to 4′ width, carrying ores assaying up to 10% copper, with good gold and silver values, and having an iron gangue. Idle since circa 1905.

LEADVILLE MINING CO. **ARIZONA.**

Mine office: Pearce, Cochise Co., Ariz. Wm. Holmes, general manager. Capitalization $600,000. Was under bond to Calumet & Arizona, 1906-1907, but bond was surrendered. Lands, 18 claims, known as the Leadville group, near the Copper Bell, in the Turquoise district, having a 280′ shaft showing 24″ to 30″ of 4% sulphide ore below a depth of 175′, with some copper carbonates above.

LEADVILLE MINING & SMELTING CO. **MONTANA.**

Office: care of J. F. Upson, secretary and treasurer, Larned, Kans. Mine office: Basin, Jefferson Co., Mont. Chas. A. Cottrell, president; John Lindas, vice-president; preceding officers, F. J. Brule and F. D. Lowrey, directors. Or-

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ganized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 12 claims, area 240 acres, 14 miles from a railroad, having circa 800′ of workings, showing mainly argentiferous galena.

LEALTAD COPPER MINE CO.

Office: care of Dr. René Le Fournier, 5 Blvd. Magenta, Paris, France. Organized July, 1907, under laws of New Jersey, with capitalization $500,000.

LEASTOCK GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: care of L. M. Gregory, general manager, Los Angeles, Cal. Andrew Glassell, president; E. H. R. Stone, secretary. Organized 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 12 claims, on the northern side of New York Mountain, San Bernardino county, California, having about 500′ of workings, showing some ore assaying up to 9% copper.

LEEDS COPPER CO., LTD. **QUEBEC.**

Dead. Formerly at Broughton Station, Beauce Co., Quebec.

LEEDS COPPER WORKS. **ENGLAND.**

Works office: Hunslet, Leeds, Yorkshire, Eng. Works include an electrolytic refinery of 10 to 12 long tons daily capacity, having four 170-kw. generators, with 216 tanks, using the Elmore arrangement of electrodes, and treating mainly Chile bars averaging about 96% in copper tenor.

LEHIGH & ARIZONA MINING CO. **ARIZONA.**

Office: 43 Wall St., New York, N. Y. Mine office: Chloride, Mohave Co., Ariz. Franklin H. Griffith, general manager. Lands, in the Hualapai district, include the Minnesota-Connor, Merrimac and Manzanita mines, having fissure veins of about 6′ average width, carrying sulphide ores assaying 1 to 20% copper, 15 oz. silver and $6 gold per ton, with a little lead. Mine has about 20 pits and shafts of 20′ to 600′ depth, and a 3,500′ tunnel. Has steam and electric power, 10-stamp mill and a 150-ton concentrator. Property considered valuable.

LEICHHARDT-CLONCURRY DEVELOPMENT CO., LTD. **AUSTRALIA.**

Office: 398 Collins St., Melbourne, Australia. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. V. J. Saddler, chairman; F. C. Hughes, secretary; J. R. Peberdy, mine manager. Lands include several groups, principal being the Dugald mine, having a number of shallow shafts, showing ore averaging circa 15% copper. In 1906 shipped 53 tons of ore, of about 30% average copper tenor. Employed 30 men at last accounts.

LEICHHARDT COPPER CO. **AUSTRALIA.**

Office: Queen St., Brisbane, Queensland, Australia. Capitalization £62,500.

LEIGHTON GENTRY COPPER CO. **WYOMING.**

Dead. Succeeded, 1904, by Independence Mining Co. Formerly at Rawlins, Carbon Co., Wyo.

LEIGHTON-WYOMING COPPER CO. **WYOMING.**

Office: Milwaukee, Wis. Mine office: Dillon, Carbon Co., Wyo. A. H. Welles, president; C. W. Hendrick, vice-president; Edgar L. Fowler, secretary; E. J. Henning, treasurer. Organized 1906, with capitalization $1,000,000, shares $1 par. Lands, 8 claims, in the Battle Lake district, about one mile north of Dillon, having about 200′ of openings, said to show 10% copper ore.

LELAN GOLD & COPPER CO. **ARIZONA.**

Mine office: McCabe, Yavapai Co., Ariz. Elmer W. Wells, manager. Has gasoline power and a 10-stamp mill.

LENA MINING CO. **NEW MEXICO.**

Dead. Formerly at Londsburg, Grant Co., N. M.

LENAWEE MINING, MILLING, TUNNEL & TRANSPORTATION CO. **COLORADO.**

Mine office: Dillon, Summit Co., Colo. Jas. H. Meyers, superintendent.

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Has auriferous and argentiferous copper ores, with steam plant and 20-stamp mill.

LENORA MINING & MILLING CO. **UTAH.**

Office: care of P. C. Evans, secretary, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Milford, Beaver Co., Utah. Miles L. Burns, president; J. D. Carpenter, general manager. Organized Dec. 19, 1903. Lands, 9 claims, known as the Lenora group, in Beaver county, Utah. Idle several years.

LENORA-MOUNT SICKER COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Sold, 1907, to Vancouver Copper Co., Ltd. Formerly at Duncans, Vancouver Island, B. C. Fully described Vol. VI.

LENOX COPPER MINING CO.

Dead. Formerly had an office 412 Tremont Bldg., Boston, Mass.

LENTZ EXTENSION MINES CO. **MONTANA.**

Office and mine: Sheridan, Madison Co., Mont. C. E. Lentz, manager.

LENTZ GOLD-COPPER MINING & REDUCTION CO. **MONTANA.**

Office: 964 Penn Ave., Pittsburg, Pa. Mine office: Sheridan, Madison Co., Mont. C. E. Lentz, president and general manager; F. J. Mangus, vice-president; R. P. McChesney, secretary and treasurer; S. E. Brimm, superintendent. Organized under laws of Arizona, with capitalization $3,000,000, shares $2 par. Annual meeting, third Friday in February.

Lands, 11 claims, area 220 acres, and a 20-acre millsite, in the Tidal Wave district, 7 miles from the Northern Pacific railway, showing granite-porphyry, gneiss and quartzite, said to carry 10 ore bodies, occurring as fissures in porphyry and as contacts between limestone, gneiss and granite, of which 3, under development, are claimed, by the company, to have average widths of 16′ to 30′, with strong gossans, and are claimed to carry all varieties of copper ore, presumably mainly oxidized, of estimated average values of 2% copper, 12 to 50% lead, 12 to 1,400 oz. silver and $8 to $600 gold per ton. Property is opened by shafts of 30′, 130′, 60′ and 110′, and by tunnels of 80′, 100′, 120′ and 1,600′, with a total of circa 4,800′ of workings, estimated by company to show 8,000 tons of high-grade ore, and 160,000 tons of low-grade ore, which figures are considered excessive, as are the estimated average values.

Company claimed, 1906, to have an air-compressor and two 60-h. p. hoists, with 8 small mine buildings, but neither hoist nor compressor were erected. The Northern Star mine of the company is in litigation. Property has been idle for some time, and company apparently is moribund.

MINAS LEONORA y HUERTA. **MEXICO.**

Office: care of James M. Daniel, owner and general manager, Apartado 16, Aguascalientes, Mex. Mine office: Villanueva, Zacatecas, Mex. Jas. M. Daniel, Jr., superintendent and engineer; Manuel Varila, mine superintendent. Lands, 100 acres, also 500 acres miscellaneous lands, in the Jalpa district, showing a fissure vein in porphyry, of 10′ average width, carrying argentiferous galena, argentite, melaconite and azurite, with clay gangue, said to give average returns of about 5% copper, 10% lead, 200 oz. silver and 29 milligrams gold per ton. Mine, opened circa 1820 and reopened 1883, has shafts of 300′ and 1,000′, with about one mile of underground workings. Has a steam plant and a concentrator with one crusher and 12 planillas, for treating low-grade ores. Concentrates and smelting ores are shipped, 75 miles, by burros, to the Aguascalientes smelter.

LEONARD MINE. **MONTANA.**

Owned by Boston & Montana Consolidated Copper & Silver Mining Co.

LEONTINE CONSOLIDATED MINING CO. **ARIZONA.**

Office: care of Meredith E. Lawson, president, Parkersburg, W. Va. Mine

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office: Poland, Yavapai Co., Ariz. Lands, 8 claims, in the Big Bug district, bought Jan. 1, 1908, of Alto Mines Co., having a shaft, planned to be sunk 600', showing ores assaying up to 4.9% copper and $200 gold per ton.

LEOPOLD-TYRONE COPPER CO. NEW MEXICO.

Office: Kreider Bldg., San Francisco, Cal. Mine office: Tyrone, Grant Co., N. M. Frank L. Kreider, general manager; G. A. Eastman, superintendent. Organized 1907. Lands were 6 claims, near the Copper Gulch, having a 2-compartment shaft showing sulphide ore of fair copper tenor. Is said to have sold its lands to the Copper Gulch, and presumably is out of business.

LEPANTO MINING CO., INC. PHILIPPINES.

Office: Calle Carnero Núm. 20, Manila, Philippines. Mine office: P. O. Box 964, Mancayan, Lepanto, Luzon, Philippines.

LERIDA COPPER MINES, LTD. SPAIN.

Dead. Voluntarily liquidated, September, 1902. Formerly in Lérida, Spain.

SOCIEDAD ANONIMA MINERA BELGA DE LOS COBRES DE LERIDA y GRANADA. SPAIN.

Dead. Voluntarily liquidated, September, 1902. Formerly in Lérida, Spain.

COMPAGNIE CUIVRES DE LÉRIDE-GRÉNADE. SPAIN.

Dead. Voluntarily liquidated, September, 1902. Formerly in Lérida, Spain.

LE ROI MINING CO., LTD. BRITISH COLUMBIA.

Office: 541 Salisbury House, London, E. C., Eng. Mine office: Rossland, Trail district, B. C. Employs 250 men. T. D. Grimke-Drayton, J. P., chairman; Anthony J. McMillan, managing director; preceding officers, G. W. Wilson and Chas. Dunderdale, directors; Andrew Larson, superintendent; Thos. Kiddie, smelter superintendent; Harold A. Wesson, secretary; W. A. Carlyle, consulting engineer. Organized June 7, 1898, under laws of Great Britain, with capitalization £1,000,000, shares £5 par, fully issued and fully paid. Has paid dividends as follows: 5s., Nov. 7, 1899; 1s. 6d., March 3, 1906; 2s., November, 1906. For fiscal year ending June 30, 1907, profit was £3,582 4s. 5d., with surplus of liquid assets of £74,259 19s. 4d. Controls, through stock ownership, the Northport Smelting & Refining Co., Ltd. Fiscal year changed, 1908, to end Sept. 30, instead of June 30.

Lands, 71.45 acres, freehold, and the I. X. L. mine, held under lease, also a limestone quarry for fluxing, and the Spitzee and Townsite claims are held under option. In 1907 did 3,740' of diamond drilling, and made nearly one mile of new mine openings, expending $164,468.99 on exploratory and development work. The ore body is narrow at the top and wider at the bottom, but carries decreased values at depth, the bottom of the mine showing 3' to 5' of good smelting ore, with a continuance of the vein to considerably greater depth proven by diamond drill borings made from the bottom of the shaft. Ore averages about 1.2% copper, 0.5 oz. silver and 0.4 to 0.5 oz. gold per ton.

The 5-compartment main shaft is 1,650' deep, and, in 1907, produced ore from levels down to and including the 1,350'.

Equipment includes a good mining plant, with hoists, air-compressors and a steam shovel, and the property is supplied with necessary shops and mine structures.

The reduction plant, at Northport, Washington, 17 miles from the mine, is held through the Northport Smelting & Refining Co., Ltd. The works, of 1,200 tons daily capacity, are modern in design and equipment. Limestone for fluxing is secured from the company's quarry, 4 miles distant, and water is supplied from Deep Creek, through a 4x5' flume of 3 miles length, leading to two 125,000-gallon storage tanks, whence water is brought to the works in pipes, under a head of 145', with an effective pressure of 60 lbs. per square inch, actuating 18" and 24" Pelton water-wheels.

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The Northport works include a sampling mill, 70x98′ in size, equipped with Vezin samplers, some custom ores being smelted, in addition to treatment of Le Roi production.

The bulk of the ores treated are roasted before charging. Ore is received by rail and dumped into ore-bins of 1,600 tons capacity, elevated 17′ above the roast-yard, which is 500x500′. Ore is trammed to the roast-yard on temporary trestles, and roast-heaps are built about 125x350′, and approximately 15′ high, each heap containing about 24,000 tons, and requiring 6 weeks for burning. The roasting reduces the sulphur content from 10% to about 3.5%, and wood consumption averages one cord for 50 tons of ore. After burning the ore is loaded into self-dumping cars by a steam-shovel capable of handling 600 tons of ore daily, and cars are hauled up an incline track by a small steam locomotive and dumped into the roasted-ore bunkers, immediately behind the blast-furnace building.

The roaster building, 72x850′, has two 35-ton 10x100′ single-deck Holthoff-Wethey furnaces, and one double-deck furnace of the same design and dimensions, latter treating matte and concentrates.

The blast-furnace building is 69x240′, with a southern annex of 55x69′, for the silica-mill, and a northern annex 69x100′, for the power plant. There are 6 water-jacket blast-furnaces, with mechanical feed, two being 38x120″ in size, one 40x160″ and three 42x160″, latter with daily capacity of circa 350 tons each. The furnace charges are mixtures of raw and roasted ore, with limestone and coke, charged from side-dumping cars. Steel downtakes of 60″ diameter connect the blast-furnaces with the dust-chamber, which is 10x11x428′, with hopper-bottom and side-discharge gates, leading to a brick smokestack 10′ square and 182′ high. There are also two smaller stacks. Flue-dust is briquetted, with lime for a binder, in two White mineral presses, and resmelted slags are granulated, and washed into the Columbia River. The first fusion product is a 25% matte, which is roasted, granulated, briquetted and blown up to 50% matte carrying small silver values and good gold values, which is shipped to New York for conversion and refining.

The power plant at the smelter includes a 400-h. p. Allis-Chalmers engine, two smaller engines, 6 Connersville blowers, a 500-light Westinghouse dynamo and five 250-h. p. Heine boilers.

The Le Roi suffered for several years from a bitter internecine dispute, culminating, circa 1905, in the summary removal of Mr. McMillan from the directorate, by his associate directors, but this action was repudiated by the shareholders, at the annual meeting of 1906, when McMillan was again placed in power, and signalized his victory by declaring a dividend. The fight began over a disagreement between the Canadian Pacific and Great Northern railways, relative to ore tonnage, the former desiring the abandonment of smelting at Northport, which is in the United States. After Mr. McMillan's ouster, the Northport smelter was closed, and a 3-year smelting contract was made with the Trail smelter, but this was not recognized by Mr. McMillan, on his return to power, and smelting was resumed, at the Northport works, Dec. 6, 1906, but the plant was operated only 154 days in 1907.

Production, 1907, was 110,410 tons of ore, carrying about 2,500,000 lbs. fine copper. Gross values and costs, per ton of ore, have been as follows: $10.94 value and $10.57 costs in 1904; $12.41 value and $10.08 costs in 1905; $12.37 value and $10.50 costs in 1906; $10.49 value and $10.02 costs in 1907.

The Le Roi has suffered in the past from various changes of plans, but seems to have reached a fixed policy and an assured financial footing, and should do better for the future.

LE ROI NO. 2, LTD. **BRITISH COLUMBIA.**

Office: 541 Salisbury House, London, E. C., Eng. Mine office: Rossland,

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Trail district, B. C. Employs circa 100 men. Lord Ernest Hamilton, chairman; preceding officer, A. B. Deltry, F. C. D. Haggart and W. T. Morrison, directors; Paul E. Couldrey, mine manager; R. R. Cormack, assistant manager; F. A. Labouchere, secretary; Alex. Hill & Stewart, consulting engineers.

Organized June 1, 1900, under laws of Great Britain, with capitalization £600,000, shares £5 par, fully issued and fully paid. Has paid dividends as follows: 5s. in 1901; 5s. in 1902; 2s. in 1904; 3s. in 1905; 8s. in 1906; 3s. in 1907; 4s. to August, 1908. For year ending Sept. 30, 1907, net profit was £13,806 5s. 1d., after writing off £11,944 12s. 8d. for depreciation. From organization to Sept. 1, 1908, company paid dividends of £180,000. The company holds a share interest in the Cloncurry Syndicate, Ltd.

Lands, 72 acres, including the Josie No. 1 and Annie mines, also 8 claims near the old mine, 2 claims near the Velvet mine and 5 claims in the Ymir district. Upwards of one mile of diamond drill borings were made in 1907, and 3,286′ of new mine openings were made in the same year. Ores carry values in gold, copper and silver, in the order named, and are graded into two classes, for smelting and concentrating, latter grade ranging 0.4 to 0.5% in copper tenor, with only about 20% of the copper saved, extraction of assay values in gold being 56 to 60%.

Development is by a 900′ main shaft, on the Josie, and by 2 tunnels on the Josie and one on the Poorman claim. The mine has ore reserves estimated at 300,000 tons, which seems high, and has some ore chutes of considerably better than the average grade of the Rossland camp.

The mill, of 50 tons rated daily capacity, has Blake and Gates crushers, 2 Chilean mills, 3 Jenckes sizers and 6 Wilfley tables. An Elmore oil concentrator, fully described Vol. IV, was installed 1903, proving a technical but not a commercial success, and was superseded by Wilfley tables. Concentrates carry circa 1.8% copper, 1.5 oz. silver and 1.75 oz. gold per ton.

Production has been as follows: 980,000 lbs. copper, 27,968 oz. silver and 11,050 oz. gold in 1904; 885,992 lbs. copper, 28,369 oz. silver and 14,493 oz. gold in 1905; 803,409 lbs. copper, 22,054 oz. silver and 19,615 oz. gold in 1906. In 1907 production was 22,198 tons of ore shipped, and 12,963 tons of ore concentrated. Largest copper production was 3,001,027 lbs., for fiscal year 1902. Smelting ore, 1905, returned 3.62% copper, 2.32 oz. silver and 1,184 oz. gold per ton. Management is good and property is valuable.

LE ROY MINING CO. **MEXICO.**

Mine office: Pilares de Teras, Moctezuma, Sonora, Mex. Has auriferous and argentiferous copper ores. Idle.

LESLIE COPPER MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Wesley Everett, manager. Organized February, 1899, under laws of Idaho, with capitalization 100,000, shares 10 cents par. Lands, 11 claims, area 220 acres, also a millsite and 2 water rights, lying east of Mullan, showing 4 veins traversing porphyry, main vein averaging circa 12′ width at surface, opened by tunnel, with about one mile of workings, carrying silver-lead ore of concentrating grade, with a narrow copper paystreak. Has water power, a 5-drill air-compressor and several mine buildings.

L'ETETE GOLD & COPPER MINING CO. **NEW BRUNSWICK & NOVA SCOTIA.**

Mine office: L'Etete, Charlotte Co., N. B. Property is the old Johnson mine, opened circa 1860, reopened 1902, having two short tunnels and a 145′ main shaft, showing ore of good assay value. Has a steam plant, and shipping facilities at tidewater. Company also owns mineral lands in Nova Scotia. Idle several years.

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LEVANT LIINING CO., LTD. **ENGLAND.**

Office and mines: St. Just, Cornwall, Eng. T. R. Bolitho, chairman; Capt. M. Trembath, manager; Maj. Richard White, purser. Organized 1872, as a cost-book company, with 2,500 shares, 2,385 issued, £12 4s. 6d. paid in. Dividends, £25 6s. per share, last, 5s., paid January, 1904. Mine produces tin and copper, mainly the former, and has been continuously worked since 1820, paying £170,000 in dividends during its first 20 years of operation. Is now a small producer only, in 1906 mining 2,140 long tons of copper ore of 12% average tenor, producing circa 575,000 lbs. fine copper, rendering the Levant the largest copper producing mine of England.

LEWIS & CLARK MINING CO. **IDAHO.**

Office and mine: Mullan, Shoshone Co., Idaho. Organized 1907, under laws of Idaho, with capitalization $1,250,000, shares $1 par, by J. N. Thennes and others. Lands, 12 claims, northeast of the Snowstorm.

LEWISOHN EXPLORATION & MINING CO.

Office: 334-11 Broadway, New York, N. Y. J. Parke Channing, general manager; Martin H. Vogel, counsel. Organized Jan. 6, 1906, under laws of New Jersey, with capitalization $5,000. Is said to plan increasing capitalization to $15,000,000, by easy stages, as properties are acquired. Plans of promotion and finance are understood to be somewhat similar to those of the American Smelters Securities Co., and it is supposed that this corporation will become a holding company for the various Lewisohn interests, including the Tennessee Copper Co., Miami Copper Co. and General Development Co., with considerable share interests in the Nevada Consolidated and other properties.

LEXINGTON MINE. **MONTANA.**

Owned by La France Copper Co.

COMPAÑIA MINERA LIBERTAD DE SANTA ROSA. **CHILE.**

Office: Iquique, Chile. Mine office: Huantajaya, Tarapacá, Chile. Organized Nov. 13, 1904, under laws of Chile, with capitalization 100,000 pesos, shares 100 pesos par.

LIBERTY COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. T. F. Wilson, president; L. C. Dougherty, vice-president; L. Bryant, secretary and manager; preceding officers, S. G. Neff and W. W. Morris, directors. Lands, on Blue Creek, have a 225′ tunnel, said to show a 7′ vein of auriferous and argentiferous copper-lead ore.

LIBERTY COPPER MINING & MILLING CO. **MARYLAND.**

Dead. Property sold to Virginia Consolidated Copper Co. Formerly at Libertytown, Frederick Co., Md.

LIBERTY GOLD & COPPER CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Clara, Yuma Co., Ariz. Frank Burns, manager. Property, near the Clara, slightly developed, by shaft, is said to give a promising showing of gold-copper ores.

LIBERTY MINES CO. **ARIZONA.**

Letter returned unclaimed from former office, Prescott, Ariz. Mine office: Turkey, Yavapai Co., Ariz. Organized circa 1907. Property is the Mountain View group. Idle and presumably moribund.

LIBERTY MINING & SMELTING CO. **ARIZONA.**

Mine office: Arivaca, Pima Co., Ariz. D. L. Noyes, president and treasurer; T. D. Pease, secretary. Capitalization $500,000, shares $100 par. Lands, 19 claims, unpatented, slightly developed, showing mainly argentiferous lead ore, with small gold and copper values. Has gasoline hoist and several mine buildings. Said to have produced ore worth more than $50,000.

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SOCIETÀ ANONIMA PER L'ESERCIZIO DELLA MINIERE DI LIBIOLA. ITALY.

Mine office: Sestri Levante, Liguria, Italy. Property is leased to Libiola Copper Mining Co., Ltd.

LIBIOLA COPPER MINING CO., LTD. ITALY.

Office: 138 Leadenhall St., London, E. C., Eng. Mine office: Sestri Levante, Liguria, Italy. Kenneth Haweis James, chairman; preceding officer, Thomas V. Anthony and Albert Straube, directors; W. S. Bartlett, secretary; Robert H. Craven, mine manager. Organized January, 1867, under laws of Great Britain, and reconstructed, 1888, with capitalization £250,000, shares £5 par. Paid dividends of 2s. 6d. in 1903; 3s. 6d. in 1904, and 3s. 6d. in 1905, with total dividends, to end of 1905, of £4 10s. Net earnings, 1907, were £7,141, with dividends of £7,560. Company has a heavy share interest in the Cruccuen silver-lead mine, Sardinia, now idle.

Lands, 2 claims, area circa 700 hectares, freehold, including the Libiola copper mines, in Liguria, northern Italy. Ores are chalcopyrite and iron pyrites, occurring as veins in serpentine and diabase, ore bodies being of good size. The property was discovered and worked by the Romans, and was reopened, 1867, by predecessor of present company. Ores produced average 5.76% copper in the cupriferous ore and 46.75% sulphur in the pyrites.

Equipment includes a 60-h. p. steam plant, 30-h. p. water plant and 50-h. p. electric plant.

The crushing mill, covering 550 square meters, built of reinforced concrete and stone, has a daily capacity of 180 tons. Production, 1905, was 28,388 tons of copper and iron pyrites, of which about 20% was copper ore. Company is well managed, and, by careful handling, the property is made to return satisfactory profits.

SOCIÉTÉ DES MINES DE LA LIENNE. ITALY.

Mine office: Alagna, Circondario di Varallo, Novarra, Italy. Also has property at Riva, near Alagna. Ore is disseminated chalcopyrite of low to medium copper tenor, and mines were worked on a small scale only, at last accounts.

SOCIETÀ LIGURE RAMIFERA. ITALY.

Mine office: Casarza, Liguria, Italy. Property includes the Fontanelle, Rio Albareta, Rio Monticello and Rio dei Fichi mines, carrying chalcopyrite in a quartzose gangue. Was a small producer, at last accounts.

LILBURN MINING CO. UTAH.

Dead. Lands sold, 1908, to Alta-Hecla Mining Co. Formerly at Alta, Salt Lake Co., Utah.

LILLY MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Ores carry gold, silver, lead and copper. Has steam power. Presumably idle.

LILYAMA MINE. CALIFORNIA.

Office: care of Robt. Crocker & Co., Placerville, Cal. Mine office: Auburn, El Dorado Co., Cal. Lands, 240 acres, unpatented, 11 miles from Auburn. Ores, mainly sulphides, occur as lenses in limestone and between granite and quartz-porphyry. Has 4 tunnels and a prospecting shaft. Idle some years.

LIMA COPPER MINING SYNDICATE, LTD. PERÚ.

Dead. Voluntarily wound up, February, 1908. Formerly in Perú.

LIME CREEK CONSOLIDATED GOLD & COPPER CO. ARIZONA.

Dead. Property sold to Kentucky-Arizona Consolidated Mining, Smelting & Development Co. Formerly at Cave Creek, Maricopa Co., Ariz.

LIME MOUNTAIN COPPER CO. ARIZONA.

Mine office: Johnson, Cochise Co., Ariz. Organized 1906, under laws of

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Arizona, with capitalization $1,000,000, by Davis S. McGahan and I. N. Kattensbroth. Lands, 21 claims, known as the George Washington group, near the Empire mine, in the Dragoon Mountains, developing by tunnel.

LIMMEN COPPER SYNDICATE, LTD.

Office: 2 Broad Street Place, London, E. C., Eng. E. A. Paris, secretary. Organized Apr. 29, 1907, under laws of Great Britain, with capitalization £3,000, shares £1 par; issued, 711 shares, fully paid. Location of lands, if any, unknown.

LIMON MINING CO. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Geo. W. Avery, superintendent. Has auriferous and argentiferous copper ore, with 10-stamp mill.

LINARES MINING SYNDICATE, LTD. **SPAIN.**

Mine office: Linares, Jaen, Spain. S. Moos, manager. Organized 1903, to exploit lead, copper, zinc, iron and coal properties in vicinity of Linares, and to construct a warehouse and shipping pier at Almeria, Spain. Idle.

LINCOLN CONSOLIDATED COPPER CO. **NEW MEXICO.**

Office: care of Daniel D. Hunt, St. Joseph, Mo. Mine office: Jarilla, Otero Co., N. M. M. E. Riggs, president; T. D. Hosmer, vice-president; Geo. Roche, secretary and treasurer; Wm. Wade, general manager; preceding officers, Dr. J. F. Standley, Thos. Winn, Chas. P. Faul and Reinhold Meiershoffer, directors. Organized Apr. 13, 1906, under laws of New Mexico, with capitalization $50,000. Lands, 2 claims, said to be held under bond and lease from Southwest Smelting & Refining Co., showing a 5′ vein carrying ore of 4 to 6% copper tenor, with fair silver values, opened by a shallow 2-compartment shaft. Shipped ore, 1907, to El Paso smelter, first shipment returning circa 11% copper and 3 oz. silver per ton. Shipments, 1907, were said to have been sufficient to pay for development work.

LINCOLN CONSOLIDATED MINING CO. **ARIZONA.**

Office: 1563 Sherman Ave., Evanston, Ills. Mine office: Tucson, Pima Co., Ariz. Employs 30 men. Chas. A. Wightman, president; Hon. Fred W. Fickett, vice-president and general manager; Geo. E. Fernald, secretary and treasurer; D. B. Bisbee, superintendent. Organized June, 1904, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 35 claims, area 700 acres, including the Garcia group of 31 claims, also a 100-acre millsite, with total holdings of circa 1,000 acres, in the Papago district, 12 miles from Twin Buttes railroad, showing country rocks of limestone, granite-porphyry and diorite, carrying various ore bodies, of which 5, slightly developed, range 4′ to 25′ in width, being opened by 6 shafts, of 50′ to 120′ depth, and by a 150′ tunnel. Smelter shipments are said to have given average returns of circa 30% copper, with fair gold and silver values, and property is claimed to have produced about $80,000 worth of ore. Equipment includes two 15-h. p. gasoline hoists, good for 400′ depth, and a 15-drill Rand air-compressor. There are 5 buildings, including an 18x20′ machine-shop, 14x60′ smithy, store and several dwellings. Idle.

LINCOLN COPPER CO. **ARIZONA.**

Dead. Succeeded, circa 1904, by Lincoln Consolidated Mining Co. Formerly at Tucson, Pima Co., Ariz.

LINCOLN COPPER DEVELOPMENT CO. **CALIFORNIA.**

Dead. Was promoted by "Baron" W. E. von Johannsen, a notorious mining swindler who formerly had an office at 326 Post St., San Francisco, Cal.

LINCOLN COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Tucson, Pima Co., Ariz. Described Vol. III.

LINCOLN COPPER MINING CO. **MONTANA.**

Office: care of Jas. A. Talbot, Butte, Mont. Mine office: Helena, Lewis & Clark Co., Mont. Organized July, 1903, under laws of Montana, with cap-

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italization $1,500,000, shares $1 par. Among the incorporators given was Thos. H. Carter, but Senator Carter states that his name was used without his knowledge or consent. Lands are said to be 10 claims, in the Little Boulder district, about 30 miles from Helena. Idle and apparently moribund.

LINCOLN GOLD & COPPER MINING CO. **GEORGIA.**

Office: 33-42 New St., New York, N. Y. Mine office: Metasville, Wilkes Co., Ga. Edgar L. Pierson, president; G. S. Macdonald, vice-president; Louis Enricht, secretary; Wm. M. Orr, treasurer; preceding officers and Wilson R. Mendall, directors; A. B. Hopkins, general manager; Carl Henrich, engineer. Organized June 11, 1906, under laws of Oklahoma, with capitalization $2,000,000, shares $1 par; issued, $1,700,000. Paid one dividend, of one-half of 1%. Was practically the successor of the Seminole Mining Co., which was a bad failure. Annual meeting, first Tuesday in August.

Lands, 901 acres, freehold, known as the Magruder or Seminole mine, just over the Wilkes county line, 12 miles from the Georgia Central railroad, and circa 70 miles from Ducktown, Tennessee, though advertised by the company to be in the same mineral zone. Property shows Huronian or Laurentian schists, intruded by eruptive dykes of two different ages, carrying 4 approximately parallel ore bodies, in schists and between schists and eruptive rocks, these having an average strike of N. 30° E. to N. 40° E. and dip of 50° to vertical, veins averaging 3′ to 14′ in width, and traceable circa 1,200′, showing mainly chalcopyrite, with some bornite, cuprite and melaconite, estimated by company to average 4.5% copper, .3% lead, 1.5% zinc, 4 to 5 oz. silver and $6 to $14 gold per ton, which figures are considered unduly high.

The mine, opened 1852, and closed 1862, on account of the American Civil War, was reopened 1878, 1899 and 1905. Development is by a 225′ main shaft, a 150′ air-shaft and shafts of 40′, 45′ and 80′, with about 1,800′ of workings, estimated to show 15,000 tons of ore, with 2,500 tons blocked out for stoping.

Equipment includes a 175-h. p. boiler, 12-h. p. and 15-h. p. hoists and a 4-drill Rand air-compressor. There are 10 buildings, including a machine-shop, smithy, assay-office and boarding-house.

The mill, 30x70′, of wood, on stone foundations, has a Gates crusher, centrifugal crusher, set of rolls, Twentieth Century jig, 2 Bartlett tables, elevators and revolving screens.

The smelter, immediately adjoining the concentrator and very close to the mine, has a 16-ton rectangular water-jacket blast-furnace, and a 10-ton reverberatory furnace, making, when in operation, a matte of 15 to 20% copper tenor, carrying circa 20 oz. silver and 1.5 to 3 oz. gold per ton, shipped to the Maurer works of the American Smelting & Refining Co. for reduction, first-class ore and concentrates also being shipped to Maurer.

The advertisements of J. M. Percy & Co., fiscal agents of the company, were most misleading. Dividends were promised for 1907, and a small dividend was paid, May 1, 1907, but it is extremely doubtful if it was earned. Company reports difficulty in securing satisfactory labor, and plans colonizing white labor. Property considered promising.

LINCOLN MINING CO. **AUSTRALIA.**

Mine office: Lincoln, Canbelego Co., N. S. W., Australia. Organized 1907, under laws of New South Wales, with capitalization £4,500, shares £10 par.

LINCOLN MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Ores carry gold, silver, copper and lead. Has steam power and a 15-stamp mill. Presumably idle.

LINCOLN-NEVADA MINING & MILLING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. W. M. MacSherry, president and general manager. Capitalization $1,000,000, shares $1 par. Idle and apparently moribund.

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LINDSEY CANANEA COPPER CO. **MEXICO.**

Office: care of C. O. Barrow, clerk, Portland, Me. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Organized 1907, under laws of Maine, with capitalization $5,000,000. Supposedly out of business.

LINEDALE WEST CHILLAGOE, LTD. **AUSTRALIA.**

Dead. Lands sold to Irvinebank Mining Co. Formerly at Arbouin, Chillagoe, Queensland, Australia.

LINGANORE COPPER CO. **MARYLAND.**

Office and mine: Frederick, Frederick Co., Md. T. A. Dunshee, president and general manager; W. F. Wilson, secretary; C. C. Ausherman, treasurer. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 306 acres, including the New London and Dolly Hyde mines.

The New London mine, area 64 acres, with 14 acres of timber land, was worked, 1835-1855, apparently at a profit, but was idle since 1881, excepting for unwatering and retimbering the shaft, 1903-1904, when no ore was extracted, until reopened by present company. Mine has a 210′ shaft and 4 short tunnels, longest 104′, with circa 500′ of workings, and the new management has opened a 350′ tunnel. Ores are bornite and chalcocite, in a vein of 3′ to 4′ width, in dolomite and phyllite, ores assaying 3.5 to 7% copper.

The Dolly Hyde was the principal copper mine of the state, though never a large producer, and, in early days, shipped, without selection, considerable ore of good average tenor. The mine has contact deposits in limestone, carrying malachite, bornite and chalcopyrite, and was idle for many years. Property considered promising and management good.

LINWOOD GOLD & COPPER CO.

Dead. Was promoted by Henry T. Rodman & Co. "Big Mitt" Bill Henig, not altogether unknown to the metropolitan police, was secretary. Apparently company had no lands, and was a swindle, pure and simple. Formerly had an office at 303-334 Fifth Ave., New York, N. Y.

LION COPPER CO. **WASHINGTON.**

Dead. Was organized 1906, with capitalization $1,000,000, shares $1 par. Lands were in the Hoodoo district. Office was at Wallace, Idaho. Formerly at Palouse, Whitman Co., Wash.

LION COPPER MINING CO. **ARIZONA.**

Office: 313 West Second St., Los Angeles, Cal. Mine office: Stoddard, Yavapai Co., Ariz. Chas. Matthews, president; O. A. Cox, secretary and treasurer; Henry Reifsnyder, general manager. Organized February, 1903, under laws of Arizona, with capitalization $2,500,000, shares $1 par, succeeding Rambler Copper Mining Co. Lands, 13 claims, area 260 acres, in the Agua Fria district, 6 miles from a railroad. Country rocks are limestone, quartzite and porphyry, showing numerous veins carrying oxide, carbonate and sulphide ores, claimed to give average assays of 24% copper, opened by shafts of 50′, 100′ and 300′, with 515′ of underground workings. Has gasoline power. Idle and apparently moribund.

LION GULCH DEVELOPMENT CO. **MONTANA.**

Office: 807 Lonsdale Bldg., Duluth, Minn. Mine office: Homestake, Jefferson Co., Mont. Chester A. Congdon, manager; John Hewett, superintendent. Lands, 5 claims, 3 miles north of Homestake and only a few miles south of Butte. Property, formerly held by Gold Flint Mining Co., produced considerable gold and silver in the past, but shows increasing copper values at depth. New development is by a 3-compartment shaft, planned to be sunk 300′. Equipment includes a double-drum hoist and an Ingersoll air-compressor. Employs circa 25 men. Property considered promising.

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LISBON VALLEY COPPER CO. **UTAH.**

Office and mine: care of H. E. Blake, manager, Moab, Grand Co., Utah. Was said, 1907, to plan a 100-ton concentrator, but mill apparently not built.

LITHGOW SMELTER. **AUSTRALIA.**

Owned by Great Cobar, Ltd.

LITTLE BEAVER MINING & REDUCTION CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. W. W. Little, president; Samuel A. Tarbet, vice-president; Victor B. Wells, secretary and treasurer. Organized 1908, with capitalization $250,000, shares $1 par. Lands, known as the Kittie Clough group, are in the northern part of the Star district.

LITTLE BILLY OPERATING CO. **BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Property is the Little Billy mine. Idle.

LITTLE BOPPY COPPER MINING CO., LTD. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized 1907. Property is a lease of copper lands about 20 miles from Cobar, on the railroad to Nyngan.

LITTLE BULLY HILL MINING & SMELTING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, San Francisco, Cal. Mine office: Winthrop, Shasta Co., Cal. Capitalization $1,000,000, shares $1 par. Lands, 5 claims, said to adjoin the Bully Hill mine, said to be opened by a 130′ tunnel and several trenches, said to show sulphide ore. Prospectus was filled with bunco-talk, and apparently company is moribund.

LITTLE CHIEF MINING CO. **UTAH.**

Office: care of John R. Van Evera, president, Marquette, Mich. Mine office: Eureka, Juab Co., Utah. F. D. Kimball, vice-president; Jas. P. Driscoll, secretary and treasurer; preceding officers and H. T. Moritz, directors; John Driscoll, superintendent. Has a 1,400′ shaft. Hoisting plant, valued at $15,000, was burned September, 1908. Reorganization planned. Property considered promising.

LITTLE EDDIE GOLD & COPPER MINING CO. **UTAH.**

Office: Bingham Canyon, Salt Lake Co., Utah. Edw. McCarrick, general manager. Development is by tunnel, said to show a fair ore body.

LITTLE GIANT MINING, MILLING & SMELTING CO. **WASHINGTON.**

Dead. Formerly at Marcus, Stevens Co., Wash.

LITTLE MATTIE MINING, MILLING & POWER CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. F. V. S. Leebrick, superintendent. Has auriferous and argentiferous lead and copper ores. Equipment includes steam and water power and a 20-stamp mill.

LITTLE MINAH MINE. **MONTANA.**

Owned by Parrot Silver & Copper Co.

LITTLE NORTH FORK COPPER MINING & MILLING CO., LTD. **IDAHO.**

Office and mine: Wardner, Shoshone Co., Idaho. F. P. Matchette, president; J. W. Slayter, vice-president; W. J. Locke, secretary; T. R. Mason, treasurer and general manager. Organized September, 1903, under laws of Idaho, with capitalization $1,500,000, shares $1 par. Development is by tunnel. Employs 3 men.

LITTLE YERINGTON COPPER-GOLD MINES CO. **NEVADA.**

Office: P. O. Box 633, Goldfield, Nev. Mine office: Yerington, Lyon Co., Nev. Lands, 4 claims, area 80 acres, on the Walker Lake Indian reservation. At last accounts company was peddling stock on the weekly installment plan. Is not regarded favorably.

LIVE OAK COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 438 Broome St., New York, N. Y. Mine office: Globe, Gila Co., Ariz. Forest J. Kaldenberg, Sr., president; Forest J. Kaldenberg, Jr., secre-

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tary. Organized under laws of Arizona, with capitalization $1,250,000, shares $1 par.

Lands, 16 claims, area 320 acres, 8 miles from a railroad, showing schists and quartz-porphyry carrying 8 lenticular contact deposits, of which 3, under development, average circa 10′ width by 700′ proven length and 300′ estimated average depth. Ores are chalcocite, chalcopyrite, chrysocolla and dioptase, said to give average returns of 10% copper. Mine, opened 1897, has shafts of 85′ and 250′, and tunnels of 900′, 125′, 175′, 185′, 725′ and 60′, with a total of about one mile of workings, estimated by former manager to show 120,000 tons of ore, with 65,000 tons blocked out for stoping, which latter figure is considered excessive. Ore shipped was graded into first class, carrying circa 24% copper, and second class, averaging about 12% copper.

Equipment includes a 200-h. p. hoist, good for 1,500′ depth, and an 8-drill Sullivan air-compressor. Fuel is crude petroleum. The mine has ore-bins and 12 buildings.

There was a serious dispute, with extensive litigation, 1906, between the company and Jos. C. Erman, then the company's agent and superintendent. On Aug. 10, 1905, the company accepted Mr. Erman's offer to ship enough ore to erect a leaching plant, without calling on the company for funds. The company states that Mr. Erman made contracts for the shipment of about 30,000 tons of ore to the El Paso smelter, without the knowledge of the company, and to the company's detriment, and at the end of 30 days began to make leases without the knowledge of other officers, despite the fact that Mr. Erman was not authorized to make any leases, and specifically instructed to make no debts. The company charges that Mr. Erman did not send correct copies of leases to the New York office. Boone & Strang, the principal lessees, are said to have taken out about $100,000 worth of ore, after which the workings caved in, necessitating the sinking of a new shaft. The father of Mr. Erman is said to have found a purchaser for the property, whereupon the lessees demanded $150,000 for the cancellation of their leases, and the company claims that Mr. Erman and his father were to have received a portion of the $150,000. The company charges that fraudulent leases were made, by Mr. Erman, to his friends, his wife, and others, in which leases he himself was interested, and Mrs. Erman, who was the bookkeeper of her husband, is said to have destroyed the books. Mr. Erman is also charged with having given a lease shortly before his discharge, predating same 4 months.

Production has been as follows: 587,961 lbs. fine copper in 1905; 1,714,074 lbs. in 1906; 588,347 lbs. in 1907. Property considered valuable.

LIVERMORE GOLD & COPPER MINING CO. **WYOMING.**

Dead. Formerly at Laramie, Albany Co., Wyo.

LIVERPOOL SILVER & COPPER CO., LTD. **ENGLAND.**

Works office: Widnes, Lancashire, Eng. Property is a reduction plant with an electrolytic refinery.

LIVINGSTONE MINING CO. **MEXICO.**

Office: 1a, Independencia 22, Mexico, D. F. Mine office: Temascaltepéc, Mexico, Mex. Has auriferous and argentiferous copper and lead ores.

LLANO COPPER CO. **MEXICO.**

Office: 407 American Bank Bldg., Kansas City, Mo. Mine office: Llano, Magdalena, Sonora, Mex. Employs 40 men. Dr. C. L. V. Hedrick, president and general manager; Dr. F. A. Patterson, vice-president; M. Y. Loaiza, first vice-president; preceding officers, W. R. Braden, R. L. Davidson and W. W. McEntire, directors; Harry Haldeman, secretary and treasurer; I. E. Bowers, mine superintendent. Organized Apr. 11, 1905, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, $1,400,000. Was registered

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and protocolized, May 30, 1908, under laws of Mexico. Annual meeting, first Monday in June.

Lands, 10 groups, area 526 hectares, also 5,000 hectares miscellaneous ranch and timber lands, including mineral lands an Curacahui Mountain, circa 10 miles southeast of Llano. Lands show porphyry and limestone, carrying ore bodies, one, of 3′ to 50′ estimated width, traceable circa 3 miles, opened by sundry pits and prospect shafts of 8′ to 50′ depth and by shafts of 105′, 150′ and 500′, and tunnels of 50′, 200′ and 577′, estimated to show circa 100,000 tons of ore, including chalcocite, bornite and chalcopyrite assaying 5 to 11% copper, 6 to 10 oz. silver and $2 to $5 gold per ton.

Equipment includes a 105-h. p. steam plant, with 7x8″ and 8x10″ hoists. There are 24 mine buildings, including a store and dwellings, also a sawmill. Property is served by Sonora branch of the Southern Pacific railway, 4 miles distant.

Company plans continuous development and blocking out ore for stoping. Test shipments from upper levels indicate the possibility of making substantial shipments of ore of good average tenor, after reasonable selection. Property considered promising.

MINAS LLANOS BLANCOS y LOS PATOS. CHILE.

Mine office: Tamaya, Ovalle, Coquimbo, Chile. Mine, opened 1893, has a 250′ shaft. Idle several years.

"LLOYD" COPPER CO., LTD. AUSTRALIA.

Offices: 107 Pitt St., Sydney, N. S. W., Australia, and 195A Winchester House, London, E. C., Eng. Mine office: Burraga, Bathurst Co., N. S. W., Australia. Alex. Creighton Arthur, chairman; W. Soutar, colonial director; W. H. Corbould, general manager; H. A. McMahon, secretary; J. Sarran, colonial secretary.

Organized May 9, 1899, with capitalization £250,000, increased November, 1906, to £300,000, shares £1 par; issued, £280,000. Capitalization was increased £50,000 to extinguish an equal amount of 10% debentures. Company had a share interest in the Murrin Copper Co., Ltd., which proved a failure. Profits, 1907, were £32,419, from which a dividend of 1s., amounting to £14,000, was paid, March 2, 1907.

Lands, 380 acres freehold, and 385 acres leasehold, one mile from Burraga, in the Bathurst district, which is arid, and operations are suspended at uncomfortably frequent intervals, from lack of water, though the mine has an 85,000,000-gallon storage tank, holding 9 months' water supply.

The mine, opened 1877, is bottomed in badly disturbed ground. Ore is slightly argentiferous chalcopyrite, with quartz gangue, occurring in fissures traversing acid diorite. The main vein has an ore chute of about 700′ length, worked to depth of circa 750′. The vein ranges 3′ to 8′ width, with an average of about 5′. The ore is highly silicious, and gave average returns, 1907, of 2.36% copper. To the eastward is a fault, cutting off the eastern extension of the vein from the first to the fourteenth levels, but protracted search has shown a continuation of the vein, to the eastward of the fault, which has given a 300′ horizontal downthrow, the discovery of the eastern extension of the vein greatly improving the prospects of the property.

Equipment includes steam and electric power, with hoisting machinery and shops. Fuel is hardwood, about 75 choppers being worked when the property is in operation, as fuel requirements are about 60,000 cords yearly. Much trouble is experienced from shortage of fuel, and a 9-mile tram-line has been surveyed, for a wood line, but has not been built. Apparently the lack of this line, which would cost about £20,000, is responsible for a considerable part of the company's troubles.

The reduction plant, built 1901, at a cost of £32,000, was overhauled and

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enlarged, 1906, and includes a concentrator and smelter. The works formerly had 2 blast-furnaces, one of which was sold to the Murrin Copper Co., Ltd., which was wound up at a heavy loss, so the furnace was practically lost, and the other blast-furnace was sold to the Great Cobar mine. Present equipment includes a 40-ton calcining furnace, 19x48′ over all, treating 40-ton charges of matte, and a reverberatory furnace, 23x65′ over all, hearth having inside width of 20′, with grate area of 6x8′, and 5 charging hoppers. The smelter is said to have a converter plant.

From the beginning of mining, 1880, to the end of 1906, the company smelted 323,071 long tons of ore, making therefrom 14,122 long tons of fine copper, largest production being 4,088,000 lbs., in 1902. Production, 1905, was 2,058,560 lbs., and in 1906 was 2,739,520 lbs. fine copper. About 500 men are employed normally..

LLUVIA DE COBRE MINING CO. **MEXICO.**

Office: 711 Kansas City Life Bldg., Kansas City, Mo. Mine office: Carbó, Ures, Sonora, Mex. A. H. Glasner, president; Edgar Hubbard, first vice-president; W. M. Rynerson, second vice-president; Bruce Dodson, secretary; Wm. E. Jones, assistant secretary; E. J. White, treasurer; J. C. Worthington, general manager; Frank Smith, superintendent. Organized November, 1904, under laws of Arizona, with capitalization $3,000,000, shares $1 par, increased, 1907, to $5,000,000. Lands, 283 acres, on San Juan Mountain, in the Papago district, circa 30 miles west of Carbó, opened by the 410′ Josephine shaft, showing auriferous and argentiferous copper sulphides assaying up to 33% copper, 560 oz. silver and $7 gold per ton. Has a 10-drill air-compressor and is said to plan building a small matting furnace. Advertising is decidedly lurid and the company is not regarded favorably.

LOBBS HOLE CENTRAL COPPER MINE. **AUSTRALIA.**

Mine office: Kiandra, N. S. W., Australia. Property shows 3 veins, of 3″ to 14″ width, opened by shaft to depth of circa 100′, giving ore assaying about 30% in copper tenor.

LOBBS HOLE COPPER MINE, N. L. **AUSTRALIA.**

Office: care of Alexander Jobson, manager, Equitable Bldgs., Sydney, N. S. W., Australia. Mine office: Kiandra, N. S. W., Australia. P. W. Horton, chairman. Capitalization £60,000, shares £1 par. Lands, 120 acres, 45 miles from Tumut. Mine, to end of 1906, had produced about 2,000 tons of ore averaging 28% copper, with 2,000 tons of second-grade ore stocked at the mine, part of which since has been washed away by floods. Planned reopening mine and building a small smelter, during 1908.

LODI GOLD & COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Rhyolite, Nye Co., Nev. Lands are near Skull Valley, in the River Basin district, and a shaft was being sunk thereon, July, 1907. Idle and apparently moribund.

LOGAN & CO., LTD. **ENGLAND.**

Office and works: Birkenhead, Cheshire, Eng. Property is a copper smelter and refinery.

LOGAN COPPER CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. W. J. Casey, superintendent. Lands, 11 claims, in the Copper Basin district, having a 115′ two-compartment shaft, showing ore carrying about 3% copper and $1 gold per ton.

LOG CABIN GOLD & COPPER CO., LTD. **UTAH & ONTARIO.**

Dead. Formerly at Marysvale, Piute Co., Utah, and Mine Centre, Rainy River district, Ont. Merged, 1906, in Utah Gold Mountain Mining Co. Very fully described Vol. VI.

LOGOS MINES CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Ariz. W. H. Ferguson, general man-

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ager. Lands, in the Big Bug district, have a 60′ shaft, equipped with a 40-h. p. hoist and 5-drill air-compressor.

NEGOCIACIÓN MINERA LOMA DEL TORO. MEXICO.

Mine office: Zimapán, Hidalgo, Mex. Property includes La Luz and Loma del Toro mines, carrying silver-lead and copper ores. Employed circa 75 men at last accounts.

LOMAGUNDA DEVELOPMENT CO., LTD. RHODESIA.

Office: 404 Salisbury House, London, E. C., Eng. John Secar, chairman; H. Ewer-Jones, consulting engineer; Geo. T. Frost, secretary; Rhodesia Exploration & Development Co., Ltd., agent in Rhodesia. Organized June 18, 1894, capitalization increased December, 1901, to £250,000, shares £1 par; issued, £227,850. Paid a 10% dividend, January, 1906. Lands, 316 claims, in the Lomagunda district of Mashonaland, including the United Kingdom claim, on which development, now under way, has shown a promising body of auriferous copper ore. Company also has extensive shareholdings in the Consolidated African Copper Trust, Ltd., Ayrshire Gold Mine & Lomagunda Railway Co., Ltd., and Rhodesian Banket Co., Ltd.

LOMA VERDE COPPER CO. ARIZONA.

Dead. Was a stock-jobbing swindle. Formerly at Tucson, Pima Co., Ariz. Fully described Vol. V.

LOMBARD COPPER CO. OREGON.

Dead. Formerly at Baker City, Baker Co., Ore.

LOMBARD GOLD & COPPER MINING CO.

Dead. Formerly had an office at 316 McCornick Bldg., Salt Lake City, Utah.

LONDON-ARIZONA COPPER CO. ARIZONA.

Office: 526 Security Bldg., Los Angeles, Cal. Mine office: Winkelman, Pinal Co., Ariz. Chas. E. Finney, president; Frank L. Wright, vice-president; John Mason Ross, secretary; E. W. Brooks, treasurer; preceding officers, Chas. S. Gleed, B. L. Winchell and Hon. R. E. Sloan, directors; Edw. W. Brooks, consulting engineer.

Organized Apr. 12, 1907, under laws of Arizona, with capitalization $10,000,000, shares $10 par. Debentures, $152,000, at 6%. Commercial Trust Co., Los Angeles, registrar and transfer agent Annual meeting, third Monday in January.

Lands, 1,257 acres, known as the Dripping Springs or O'Carroll group, on London Mountain, in the Banner district, 7 miles north of Winkelman, the nearest railroad station, about 10 miles from Kelvin and 20 miles from Globe.

Property shows limestone of the upper Carboniferous series, superimposed on quartzite, with frequent intrusions of porphyritic dykes, the limestone series having the same petrographical members as the Bisbee district, with deposits occurring similarly as replacements in limestone. The basal quartzite caps a great monzonite laccolith, which presumably is the primary source of the ore, and is said to carry copper values of about 2.5%, in disseminated chalcopyrite and chalcocite. The limestone shows an ore-bearing ledge about 30′ wide, traceable circa 4,000′, to be developed by tunnel, carrying mainly carbonate ore, estimated to average circa 5% in copper tenor. The property has about 2,000′ of workings, showing considerable carbonate ore of excellent grade, but estimates, in the press, of 3,000,000 tons of ore in sight, are considered excessive.

The company plans a 1,000-ton smelter, as the first unit of 3,000-ton works, at a site on the Gila River, 2 miles north of Winkelman and about 5 miles from the mine. The company advertised extensively, using many page advertisements in the newspapers, but these were singularly free from exag-

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gerations and false statements, it being the usual rule that the larger the advertisement, the further it is from the truth. Property considered promising.

LONDON-COLORADO PROPERTIES, LTD. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Property was a bond and lease on the Pierce mine, said to give a good showing of copper ore. Presumably idle.

LONDON & GILA COPPER CO. **ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Louis Melczer, vice-president; W. B. Twitchell, superintendent. Organized circa May, 1908, with capitalization $3,000,000. Lands, adjoining the London & Arizona, show low grade ores, apparently in considerable quantities. Company is said to plan a concentrator.

LONDON & MEXICAN SMELTER & MINING CO. **MEXICO.**

Mine office: Pánuco de Monclova, Coahuila, Mex. Company planned, 1907, erecting a modern smelter at Adjuntas station, about 15 miles from Monclova.

LONDON MOUNTAIN COPPER CO. **ARIZONA.**

Office: Phoenix, Ariz. Mine office: Winkelman, Pinal Co., Ariz. Louis *Melczer*, vice-president. Organized May, 1908, with capitalization $3,000,000. Lands are near the London-Arizona Copper Co.

LONDON RANGE COPPER CO. **ARIZONA.**

Office: 526 Security Bldg., Los Angeles, Cal. Mine office: Winkelman, Gila Co., Ariz. Chas. E. Finney, president; Paul Burks, vice-president; E. J. *Mitchell*, secretary; Edw. W. Brooks, treasurer; preceding officers and John M. Ross, directors. Organized Dec. 28, 1907, under laws of Arizona, with capitalization $6,000,000, shares $10 par; issued, $2,000,000. Is controlled, through ownership of $1,940,250 of issued stock, by London Arizona Copper Co. Bonds, $68,500 issued.

LONDON & RICHELIEU MINING & DEVELOPMENT CO. **BRITISH COLUMBIA.**

Mine office: Rossland, Trail district, B. C. Capitalization, $1,200,000. Company advertised stock for sale, circa 1905, on the strength of its location near the Granby, but apparently has no property in that neighborhood. Idle.

LONE PINE COPPER MINING & REDUCTION CO. **COLORADO.**

Mine office: Gray Rocks, Laramie Co., Wyo. Organized circa 1902, under laws of Colorado, with capitalization $1,300,000. Is said to have 250′ shaft. Presumably idle.

LONE PINE MINING CO. **ARIZONA.**

Dead. Was a swindle. Was absorbed by Pan-American Mining & Smelting Co. Formerly at Prescott, Yavapai Co., Ariz.

LONE STAR CONSOLIDATED COPPER CO. **ARIZONA.**

Office: Rogers Bldg., Boston, Mass. Mine office: Safford, Graham Co., Ariz. Hon. Wm. H. Powers, president; Duncan McVichie, vice-president; Henry H. Folsom, secretary; A. G. Smith, treasurer; S. S. Campbell, general manager; C. B. Spalding, superintendent. Organized Aug. 6, 1906, under laws of Maine, with capitalization $5,000,000, shares $10 par, practically as successor of Maravilla Copper Co.

Company controls the Mineral Mountain Copper Co., through ownership of a two-thirds share interest, and controls, through majority stock ownership, the Chase Creek Copper Co.

Lands, 32 claims, including the Lone Star mine, in the Gila Mountains, circa 10 miles north of Solomonville. The Lone Star mine has a 360′ main shaft, showing a 5′ vein of auriferous and argentiferous sulphide copper ore, claimed to be of 8 to 10% copper tenor, with fair silver values and carrying a little gold. The shaft also shows stringers of ore assaying 10 to 50% copper.

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LONE STAR COPPER CO. **TEXAS.**

Dead. Formerly at Henrietta, Clay Co., Texas. Described Vol. III.

LONE STAR MINING CO. **ARIZONA.**

Dead. Was succeeded by Maravilla Copper Co., also dead, which was succeeded by Lone Star Consolidated Copper Co. Formerly at Safford, Graham Co., Ariz.

LONG BEACH & ARIZONA MINING CO. **ARIZONA.**

Dead. Was succeeded, 1907, by Swastika Copper Co. Formerly at Jerome, Yavapai Co., Ariz. Described Vol. VI.

LOOKOUT COPPER CO. **ARIZONA.**

Mine office: Poland, Yavapai Co., Ariz. Lands are in the Slate Creek district. Has steam power. Presumably idle.

LOOKOUT MINING CO. **ALASKA.**

Office: Cleveland, Ohio. Mine office: Niblack, Prince of Wales Island, Alaska. Arthur A. Wakefield, general manager. Property shows a medium sized body of auriferous copper ore, and is equipped with steam power, employing 12 to 15 men.

LOON CREEK MINING & INVESTMENT CO. **IDAHO.**

Office: Blackfoot, Idaho. Mine office: Ivers, Custer Co., Idaho. E. H. Watson, president; J. M. Stevens, secretary. Lands, about 2 miles from the Lost Packer, have a tunnel showing auriferous copper ore.

LORDSBURG MINING & REDUCTION CO. **NEW MEXICO.**

Mine office: Lordsburg, Grant Co., N. M. Thomas A. Lister, manager. Organized April, 1906, with capitalization $600,000. Idle.

COMPAÑIA MINERA LORETA y PROVIDENCIA. **MEXICO.**

Mine office: Jesus Maria, Ocampo, Rayón, Chihuahua, Mex. Owned by Jesus Poyval, Rascon Bros. and E. R. Bones, latter manager. Ores carry silver, copper and lead. Has a 500′ main shaft and a 900′ tunnel, with water power, 5-stamp mill with 12 tons daily capacity and a one-ton smelter employing circa 75 men.

LORNITA MINING CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Property is near the Puertecitos mines of the Greene-Cananea. Made a small ore shipment, September, 1908, to El Paso smelter.

LORRAINE COPPER MINING CO. **WASHINGTON.**

Office: Hoquiam, Wash. Mine office: Keller, Ferry Co., Wash. Owen Jones, president; A. G. Rockwell, secretary; Fred J. Chamberlain, general manager. Organized Apr. 13, 1900, under laws of Washington, with capitalization $1,500,000, shares $1 par.

Lands, 22 claims, area 422 acres, in 2 groups, and a 20-acre millsite, in Ferry and Pierce counties, Washington.

The Wilmot group, in the Sans Poil district, Ferry county, shows contact deposits between porphyry and schist, of 4′ to 6′ width, said to give average assays of 6.5% copper, 40 oz. silver and $4 gold per ton, from malachite and azurite near surface, and from chalcocite, bornite and chalcopyrite at depth. These figures are considered overestimates.

The Lorraine group, in the Carbon River district, shows 7 fissure veins in granite, giving assays up to 20% copper, 5 oz. silver and $1 gold per ton, from bornite and chalcopyrite. The Lorraine group is opened by 4 shafts, deepest 100′, and by 8 tunnels, 3 longest being 221′, 472′ and 630′. Properties as a whole have 2,016′ of workings. Idle several years, and apparently moribund.

LOS ALAMOS MINING & MILLING CO. **MEXICO.**

Office: 823 H. W. Hellman Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Alamos, Sonora, Mex. Dr. Finis E. Yoa-

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kum, president. Claimed to have a good showing of gold-copper ore. Not favorably regarded and apparently a dead cock in the pit.

LOS ANGELES & JALISCO MINES CO. **MEXICO.**

Office: 709 Lankershim Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Etzatlán, Ahualulco, Jalisco, Mex. M. N. Graves, general manager. Property is the Magistral mine, which formerly made copper sulphate from auriferous and argentiferous copper ores. Mine shipped a little ore in 1907. Presumably idle.

LOS ANGELES METAL REDUCTION CO. **ARIZONA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Phoenix, Maricopa Co., Ariz. Was said, 1907, to have leased, for 5 years, the property of the Copper Butte Mines, in the Walnut Grove district of Pinal county, Arizona. Idle and apparently moribund.

LOS ANGELES MINES CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. Lands show auriferous copper ores, slightly developed. Suspended operations circa October, 1907.

LOS CERROS COPPER CO. **CUBA.**

Office: Blackstone Bldg., Cleveland, Ohio. Mine office: Fomento, Santa Clara, Cuba. S. S. Saffold, president; W. C. Watkins, vice-president; Sherman C. Dalbey, secretary; W. L. Rees, treasurer; Col. D. H. Pond, general manager. Organized Aug. 12, 1905, under laws of Arizona, with capitalization $500,000, shares $100 par.

Lands, 2 claims, area 100 acres, also 1,500 acres miscellaneous lands, opened by shafts of 25′, 35′, and 50′, and by tunnels of 80′, 80′, 200′, 205′ and 250′, showing ore assaying 10% copper, 20 to 25% zinc, 20% sulphur and 30% silica, with gold and silver values. Zinc apparently is decreasing at depth. Vein has a 12′ to 15′ gossan outcrop along its strike. Property is an antigua, operated in the Eighteenth Century, and idle since circa A. D. 1750. Presumably idle.

LOS MARCHES MINING CO. **MEXICO.**

Mine office: Indé, Durango, Mex. Said to have a small concentrator and smelter. Presumably idle.

LOS MUERTOS MINING CO. **MEXICO.**

Mine office: Velardeña, Cuencamé, Durango, Mex. Carter Barker, superintendent. Has argentiferous lead and copper ores, with steam power, employing about 150 men.

LOS OSOS MINE. **CALIFORNIA.**

Letter returned unclaimed from former mine office, San Luis Obispo, San Luis Obispo Co., Cal. Mine, 8 miles from San Luis Obispo, has a short tunnel and shallow shaft, from which several hundred tons of high grade ore were shipped to Swansea, circa 1863. Has a fissure vein traversing sandstone and shale, showing oxidized ores with porphyritic gangue. Idle since circa 1865.

LOS PLATANOS DELVELOPMENT CO. **MEXICO.**

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Choix, Fuerte, Sinaloa, Mex. A. M. McDermott, president. Organized September, 1907, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Lands, circa 4 miles from Choix, bought of Choix Consolidated Mining Co., Ltd. Said to have shipped about $125,000 worth of copper ore by cart, to the coast, and to have, on the dumps, several thousand tons of ore of 6% copper tenor.

LOST BULLION SPANISH MINES CO. **NEW MEXICO.**

Dead. A deliberate swindle, promoted by Arthur Levan, Wm. E. Wilson, W. B. Cameron, E. A. Keables, C. L. Blackman, David H. Lawrence, E. W. Sebben, Dr. B. C. Hunt, Danton B. Pinkus, Geo. S. DuBois and Lee DuBois, who were convicted of using the mails to defraud. These conspirators were given very light punishments, the heaviest penalty being thirty days in jail

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and a $1,000 fine, while Arthur Levan, apparently at the head of the gang, was fined $100 and costs. Apparently it is very cheap to promote deliberate swindles through the United States mails. Formerly at Silver City, Grant Co., N. M.

LOST GARNET GOLD & COPPER MINING & MILLING CO. — WASHINGTON.

Dead. Formerly had offices at Seattle and Everett, Wash.

LOST GULCH COPPER CO. — ARIZONA.

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Globe, Gila Co., Ariz. E. F. Kellner, manager. Has auriferous copper ores and a 10-stamp mill. Presumably idle.

LOST PACKER EXTENSION MINING CO. — IDAHO.

Office: care of Col. O. P. Chisholm, secretary and treasurer, Bozeman, Mont. Mine office: Ivers, Custer Co., Idaho. W. W. Chisholm, president. Idle.

LOST PACKER MINING CO. — IDAHO.

Mine and works office: Ivers, Custer Co., Idaho. Jas. Ivers, president; J. T. Finlen, vice-president; Henry Welsh, secretary and treasurer; preceding officers, J. Czizek and E. G. Rowe, directors; Patrick Sheehan, manager; Harry Charles, superintendent. Capitalization is 150,000 shares.

Lands, 9 claims, in the Loon Creek district, circa 120 miles west of Mackay. Mine is developed mainly by tunnel, No. 1 having a back of 450′, and No. 7 a back of 700′, while No. 9, now driving, will have a back of circa 2,000′. Tunnels are run on a vein of 2′ to 7′ average width, with maximum width of 12′ to 15′, carrying ore averaging 2 to 3% copper and $5 to $7 gold per ton, with a paystreak of 6″ to 5′ width, proven to average about 2′ for a distance of 500′ and depth of 400′, which carries sulphide ore returning 10 to 25% copper, 10 to 12 oz. silver and $40 to $75 gold per ton. Property is handicapped by inadequate transportation facilities, being 120 miles from a railroad, and deep snows preclude winter work.

The smelter has a 100-ton water-jacket blast-furnace, making matte averaging 52% copper, 36 oz. silver and 13 oz. gold per ton, with slags running only 0.2% copper. A converter is planned.

About 50 men are employed, when working, but the smelter is operated only a few months yearly. Production, 1907, secured from smelting operations July 26 to Oct. 31, is estimated at 425,000 lbs. fine copper, with large gold and silver values, and presumably was greater in 1908. The property is one of exceptional promise.

LOST RIVER COPPER CO. — IDAHO.

Letter returned unclaimed from former office, Anaconda, Mont. Property in Lemhi county, Idaho, is said to show a 7′ vein of sulphide copper ore, between quartzite and limestone. Idle and apparently moribund.

NUEVA SOCIEDAD COMPAÑIA DE LOTA i CORONEL. — CHILE.

Office: Valparaiso, Chile. Mine office: Carrizalillo, Chañaral, Atacama, Chile. Works offices: Lota, Concepción, Atacama, Chile, and Los Condes, Santiago, Chile. Santiago Collins, manager. Organized under laws of Chile, with capitalization 18,000,000 pesos.

Lands include the Mina Descubridora, at Carrizalillo, opened 1850, which is about 650′ in depth; the Lota mine, opened 1856, and the Maitenes mine, opened 1844, these carrying large bodies of ore, low in average copper tenor and high in silica, which renders them difficult of reduction. Company also owns coal mines, principal copper and coal mines having railroad connections, with steam and electric power.

The Maitenes smelter, at Los Condes, is 45 kilometers from Santiago, the nearest railroad point, with a freight rate of 7 pesos per metric ton in, and 6 pesos out. Works include a crusher plant and 3 reverberatory furnaces.

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with converter department having 4 shells, each 1.41x1.83 meters, and an air-compressor. In 1903, employing circa 50 men, at average wages of 1.6 pesos daily, the Maitenes works smelted circa 2,400 metric tons of ore, of 23% average copper tenor, producing therefrom 532,325 kilograms fine copper. This was the first Chilean plant to have converters, which were installed 1885, but in 1903 the converter plant was practically abandoned, because of inability to operate at a profit. The Lota works have 16 small reverberatories for calcining, 6 small casting furnaces for ejes, 6 small casting furnaces for bars, 1 casting furnace for ingots, and 3 water-jacket blast-furnaces, equipment including 2 blowing engines, 5 small engines of 43-h. p. each, hydraulic turbines aggregating 204 h. p., and a mill with crushers and 3 sets of rolls. Fuel is domestic coal, of poor quality, costing 10 pesos per ton, and domestic coke, 5 tons of coke being required to reduce 1 ton of ore. Product is Chile bars averaging 99.5% copper, with slags averaging 0.5% copper. In 1903 the Lota works smelter 33,969 metric tons of ore, averaging 15.39% copper, and converted 4,725 tons of ejes averaging 47.77% copper, obtaining therefrom 5,642 metric tons of bars and 1,095 metric tons of ingots, employing 450 men, at average wages of 2 pesos daily. Production of company, 1903, was 15,653,906 lbs. fine copper.

LOVEDEN MINING CO. (1903), LTD. **WALES.**

Office: 52 Queen Victoria St., London, E. C., Eng. Wm. E. Martin, director. Organized Dec. 9, 1903, under laws of Great Britain, with capitalization £30,000, shares 5s. par. Debentures, £3,500 authorized; £2,700 outstanding. Property is the lease of a lead and copper mine of 150 acres, on the Farm Penrhyngerwyn, Cardiganshire, Wales. Idle several years and company apparently moribund.

MINA DO LOUZAL. **PORTUGAL.**

Office: 4 Praca dos Remolares, Lisbon, Portugal. Mine office: Louzal, Grandola, Alemtejo, Portugal. Senhor Waldemar d'Orey, general manager; Joaquin Chaves, mine superintendent. Is the property of a syndicate of 6 owners, with capitalization circa £5,000.

Lands, 1 square kilometer, showing schists carrying 8 ore bodies, largest with maximum width of 24 meters and supposed length of circa 500 meters, carrying cupriferous pyrite averaging circa 3% copper and 1.2 oz. silver per metric ton, with traces of lead, zinc and gold. Property carries occasional oxidized ores, and a little native copper.

Development is by a 400-meter tunnel, one shaft of 18 meters and 3 shafts of 24 meters each, estimated by owners to show circa 2,000,000 tons of ore. Property was operated by the Romans, and was reopened, 1901, by present owners. Mine considered valuable, but is hampered by lack of rail transportation.

LOW CREEK COPPER CO. **WASHINGTON.**

Mine office: Baring, King Co., Wash. Lands are south of the Skykomish River, opposite Baring. Was developing with 5 men at last accounts.

LOW DIVIDE COPPER MINING CO. **CALIFORNIA.**

Office and mine: care of John Murray, president, Crescent City, Del Norte Co., Cal. Lands are the Alta, Occidental and Copper Hill groups, on which several different veins have been opened slightly, these showing oxide, carbonate and sulphide ores of good grade. Idle.

LOWER MAMMOTH MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. A. C. Ellis, president; John Dern, vice-president and general manager; W. S. McCornick, treasurer; A. Reeves, secretary; William Ball, superintendent. Organized July 3, 1896, with capitalization $190,000; authorized, February, 1908, to be increased to $250,000, shares $1 par. Has authorized a bond issue

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of $60,000, at 6%, apparently not issued. Has been in financial straits for about 2 years, and levied a 5-cent assessment September, 1907. Lands, 6 claims, patented, with extensive development, showing large bodies of low grade ore, decreasing in values in lower workings. Main shaft, 1,200', is planned to be deepened to 2,000'. Ores treated, 1902, average 3% copper, 52 oz. silver and 18 cents gold per ton. Production, 1907, was 235 carloads of ore. Suspended operations March, 1907.

LOYAL LEASE CO., LTD. **BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. C. H. Jacobs, manager. Lands, 7 claims, area circa 350 acres, held under bond and lease from H. W. Treat, owner, near Blubber Bay, 3 miles from Van Anda, showing outcrops similar to those of the Marble Bay mine. Development is by a 300' shaft showing chalcopyrite and occasional bornite, of good average tenor. Has steam power and a 2-drill air-compressor.

GUSTAVO LOZANO. **SALVADOR.**

Mine office: Chalatenango, Salvador. Mines carry auriferous and argentiferous copper ore, and have steam power. Employed circa 100 men, at last accounts.

LUCERO COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Mora, Mora Co., N. M.

LUCILE DREYFUS MINING CO. **WASHINGTON.**

Mine office: Danville, Ferry Co., Wash. Theodore Petterson, superintendent. Mine has 3 tunnels, showing a ledge of 100' estimated width, with paystreak of circa 25', carrying argentiferous and cupriferous pyrite. Company fell into financial straits, circa 1903, through fraudulent stock issued by Eugene Cressley, the former secretary, who served a penitentiary term therefor. Resumed work, 1907, after several years' idleness.

LUCILE GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: 226 San Bernardino Bldg., Los Angeles, Cal. Mine office: Kelso, San Bernardino Co., Cal. Geo. R. Barker, president; F. R. Pitney, vice-president; F. H. Gleason, secretary and treasurer; preceding officers, F. S. Russell and Dr. E. L. Pillsbury, directors. Organized Nov. 21, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 3 claims, area 60 acres. Development is by tunnels of 150' and 350'.

LUCIN COPPER MINES CO. **UTAH.**

Mine office: Tecoma, Elko Co., Nev. Organized 1907, with capitalization $1,500,000, shares $1 par. Lands, 28 claims, area 500 acres, 7 miles east of Tecoma, in the Lucin district of Box Elder county, Utah.

LUCKY BUTTE MINING CO. **MONTANA.**

Office and mine: care of S. W. Billings, Butte, Silver Bow Co., Mont. Organized 1907, under laws of Montana, with capitalization, $100,000.

LUCKY CALUMET COPPER MINING CO. **IDAHO.**

Office: care of John H. Nordquist, vice-president and general manager, Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. A. A. Booth, president; H. P. Knight, secretary; Chas. Solberg, treasurer; preceding officers, J. H. Hewand and O. O. Larsen, directors. Organized October, 1906, under laws of Idaho, with capitalization $1,500,000, shares $1 par.

Lands, 10 claims, patented, on Snow Storm Hill, between the Independent and Snow Storm mines and about 1,500' from latter, supposedly carrying the extension of the Snow Storm vein. Property shows 2 fissure veins, of 10' to 50' width, in quartzite, opened by ten 10' pits and by 3 tunnels, longest circa 1,100', latter cutting a vein of 30' to 40' width at a distance of 1,055' from portal, with back of 575', showing a vein of 30' to 40' width, carrying cuprite, malachite, chalcopyrite and tetrahedrite, giving assays of 2.5 to 5% copper, with slight silver values. Plans driving a new crosscut tunnel, from head of

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Gentle Ann Gulch, to cut vein at circa 2,000'. Has electric power, air-compressor and 4 mine buildings.

LUCKY DAY MINING CO. **WASHINGTON.**

Dead. Formerly at Silverton, Snohomish Co., Wash.

LUCKY DUTCHMAN MINING & DEVELOPMENT CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Crescent, Lincoln Co., Nev. W. J. Snyder, president; John R. Royer, vice-president; preceding officers, B. O. Atkins, C. L. Anderson and R. S. Weimer, directors; H. B. Cole, secretary and treasurer. Organized 1905, with capitalization $125,000, shares 25 cents par. Lands, 4 claims. Idle.

LUCKY FRIDAY GOLD & COPPER MINING CO. **NEVADA.**

Office: care of J. T. Davis, secretary-treasurer, Carson, Nev. O. H. Gallup, president; S. L. Lee, vice-president. Organized Sept. 26, 1906, under laws of Navada, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, on Copper Mountain, in the Walker River district, Esmeralda county, Nevada. Has a 90' shaft, claimed to show ore averaging 28% copper.

LUCKY FRIDAY MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Lands, 4 claims, adjoining the Hunter mine on the south, having a 625' crosscut tunnel cutting a 10' vein with a 4' paystreak giving assays up to 3.5% copper, 29% lead and 89 oz. silver per ton.

LUCKY GOLD & COPPER MINING CO. **ARIZONA.**

Office: 201-253 South Broadway, Los Angeles, Cal. Letter returned unclaimed from former mine office, Kelvin, Pinal Co., Ariz. J. D. Ferree, president. Lands, 16 claims, in the Riverside district, undeveloped but showing surface ores giving small assay values in copper, and about $7 gold per ton.

LUCKY STRIKE COPPER MINING CO. **WYOMING.**

Dead. Was succeeded by Lucky Strike Mining & Milling Co. Formerly at Lusk, Laramie Co., Wyo.

LUCKY STRIKE MINING & MILLING CO. **WYOMING.**

Office: Rawlins, Carbon Co., Wyo. Mine office: Lusk, Laramie Co., Wyo. Said to have been organized 1904, but company never filed articles of incorporation with the secretary of state of Wyoming. Is controlled, through stock ownership, by Copper Belt Mines Co. Lands, 6 claims, in the unorganized Buffalo Forks mining district, having a 251' crosscut tunnel, said to cut ore, with a surface showing of auriferous and argentiferous copper ore.

LUCKY VERDE COPPER CO. **ARIZONA.**

Dead. Lost lands, 1904. Formerly at Jerome, Yavapai Co., Ariz. Described Vol. III.

LUCY L. MINING & MILLING CO. **UTAH.**

Office: 208-69 East Third South St., Salt Lake City, Utah. Mine office: Callao, Juab Co., Utah. Frank L. Wilson, secretary and treasurer. Property, in the Deep Creek district, shows ores carrying gold, silver, copper, lead, tin, nickel and bismuth, and company claims to have developed bismuth ores carrying $160 gold per ton.

LUDWIG COPPER MINING CO. **NEVADA.**

Dead. Lands sold, 1907, to Nevada-Douglas Copper Co. Formerly at Yerington, Lyon Co., Nev. Described Vol. VI.

KUPFERBERGWERK LUDWIGSDORF. **GERMANY.**

Mine office: Ludwigsdorf, Schlesien, Germany. Presumably idle.

LUKE CREEK GOLD-COPPER MINING CO. **BRITISH COLUMBIA.**

Office: 435 Temple Court, Minneapolis, Minn. Letter returned unclaimed from former mine office, Marysville, Fort Steele division, East Kootenai, B. C. S. D. Pumpelly, president and general manager; E. D. Barcalow, secretary.

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Organized under laws of South Dakota with capitalization $1,000,000, shares $1 par. Lands, 2 claims. Idle several years and apparently moribund.

BALDOMERO LUNA. **CHILE.**

Office and mine: Chañaral, Atacama, Chile. M. Rojas, superintendent. Property is the Mina Filomena, having steam power and employing circa 60 men, at last accounts.

LUNA LEAD CO. **NEW MEXICO.**

Office: 63 Centre St., New York, N. Y. Works office: Deming, Luna Co., N. M. Robt. E. Powell, president and general manager. Has a 50-ton smelter, treating mainly argentiferous lead ores, but also purchases copper and gold ores.

LUNING CONSOLIDATED COPPER MINING CO. **NEVADA.**

Dead. Formerly at Luning, Esmeralda Co., Nev.

LUNING COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Luning, Esmeralda Co., Nev. Lands, 9 claims, said to carry a large body of low grade ore ranging 10 to 20% in copper tenor, which seems a self-evident contradiction. Ores carry mainly copper, with considerable lead, both more or less auriferous and argentiferous. Idle and apparently moribund.

LUNING COPPER MINING CO. **NEVADA.**

Dead. Property was near the Nevada Champion and Luning Copper Co. Formerly at Luning, Esmeralda Co., Nevada.

LUNING GOLD MINES SYNDICATE. **NEVADA.**

Letter returned unclaimed from former mine office, Luning, Esmeralda Co., Nev. A. L. Moore, superintendent. Lands, 5 claims one fractional, circa 6 miles from Luning. Idle.

LUSTRE MINING CO. **MEXICO.**

Dead. Succeeded January, 1906, by Lustre Mining & Smelting Co. Formerly at Santa Maria del Oro, El Oro, Durango, Mex.

LUSTRE MINING & SMELTING CO. **MEXICO.**

Office: 1514 Park Bldg., Pittsburg, Pa. Mine office: Santa Maria del Oro, El Oro, Durango, Mex. H. D. Gamble, president; J. H. Mueller, vice-president; C H. Tebbetts, secretary; Wm. A. Pomeroy, general manager; Simon Lambert, mine superintendent; Frank B. Hine, smelter superintendent. Organized January, 1906, under laws of Arizona, with capitalization $5,000,000, as successor of Lustre Mining Co.

Lands, 400 hectares, with 872 hectares in mill and smelter sites, and 19,300 hectares miscellaneous lands, including 6,000 acres of leasehold wood land. Property is the Magistral mine, opened by 3 tunnels and 9 shafts, showing a large body of auriferous, argentiferous and slightly cupriferous pyrite, with quartz and limestone gangue, carrying 0.5 to 5% copper, with an average probably under 1% copper, circa 1 oz. silver and 15 to 20 grams gold per metric ton.

Equipment is very complete, including a central power plant with two 360-h. p. Koerting gas engines and one 190-h. p. gas engine, with a 60-kw. 2,300-volt 3-phase generator, electric hoists, pumps and blowers. There are one 200-h. p. and three 400-h. p. gas producers. Mining machinery includes 10 hoists, of 100-h. p. to 300-h. p., and two 6-drill Ingersoll-Rand air-compressors.

The company owns 110 buildings, including a considerable number of dwellings, with a 60x110′ adobe carpenter shop and a 30x60′ smithy.

The stamp mill, which is idle, is 70x100′ in size, of wood, covered with galvanized iron, and has 40 Colorado Iron Works gravity stamps.

The concentrator, also idle, is 60x100′ in size, of wood, covered with gal-

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vanized iron. Equipment includes 2 Huntington mills, chlorination works and a cyanide plant.

The smelter, operating on the semi-pyritic system, has 6 blast furnaces, including two 150-ton McDonald hot-blast furnaces and three 200-ton blast-furnaces, 42x126" at the tuyeres. Air for blast is heated by waste gases in a specially designed McDonald hot-blast heater. Fuel is West Virginia coke. The smelter is said to be putting about 15 tons of ore into one ton of matte, which is sold to the Aguascalientes smelter.

This company and its predecessors have operated for about 25 years, and through former poor management and trouble with refractory ores, accumulated an enormous debt. Experiments with chlorination and cyanide plants failed, but better results are being secured from semi-pyritic smelting. The company has displayed great persistence, and apparently has good prospects of reaching an assured footing.

LUTZ MINES CO. **ARIZONA.**

Office: care of Anton Lutz, Pittsburg, Pa. Mine office: Ft. Huachuca, Cochise Co., Ariz. C. R. Brinton, consulting engineer; A. L. Schultz, superintendent. Organized June 15, 1907, under laws of Arizona, with capitalization $100,000, shares $100 par. Lands, 7 claims, known as the Independence group, on the north fork of Ash Cañon, in the Hartford district of the Huachuca Mountains. Development is by tunnel, planned to be driven 1,200'. Has a 17-h. p. gasoline engine and 6-drill Ingersoll air-compressor.

LYELL BLOCKS CONSOLS MINING CO., N. L. **TASMANIA.**

Dead. Formerly at Mt. Lyell, Montagu Co., Tasmania.

LYELL-COMSTOCK CONSOLIDATED COPPER CO., LTD. **TASMANIA.**

Dead. Succeeded June 1, 1907, by Mount Lyell Comstock Copper Co., Ltd. Formerly at Mount Lyell, Montagu Co., Tasmania.

LYELL PIONEER CONSOLIDATED MINING CO., N. L. **TASMANIA.**

Office: 30 Queen St., Melbourne, Australia. Mine office: Mount Lyell, Montagu Co., Tasmania. C. E. Packer, manager. Capitalization £72,000, shares £1 par. Lands, 56 acres, leasehold, slightly prospected. Idle.

LYELL THARSIS MINING CO., N. L. **TASMANIA.**

Dead. Wound up circa 1906, and lease sold to Mt. Lyell Mining & Railway Co., Ltd. Formerly at Mt. Lyell, Montagu Co., Tasmania. Described Vol. V.

LYMNI COPPER MINING SYNDICATE, LTD. **CYPRUS.**

Office: 32 Great St. Helens, London, E. C., Eng. Mine office: Limassol, Cyprus. J. E. Lomas, chairman; A. C. Gibbons, secretary; Chas. Christian, mine manager; J. M. Ashworth, works manager. Organized March 12, 1897, under laws of Great Britain, with capitalization £23,500, shares £1 par, in 20,000 ordinary and 3,500 preferred shares; issued, £17,342.

Lands, 30 square miles, in the Bellathousa district of Colis, Chrysokhow, Cyprus. Ore occurs as lenses, largest claimed to be 600' wide and 1,400' long, which is something more than doubtful, claimed to carry bornite and chalcopyrite averaging 9 to 10% copper and 3 dwts. silver per long ton, which figures are ridiculous exaggerations. Ore formation apparently is continuous for 3 miles. Development is by 7 shafts, of 150' to 300' depth, and by a 2,100' tunnel. At last accounts mine was not permanently equipped, and development work was in progress, on a small scale.

LYNDHURST (SOUTH AUSTRALIA) COPPER CO., LTD. **SOUTH AUSTRALIA.**

Offices. 8 Broad Street Ave., London, E. C., Eng., and 75 King William St., Adelaide, South Australia. Mine office: Umberatana, Lyndhurst, South Australia. G. B. Elkington, J. P., chairman; Arthur Hobden, secretary. Organized Jan. 22, 1907, with capitalization £200,000, shares £1 par; issued, £180,000.

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Is controlled, through stock ownership, by Union Consolidated Copper Mines, N. L. Lands, 180 acres, known as the Daly mine, at Umbratana, circa 75 miles from Lyndhurst, the nearest railway point.

LYNDON MINES CO. **NEVADA.**

Office: Los Angeles, Cal. Mine office: Pioche, Lincoln Co., Nev. E. F. Freudenthal, manager; C. M. Sampson, superintendent. Lands, 9 claims, in the Comet district, 9 miles west of Pioche, showing ore assaying up to 8% copper, 15% lead, 70 oz. silver and $5 to $50 gold per ton, with occasional sphalerite running up to 200 oz. silver and 1 oz. gold per ton.

LYNGENFJORD KOBBERVAERK. **NORWAY.**

Owned by Norwegian-American Copper Mining & Smelting Co.

LYNN CREEK COPPER-GOLD CO., LTD. **BRITISH COLUMBIA.**

Office: 419 Hastings St., Vancouver, B. C. Mine office: Lynn Creek, Vancouver Island, B. C. G. L. Allan, president and treasurer; W. H. Pegram, secretary; W. Thos. Newman, general manager. Organized 1901, under laws of British Columbia, with capitalization $300,000, shares $5 par.

Lands, 6 claims, area 200 acres, 8 miles from Vancouver, in the New Westminster district, showing 6 veins, of which 3, said to range from 5′ to 40′ in width, give assays up to 8.9% copper, 3 oz. silver and $1 gold per ton. Also has a 4′ to 6′ vein of zinc ore, opened by 2 tunnels, giving a back of 800′ to 1,000′. Mine is claimed to have a large amount of ore in sight, and could ship ore by water to various smelters. Idle some years.

LYONS KYLE GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Property is the Tucker mine, having auriferous and argentiferous lead and copper ores. Has steam power, 5-stamp mill and a 50-ton cencentrator.

MAADEN-KENI MINES. **TURKEY IN ASIA.**

Mine office: Baibourt, Trebizond, Turkey in Asia. Were operated, in a small way, by a Greek syndicate, circa 1904. Presumably idle.

MACBETH LEASING CO. **IDAHO.**

Dead. Property, a lease on the White Knob mine, was sold, 1907, to the Empire Copper Co. Formerly at Mackay, Custer Co., Idaho.

MACGREGOR CLONCURRY COPPER MINES, LTD. **AUSTRALIA.**

Offices: Palmerston House, London, E. C., Eng., and 395 Collins St., Melbourne, Australia. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. Harvey Patterson, chairman; F. G. Hughes, Melbourne, secretary; E. Hebden, London secretary. Organized Dec. 19, 1906, under laws of Victoria, with capitalization £150,000, shares 10s. par; issued, £137,500. Lands include the Wee Macgregor group, area 55 acres, bought of the Leichhardt Cloncurry Co., Ltd., and the Wallaroo mine, having shafts, 240′ apart, said to show a 28′ vein assaying 9% copper in No. 1 shaft, and a 40′ vein assaying 15% copper in No. 2 shaft.

MACK COPPER MINING CO. **WYOMING.**

Mine office: Thermopolis, Frémont Co., Wyo. Organized 1908, with capitalization $1,000,000. Lands are at the head of Mud Creek, 18 miles from Thermopolis. A smelter shipment of one carload of gold and silver ores, made 1908, was said to have returned $43 per ton.

MACKEY-BURROUGHS MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Has auriferous and argentiferous copper ore. Has steam power. Presumably idle.

MACKINAW COPPER CO. **IDAHO.**

Mine office: care of E. Daft, manager, Hailey, Custer Co., Idaho. Lands, 3 claims, well timbered and watered, 25 miles east of Hailey and connected herewith by a good wagon-road, at the head of Lost River, in the Lost River Mountains. Mine has a 100′ shaft in a 3′ to 5′ vein between limestone and

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porphyry showing chalcopyrite with quartz gangue assaying up to 15% copper. Idle.

MACKINAW MINING & MILLING CO. WASHINGTON.

Mine office: Monte Cristo, Snohomish Co., Wash. Has ore giving fair assay values in copper and nickel. Idle several years.

MACKPAR SYNDICATE, LTD. AUSTRALIA.

Offices: 8 Regent St., London, S. W., Eng. Mine office: Moonmera, Queensland, Australia. T. D. C. Parker and R. W. McKay, permanent directors. Organized Jan. 13, 1906, under laws of Great Britain, with capitalization £3,600, shares £1 par, to take over the Mount Morgan copper mines, area 200 acres. Presumably abortive.

MADERA-MEXICO MINING CO. MEXICO.

Office: Madera, Cal. Mine office: Hostotipaquillo, Ahualulco, Jalisco, Mex. W. H. Hunt, general manager. Organized circa 1904. Lands, 16 pertenencias, showing auriferous copper ore.

MADERA MINING CO. ARIZONA.

Office: 612 Grant Bldg., Los Angeles, Cal. Mine office: Tucson, Pima Co., Ariz. J. Hoffman, president; A. Erickson, vice-president; H. E. Brandt, secretary and treasurer; preceding officers, W. P. Ascutt, F. Gilleden, L. Lemieux and T. E. Magee, directors. Organized November, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 16 claims, area circa 200 acres, south of Tucson, near Old Baldy Peak, in the Santa Rita Mountains, showing a 5′ vein carrying auriferous and argentiferous bornite and chalcopyrite, developed by a 100′ tunnel.

MADERO HERMANOS. MEXICO.

Office: Parras, Coahuila, Mex. Mine office: Santo Domingo, Iturbide, Chihuahua, Mex. Own the Francisco Diaz mine, adjoining the Hathaway. The Madero Brothers are the principal owners and managers of the Compañía Metalurgica de Torreón, and are noted as among the most enterprising, capable and financially solid mine and smelter operators of the Republic.

MADISONIAN MINE. MONTANA.

Office: care of Estate of Levi Z. Leiter, owner, Chicago, Ills. Mine office: Norris, Madison Co., Mont. E. J. Trerise, superintendent. Ores carry gold, silver and copper. Has steam power, concentrator and 60-ton cyanide plant. Presumably idle.

SOCIEDAD ESPLOTADORA DE MINAS DE MAGALLANES. CHILE.

Office and mine: Punta Arenas, Magallanes, Chile. Organized Oct. 20, 1904, under laws of Chile, with capitalization £15,000, shares £1 par.

MAGAZINE MINING CO. ARIZONA

Mine office: Johnson, Cochise Co., Ariz. Has 3 shafts and shipped, 1907, a number of carloads of 8% copper ore.

GRUBE MAGDALENA. GERMANY.

Mine office: Morsbach, Rheinprovinz, Germany. Has sulphide lead and copper ores and at last accounts was a trivial producer.

MAGDALENA COPPER CO. NEW MEXICO.

Office: 34 First National Bank Blk., Colorado Springs, Colo. Mine office: Magdalena, Socorro Co., N. M. Jos. C. Colligan, president; Edwin Arkell, vice-president; F. H. Dunnington, secretary and treasurer; E. S. Timmons, general manager; P. E. Johnson, mine superintendent. Organized March 7, 1906, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands, 17 claims, area 340 acres, showing granite, porphyry and limestone, carrying an 8′ fissure vein, opened by 4 shafts, of circa 80′ average depth, giving sulphide ore ranging 3 to 10% copper, 5 oz. silver and $2 gold per ton, with quartz gangue. Also has zinc and lead sulphides.

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MAGDALENA SMELTING & MINING CO. MEXICO.

Office: 208 Fifth Ave., New York, N. Y. Mine office: Magdalena, Taxtepec, Oaxaca, Mex. Henry W. Catlin, president; Lloyd R. Hamer, vice-president and manager; Marion DeKalb Smith, treasurer; Jas. L. Leeds, secretary; John H. Williams, general manager. Organized August, 1907, under laws of New York, with capitalization $5,000,000. Lands, 150 hectares, showing mainly silver-lead carbonates. Reduction plant, known as the Magdalena, was the first modern smelter in the state of Oaxaca, blown in July, 1906, with daily capacity of 50 tons, which company planned increasing to 150 tons. In hands of a receiver, August, 1908.

MAGDALENE MINE. NATAL.

Mine office: Undweni, Zululand, Natal. Lands, near the Tugela border, show carbonate, silicate and sulphide ores, latter zinciferous, of high average copper tenor, occurring irregularly, mainly as impregnations. Was under development at last accounts.

MAGENTA GOLD MINING CO. COLORADO.

Mine office: Granite, Chaffee Co., Colo. Has gold, silver and copper ores, and steam power. Presumably idle.

MAGGIE MURPHY COPPER CO. WYOMING.

Office: 16 State St., Boston, Mass. Mine office: Douglas, Converse Co., Wyo. Hon. Chas. S. Ashley, president; John O'Neil, vice-president; A. D. Lee, secretary; Dr. F. M. Kennedy, treasurer; preceding officers, Geo. H. Hedge and Capt. Robt. A. Hammond, directors. Organized August, 1904, under laws of Wyoming, with capitalization $1,000,000, shares $1 par.

Lands, 12 claims, area 180 acres, also a 60-acre millsite, all fairly timbered, on the northwestern side of Horseshoe Cañon, in the Laramie Peak district, showing country rock of granite, fissured with diorite, gneiss and schists, carrying 7 contact veins between gneiss and mica-schist, of which one, under development, with a 114' shaft, ranges 30' to 60' in width, carrying covellite, bornite and chalcopyrite, associated with pyrrhotite, assaying 1 to 6% copper, 2 to 9 oz. silver and 40 cents to $4.50 gold per ton.

COMPAÑIA MINERA DEL MAGISTRAL. MEXICO.

Dead. Formerly at Santa Bárbara, Hidalgo, Chihuahua, Mex. Fully described Vol. VII.

NEGOCIACION MINERA DEL MAGISTRAL, S. A. MEXICO.

Office and mine: Apartado 22, Zacatecas, Mex. Dudley H. Norris, president; Chas. O. Gilbert, manager. Mine has a small branch line, connecting with Magistral Siding, on the Mexican Central Railway, near the city of Zacatecas. Mine formerly turned out copper in the form of bluestone, or magistral, for use in reducing the silver ores of Zacatecas. Has steam power. Smelter site is at Magistral Siding, and a concession was secured therefor, 1907. Plant is planned to be of about 250 tons daily capacity, to treat custom ores, as well as ores from the Mina Magistral. Development and equipment are said to have been paid for out of earnings of the mine, which, 1906, shipped about 100 tons of copper ore weekly. Employs circa 150 men. Production, 1907, estimated at 500,000 lbs. fine copper.

MINAS MAGISTRAL y ANEXAS. MEXICO.

Owned by Las Moras Copper Mining Co.

MAGISTRAL COPPER MINES CO. MEXICO.

Dead. Formerly at Magistral, Chihuahua, Mex.

MAGISTRAL MINING CO. MEXICO.

Dead. Formerly at Ameca, Jalisco, Mex.

MAGISTRAL MINING SYNDICATE. MEXICO.

Dead. Was succeeded, 1907, by Los Angeles & Jalisco Mines Co. Formerly at Etzatlan, Ahualulco, Jalisco, Mex.

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MAGISTRAL SMELTING CO. **MEXICO.**

Mine and works office: Santa Barbara, Hidalgo, Chihuahua, Mex. John C. Shepherd, general manager; H. L. Snyder, smelter superintendent. Lands are leased from the Compañia Minera del Magistral, controlled by Governor Enrique C. Creel. Mine, 15 miles from Chihuahua y Pacifico railroad, having a 300' shaft, carries extensive contact deposits between limestone and porphyry of low grade copper ore. Has steam and gasoline power. Is said to have a 150-ton smelter. Mine must be worked on a large scale to be profitable, as ore is low in tenor, though existing in large quantities.

MAGNETAWAN MINING CO. **ONTARIO.**

Dead. Formerly at Burks Falls, Parry Sound district, Ont.

MAGNOLIA GOLD & COPPER MINING CO.

Dead. Formerly had an office at Seattle, Wash.

MAGPIE GOLD & COPPER CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. J. F. Murry, president; S. E. Fersee, secretary; Chas. D. Terwilliger, treasurer. Organized Oct. 4, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par; issued, $536,820. Lands, 3 claims, unpatented, area 60 acres, on the south fork of the Encampment river, 5 miles from Encampment, opened by a 200' tunnel showing medium grade chalcopyrite.

MAGUS MINING CO. **WASHINGTON.**

Office: 712-1341 G St., N. W., Washington, D. C. Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Alphonso Young, president; Henry M. Kingsley, secretary. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, circa 24 claims, formerly owned by Forty-Five Consolidated Mining Co., in the Stillaguamish district, showing auriferous and argentiferous copper ores, with values mainly in the precious metals. Has a hydro-electric power plant and air-compressor. Idle for 3 years, until taken over June 1, 1905, by present company. Apparently idle since 1907.

MAHAKAHARA COPPER CO. **NEW ZEALAND.**

Mine office: Woodville, N. Z. Has a large ore body, under development, and made small shipments, 1907, to Melbourne, for smelting.

MAINE & MONTANA COPPER CO. **MONTANA.**

Office: Ft. Fairfield, Me. Mine office: Basin, Jefferson Co., Mont. Idle.

COMPAÑIA MINERA DE MAIPÓ. **CHILE.**

Mine office: Cajon de Maipó, Victoria, Santiago, Chile. Works office: El Volcan, Victoria, Santiago, Chile. Gregorio Cososo, general manager.

Property includes El Volcan, San Simon, Juanita and other mines, carrying circa 2,500 meters of the strike of a strong vein, in sedimentary rocks in conjunction with syenite. The vein has a minimum of one and maximum of 5 meters width, with an average of circa 2 meters, with strike of N. 45° E., and nearly vertical dip. The upper portion of the vein is strongly ferruginous and micaceous, with a little limestone and quartz, carrying oxidized ores, followed, at little depth, by chalcopyrite. The general average tenor of the ore is estimated at 4 to 5%. The ore is selected, with the object of eliminating iron, which is in excess for smelting purposes. Greatest depth of mine is about 170 meters, and workings extend along a distance of 1,800 meters.

The power plant at the smelter has 100-h. p. and 200-h. p. turbines, direct-connected to Siemens & Halske dynamos, furnishing power to pumps, hoists and blowers. The mine has 4 Siemens & Halske electric drills, employing a 305-volt current at 3 amperes, and these have given excellent results, despite trouble with similar drills at other Chilean properties.

The reduction plant includes a small concentrator having a Blake crusher. The smelter, 52 kilometers east of Puente Alto, with a freight charge of

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$9 per metric ton to the railroad, burns imported coke, costing 47 pesos per ton, with a little local wood. Equipment includes four 54" circular water-jacket blast-furnaces and two 36x72" quadrangular blast-furnaces, with 6 blowers. The converter department has 6 stands and a Vulcan air-compressor, shells being 1.68x1.82 meters in size. Product is Chile bars, averaging 98.5% in copper tenor. In 1903 the smelter employed 150 men, at average wages of 2 pesos daily.

Production, 1903, when this was the second largest copper producer of Chile, was 17,997 metric tons of ore, averaging circa 7.9% copper, and making 2,838,000 lbs. fine copper. Mining and smelting costs are low, and finished copper is said to cost only £30 per long ton, laid down in London, which figure seems unduly low. The company employs circa 300 men, and is enterprising and vigorously managed.

JOAQUIN MAIZ y CA. MEXICO.

Office and mine: Villa Aldama, Décime, Nuevo León, Mex. C. Robles, manager. Property is the Blanca y Anexas mines, developed by tunnel, producing copper ore with a force of about 50 men, at last accounts.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE DE MAJDANPEK. SERVIA.

Office: Brussels, Belgium. Mine office: Majdanpek, Servia. Employs 500 men. Emile Thorez, chairman; Emile Fromont, manager; Chas. Brunard, secretary; Leo Zenzes, manager; Alfred Müller, smelter superintendent; Hugo Hermann, engineer. Organized 1903, under laws of Belgium and Servia, with capitalization 5,000,000 francs, shares 500 francs par.

Lands include mineral concessions covering 18,300 hectares, 10 miles from the Danube and circa 75 miles southeast of Belgrade, showing trachyte and limestone carrying native copper, malachite, azurite and chalcopyrite, commercial ores being almost exclusively sulphide, and mainly chalcopyrite, with some chalcocite, bornite and covelite, associated with pyrite and occasional magnetite, in a quartzose gangue, ores averaging about 3% copper, 0.4 oz. silver and 75 cents gold per ton. The property was worked on a limited scale, under former ownership, and was estimated, 1906, by the company, to show 600,000 tons of ore, with 250,000 tons blocked out for stoping, which figures seem high.

Transportation is furnished by a 10-mile Bleichert aerial tram from the mine to the Danube, and there is a half-mile Bleichert aerial tram between the mine and smelter.

The smelter formerly had three 40-ton Hereshoff water-jacket blast-furnaces, and a 200-ton blast furnace was installed, 1907, to employ the Knudsen pyritic process of smelting. Product is blister copper, averaging circa 96% copper, 14 oz. silver and 1.5 oz. gold per ton. The company is said to plan a 250-ton leaching plant, for treating of low grade pyritic ores.

MAJESTIC COPPER CO. UTAH.

Office: 1102-79 Milk St., Boston, Mass. Mine office: Milford, Beaver Co., Utah. E. E. Abercrombie, president. Organized June 18, 1904, under laws of Maine, with capitalization $450,000, shares $10 par. In November, 1907, capitalization was reduced to $400,000, shares $1 par, and increased to $600,000, shares $1 par. Bonds, $1,000,000 authorized, $514,000 outstanding. Company was organized as successor of Majestic Copper Mining & Smelting Co., but the old corporation continues in existence, and the Majestic Copper Co. practically has been succeeded by the Majestic Mines Co. Fully described Vol. VI.

MAJESTIC COPPER MINING & SMELTING CO. UTAH.

Office: 1102-79 Milk St., Boston, Mass. Mine office: Milford, Beaver Co., Utah. To all practical intents and purposes was succeeded, 1904, by Majestic Copper Co., which was succeeded, 1906, by Majestic Mines Co., but

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the Majestic Copper Mining & Smelting Co. remains in existence. The company became bankrupt, circa 1904, but eventually paid 100 cents on the dollar. Very fully described Vol. IV.

MAJESTIC MINES CO. **UTAH.**

Office: 1102-79 Milk St., Boston, Mass. Mine office: Milford, Beaver Co., Utah. W. D. Elwell, president; John M. Dick, vice-president; D. J. Flanders, secretary and treasurer; Alex J. Moffatt, manager. Organized May, 1908, with capitalization $5,000,000, shares $5 par, practically as successor of Majestic Copper Co. and Majestic Copper Mining & Smelting Co. On Oct. 1, 1908, owned circa 80% of the outstanding bond issue, $514,000, of the Majestic Copper Co. Stock of the new company was exchanged for bonds of the old company, on the basis of 900 shares of stock for each $1,000 bond, and holders of stock in the old company were given new stock, pari passu, on payment of an assessment of 15 cents per share. The floating indebtedness of the old company is said to have been paid off, and, by retiring the bonds, the present company is placed in better shape, financially, than any of its predecessors, which suffered from heavy loads of debt.

Lands, 120 claims, area 2,450 acres, also an 80-acre smelter site and 1,100 acres miscellaneous lands, in 8 groups, located in 5 districts of Beaver county, showing about 100 ore bodies, carrying copper, gold, silver, platinum, lead, cobalt, bismuth, vanadium and uranium. Copper ores include all of the principal oxides, carbonates and sulphides, also occasional native copper, and many of the rarer copper minerals, ores ranging from 2 to 35% in copper tenor, with estimated average values of 12% copper, 12 oz. silver and $3 gold per ton, with large percentages of lead, but these figures, made by the former management, are much too high. There are 18 shafts, of 100′ to 400′ depth, also many tunnels and innumerable test pits, with circa 6 miles of workings. Former management estimated 1,000,000 tons of ore in sight, with 500,000 tons blocked out for stoping, but these estimates were greatly exaggerated, and must have been known to be such when put forth, while stock was being fed the public. Some of the properties were worked formerly for silver, but the silver-copper ores at and near surface gave way to copper-silver ores at depth, all ores being more or less auriferous.

The company has platted the townsite of Lewisville, where the smelter is located. The mines and smelter are served by the Oregon Short Line railroad.

The O. K. mine, 7 claims, is the principal property of the company, and is opened by a 3-compartment 400′ shaft, in a vein up to 20′ in width, with considerable development on the 300′ and 400′ levels. A smelter shipment, 1901, of 253 tons of ore, returned 40% copper, 7.5 oz. silver and $3.80 gold per ton. This mine has more or less ore blocked out, apparently in a stockwerk of circa 250′ width, carrying stringers of high grade ore.

The Harrington-Hickory group, 25 claims, partly fractional, has two 400′ shafts, the main shaft having 3 compartments, with circa 40 pits and shallow shafts showing ore. The property shows numerous fissure veins, intersected by cross-veins, both approximately vertical, and in addition has a series of bedded veins, dipping at 30° to 35°, giving three separate intersecting systems of ore bodies. Values are mainly in lead, ores assaying 2 to 3% copper, 25 to 50% lead, up to 50 oz. silver and circa $1 gold per ton.

The Old Hickory group, 9 claims, has a gossan of 250′ estimated width, above a vein of 40′ to 200′ width, opened by circa 50 pits and shafts, deepest 212′, showing ores assaying 4 to 5% copper, with combined gold and silver values of $2 to $4 per ton.

The Vicksburg group, 4 claims, formerly worked for gold, has 3 practically vertical fissures, of 2′ to 20′ width, with mineralized cross-veins, opened

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by numerous shallow pits and shafts, and a 2-compartment working shaft.

The Hoosier Boy group, 10 claims, has a 250' vertical shaft in limestone carrying auriferous and argentiferous copper and lead ores.

The Larkspur group, 8 claims, has a 60' contact deposit between granite and limestone, carrying irregular bunches of high-grade ore.

The Copperfield group, 17 claims, lies between the O. K. and Old Hickory mines, and is undeveloped.

The Apex group, 4 claims, adjoins the Old Hickory mine, and is practically without development.

The Ben Harrison group is undeveloped.

Equipment includes steam, gasoline and electric power, with a 24-h. p. Fairbanks & Morse hoist, Ingersoll-Sergeant air-compressor and Rand drills. There is an undeveloped water power on Beaver River, 35 miles distant, said to be capable of generating circa 2,000 h. p. and transmitting same electrically to the mine and smelter, at a cost of circa $100,000 for a hydro-electric installation and transmission line.

The reduction works, at Lewisville, 3 to 8 miles from the various mines, include a sampling mill and smelter. The smelter building, of steel frame, on stone foundations, has room for four 250-ton blast-furnaces, with necessary machinery, and has a 250-ton blast-furnace for copper and a 100-ton lead stack, with Nesmith hot-blast stoves, heating the air to 800° F. before entering the tuyeres. The smelter is small and already antiquated, though scarcely warmed, having run only 40 days, giving half the claimed duty, and smelting only about 5,000 tons of ore.

On a test run, 1903, returns were 5.1% copper, 3.6 oz. silver and $1.80 gold per ton. Apparently the copper ore as a whole averages only about 2% in tenor, and is silicious. There are numerous bodies of high grade ore, but the property, as a whole, suffers from diffusion of wealth, there being numerous points at which small quantities of high grade ore are available, with a considerable tonnage of low grade ore partially developed. The company has been reconstructed repeatedly, and the mine has redeemed none of the exaggerated promises made for it. The present company, however, seems built more solidly than its predecessors, all of which were saddled with debts beyond their power to carry.

MAJOR EVANS CONSOLIDATED MINING & MILLING CO. UTAH.

Office and mine: American Fork, Utah Co., Utah. John J. Jones, president; Jos. J. Jackson, vice-president; F. A. Jackson, secretary and treasurer; preceding officers, F. J. Adams and Jas. H. Clark, directors. Organized circa January, 1903. Lands are in American Fork Cañon.

MAKU (NORTH CHARTERLAND) COPPER SYNDICATE, LTD. RHODESIA.

Office: 2 London Wall Bldgs., London, E. C., Eng. North Charterland Exploration Co., managers. Organized Jan. 13, 1906, with capitalization £5,000, shares £1 par, to acquire copper properties from the North Charterland Exploration Co., Ltd. Apparently moribund.

MALACHITE COPPER CO. ARIZONA.

Dead. Formerly at Williams, Coconino Co., Ariz.

MALACHITE COPPER CO. NEVADA.

Office: care of Willard F. Snyder, Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. Has a shaft, said to show a considerable body of sulphide ore of fair copper tenor.

MALACHITE COPPER-GOLD CO. CALIFORNIA.

Dead. Formerly at Daggett, San Bernardino Co., Cal. Described Vol. VII.

MALDEN MINING, MILLING & MANUFACTURING CO. WASHINGTON.

Office: Rosalia, Wash. Mine office: Metaline, Stevens Co., Wash. D. D.

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Birks, manager. Mine, opened by tunnel, is the only copper property in the camp, other mines carrying lead ores. Equipment includes an air-compressor.

SOCIEDAD MAIDINI DE COLLAHUASI. CHILE.

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized Aug. 8, 1905, under laws of Chile, with capitalization 160,000 pesos, shares 100 pesos par.

MALLARD MINING CO. ALASKA.

Letter returned unclaimed from former mine office, Ketchikan, Alaska. Lands, on McLean's Arm, on the eastern side of Prince of Wales Island, are said to show a 20' vein carrying chalcopyrite assaying 10% copper, 5 oz. silver and 0.14 oz. gold per ton, probably an overestimate all around.

MALONEY-BLUE LEAD COPPER MINING & SMELTING CO. SOUTH DAKOTA.

Mine office: Sheridan, Pennington Co., S. D. John Harnan, president and general manager; Philip Harnan, vice-president and superintendent; J. G. Thomas, secretary and treasurer. Organized 1899, with capitalization, variously reported, of $750,000 or $3,000,000, shares $1 par. Lands, 380 acres, showing a vein of 118' claimed width, surmounted by a heavy gossan, carrying occasional rich oxidized ores containing good copper and gold values. Development is by a 260' shaft, showing occasional stringers of ore, and a 1,610' tunnel, showing some arsenopyrite. Developments to date have not shown copper in paying quantities, but payable ore is believed to exist below the water-level. Equipment includes a steam power plant and air-compressor. Idle.

MAMIE MINE. ALASKA.

Owned by Brown-Alaska Copper Co.

MAMISSON COPPER SYNDICATE, LTD. RUSSIA.

Office: 74 Coleman St., London, E. C., Eng. Earl of Essex, chairman; F. D. Leslie, secretary. Organized May 10, 1907, under laws of Great Britain, with capitalization £10,500, in 10,000 ordinary shares of £1 par and 10,000 preferred shares of 1s. par. Was organized to acquire copper properties in Russia. Apparently moribund.

MAMMOTH COPPER CO.

Dead. A swindle, perpetrated by the Wm. F. Wernse gang, of St. Louis.

MAMMOTH COPPER MINE, LTD. AUSTRALIA.

Office: Hope St., Glasgow, Scotland. Mine office: Mungana, Chillagoe, Queensland, Australia. R. K. Bell, John Millar, D. Gardner and J. S. Allan, directors. Organized March 20, 1907, under laws of Great Britain, with capitalization £10,000, shares £1 par.

MAMMOTH COPPER MINING CO. WYOMING.

Dead. Formerly at Saratoga, Carbon Co., Wyo.

MAMMOTH COPPER MINING CO. OF MAINE. CALIFORNIA.

Office: 50 Congress St., Boston, Mass. Mine and works office: Kennett, Shasta Co., Cal. Employs 1,000 men. Wm. C. Sharp, president; F. W. Bachelder, secretary and treasurer; A. S. Haskell, manager; Robt. E. Hanley, mine superintendent; Jas. H. Kerwin, smelter superintendent; A. P. Anderson, engineer. Organized Aug. 2, 1904, under laws of Maine, and is controlled, through ownership of entire stock issue, by the United States Smelting, Refining & Mining Co.

Lands, 14 claims, area 280 acres, also an 80-acre smelter-site, and miscellaneous lands giving total holdings of 1,400 acres, 3½ miles from Kennett, on Little Backbone Creek, in the Big Backbone district. Lands are well timbered, with numerous mountain streams available for water supply, and the topography is very rugged, mines being opened near the tops of the mountains. Lands have been probed extensively by diamond drill borings. A

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$90,000 bond on the Friday-Lowden group was relinquished, 1907. The Rattlesnake mine is supposed to be held under bond. Property includes a bond and lease on the Wood & Shelden claims, at Rainbow, on the headwaters of the Sacramento River, where development by tunnel is under way. Lands include a considerable limestone deposit, used for fluxing.

The Quartz Hill mine, in the Old Diggings district, is held under a 5-year bond and lease, dated 1906, with privilege of extension for 5 years further, subject to minimum extraction of 15,000 tons of ore yearly. Product of the Quartz Hill is silicious fluxing ore exclusively, said to carry $6 to $8 gold per ton, which probably is a considerable overestimate.

The Mammoth group is on the western side of the Sacramento River. Country rock is mainly rhyolite, somewhat altered in places, with some slate and considerable porphyry, carrying long flat-lying lenses of ore that is mainly slightly zinciferous chalcopyrite, disseminated in pyrite, both being auriferous and argentiferous, with an average of circa 3% copper, 2 oz. silver and 60 cents gold per ton, with about 40% iron and up to 40% sulphur. Mine was said, August, 1908, to be yielding about 75 lbs. fine copper per ton. There are several ore bodies, the largest being 228′ wide and circa 500′ long, and the mine has upwards of 2,000,000 tons of ore in sight, being opened considerably ahead of immediate requirements. Development is exclusively by tunnels, of which there are 4, having ore bins at the portals. In August, 1907, the fourth tunnel was started, this being 18′ wide, with double tracks, having electric haulage.

Equipment includes a 40-drill air-compressor and two 15-drill Rand air-compressors, with a 5-drill compressor at the Quartz Hill mines.

Buildings at the mine include a smithy, boarding-house and a hospital with accommodations for 20 patients. Water is piped to the mine and smelter from the Mayflower claim.

Both mine and smelter are operated by electric power, secured from the Northern California Power Co., at a very reasonable rate, delivered to the power-house at a voltage of 2,000, the company requiring about 3,000 h. p. for the operation of its mine and works.

An aerial tram of 13,200′ length, between the mines and smelter, is in two sections, the upper having a grade of 22% from the mine to the midway station, the upper section being operated by gravity, in counterbalance, and power generated by a retarding engine, which actuates an air-compressor. The lower section has sufficient grade for the loaded buckets to bring back empties. The tram line has a nominal capacity of 1,600 tons in 24 hours, carrying 1,100-lb. buckets at intervals of 150′, with wooden supporting towers at intervals of 100′. In actual practice, the aerial tram proved to have about 800 tons daily capacity only.

Owing to the inadequacy of the aerial tram, a 3,500-ton combination ground-tram has been built, on somewhat novel lines, to meet peculiar local requirements. The ground tram includes 3 miles of standard-gauge railway, from the smelter to the foot of the gravity road, the latter, 3,000′ long, connecting at the upper end with a 2-mile electric line leading to the mine. There also is a 3-mile narrow-gauge railroad to the Quartz Hill mine, with 2 locomotives.

The smelter, one-half mile from Kennett, 2½ miles southeast of the mine and 2,200′ lower, occupies a site of 80 acres, and is the largest in California, being of 1,800 tons daily capacity. The works, as built originally, at a cost of $500,000, were of 1,000 tons capacity, but were greatly enlarged, 1907. All buildings are of steel, all material is handled by gravity, and the plant is operated on three 8-hour shifts. The works include a sampling mill.

The bin-house, of steel frame, for storage of ore, coke and limestone, is 214′ long, with capacity for 2,500 tons of custom ore and 100 tons of fluxing

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ore, in addition to coke and limestone, and has 27 scales for individual weighing of cars in train-loads. In addition to the bin-house, there are 4,500-ton bins at the lower branch of the aerial tram, and a set of custom ore bins, of 20,000 tons capacity. Charge trains are run underneath the 3 sets of ore-bins. The works no longer treat Nevada or Utah ores, but require circa 200 tons of fluxing ore daily.

The blast furnace building, 72x222′ in size, including an extension, built 1907, has three 42x180″ furnaces, with two new furnaces, designed by Carl F. Moore, each 56x180″, with water-jackets and steel tops. Some trouble has been experienced at times from freezing, because of the considerable percentage of zinc contained in the ore, but, on the whole, the zinc ores have been handled very skillfully, with a minimum of trouble. Smelting is practically semi-pyritic, requiring only 3 to 4% coke charges. Charge-trains consist of four 5,000-lb. self-dumping charge-cars, drawn by 4-ton Baldwin-Westinghouse locomotives, with tracks on either side of each furnace, charging alternately. The 3 old furnaces have 6′ 9″ settlers, and the 2 new furnaces have 16′ settlers, each with a water-jacketed top, of continuous flow siphon type. The furnaces use a 42-oz. cold blast. Slag goes into 6-ton cars, drawn by 6-ton Baldwin-Westinghouse electric locomotives. Fumes go through individual goosenecks to a horizontal dust-chamber, 30′ wide, 15′ high and 500′ long, through a brick dust-flue 200′ long and of 126 square feet section, with hopper-bottom, leading to a 200′ steel stack, 18′ in diameter, standing on a 35′ base. Matte is discharged from the spouts of the settlers into a traveling matte-casting machine, 40′ long, from which chilled matte is dropped into 700-lb. barrows, first-fusion matte being resmelted. An electric tram-line running under the dust-chamber brings flue-dust to the briquetting plant, in the furnace building, which has a 6-ton Chisholm, Boyd & White press, briquettes being made from a mixture of flue-dust and sulphide fines.

The converter building, 92x204′ in size, has 2 hydraulic stands, with room for a third, and eight 96x150″ shells. Ore being a massive iron sulphide, low-grade matte is resmelted, second-fusion matte going to the converters, which blow off into hoods leading to the old stack of the blast-furnace building, which is 135′ high and 12′ in diameter. The converter building has a 50-ton electric traveling crane.

The relining department, occupying a portion of the converter building, has two 7′ Carlin grinding pans, with 400-ton bins for quartz and clay, and 2 pneumatic Ingersoll-Rand tamping machines, on a hydraulic jib crane. There also is a slag-casting apparatus.

The power-house, formerly 80′ long, was rebuilt, 1907, to length of 250′, and has seven 15,000′ blowers, driven by three 200-h. p. motors and four 250-h. p. motors.

The boiler-house, 43x176′ in size, is out of commission, owing to the use of electric power, but boilers are held in reserve for emergencies.

The shops are in a single building, 41x432′ in size, having a traveling crane with full span and crane-run for the entire distance, also 3 broad-gauge tracks running through the entire building, this being one of the best-planned shops in existence. The shop building is divided into sections as follows: Machine-shop, 76′; smithy, 45′; shed, 40′; warehouse, 106′; shed, 40′; boiler-shop, 61′; roundhouse, 55′.

Miscellaneous buildings at the works include an office and laboratory.

Water, formerly raised from Backbone Creek by two 500-gallon centrifugal pumps, is now taken by gravity from the Butters' ditch, passing above the smelter, and the pumps are held in reserve for emergencies.

Previous to the installation of the converter plant the Mammoth shipped, to the Utah smelter of the parent company, low-grade matte, of 20 to 40%

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copper tenor, this carrying considerable iron, which was valuable for fluxing purposes, but production is now blister copper, sent to the Atlantic seaboard for refining. The first furnace was blown in Oct. 6, 1905, and production, October, 1908, was circa 1,100 tons of smelting ore daily, which will be increased eventually to at least 1,500 tons daily. The property is valuable, and the equipment is adequate and efficient, while the management is thoroughly competent and is securing excellent results.

MAMMOTH COPPER & SMELTING CO. **ARIZONA.**

Dead. Lands taken over by Imperial Copper Co. Formerly at Red Rock, Pinal Co., Ariz. Described Vol. IV.

MAMMOTH GOLD MINING CO. **COLORADO.**

Office: 1104 Marquette Bldg., Chicago, Ills. Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

MAMMOTH LODES MINING CO. **BRITISH COLUMBIA.**

Office: care of H. O. Proebstel, Portland, Ore. Organized under laws of Oregon. Lands, known as the Colorado group, in the Cascade Mountains, Yale district, British Columbia, are claimed to show veins of 40′ to 250′ width, traceable for more than two miles, and it is claimed that smelting tests have given 15 to 20% copper and $12 gold per ton, these figures being, in themselves, ample evidence of their own untruthfulness, or of the unfair nature of the "test." Idle and apparently moribund.

MAMMOTH MINE. **ARIZONA.**

Owned by Calumet & Arizona Mining Co.

MAMMOTH MINING CO. **UTAH.**

Office: 41 Hooper Blk., Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. Samuel McIntire, president and general manager; Samuel McIntire, Jr., vice-president and superintendent; R. M. Wilkinson, secretary. Organized under laws of Utah, with capitalization $400,000, shares $1 par. Regular monthly dividend rate is 5 cents per share, or $20,000. Annual meeting, first Tuesday in February.

The mine, opened circa 1870, is extensively developed and has a 2,300′ main shaft, with good copper ore on the 2,200′ level. Mine carries auriferous and argentiferous lead and copper ores, principal values being in silver and lead.

The mill has 60 stamps. Production, 1907, was 477 carloads of ore. Litigation with Grand Central Mining Co. resulted in an adverse verdict for $149,812. Property is valuable and seems prudently managed.

MAMMOTH MINING & POWER CO. **MONTANA.**

Mine office: Mammoth, Madison Co., Mont. Allan C. Sanders, superintendent. Has auriferous copper ores. Equipment includes a 50-ton concentrator. Employed circa 20 men, at last accounts.

MAMMOTH TUNNEL & MINING CO. **COLORADO.**

Office: 403-331 Fourth Ave., Pittsburg, Pa. Mine office: Silverton, San Juan Co., Colo. A tunnel scheme, regarded with suspicion.

MANNASSAS GAP COPPER MINE, INC. **VIRGINIA.**

Dead. Succeeded, circa 1907, by Moqui Copper Co. Formerly at Reager, Rappahannock Co., Va. Fully described Vol. VII.

MANCAYAN COPPER SYNDICATE, LTD. **PHILIPPINES.**

Dead. Voluntarily wound up, August, 1902. Formerly in the Mancayan district, Island of Luzon, Philippines.

MANCHEGAN MINES, LTD. **SPAIN.**

Office: Clock House, Arundel St., Strand, London, W. C., Eng. Mine office: Fuencaliente, Ciudad Real, Spain. H. Cossins, secretary. Organized Nov. 25,

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1905, under laws of Great Britain, with capitalization £5,000, shares £1 par; issued, £4,480. Property is the San Bartolomé III mine and sundry share interests.

MANCHESTER ZINC & COPPER CO., LTD.

Dead. Voluntarily liquidated, April 15, 1901.

"MAN" GROUP. ARIZONA.

Office and mine: care of Otto W. H. Schley, owner, Vail, Pima Co., Ariz. Lands, 4 claims, area 80 acres, in the Helvetia district, 9 miles southeast of Vail, formerly held by Bradford Development Co., showing Carboniferous limestone, intruded by porphyry dikes, latter considerably altered, with extensive outcrops of oxide and carbonate ores, succeeded at shallow depth by sulphides. Property shows several veins of 6″ to 5′ width, and has a 2-compartment shaft of 105′, in porphyry, showing stringers of quartz carrying copper sulphides. Shipments of 100 tons, to El Paso smelter, gave returns of 9.5 to 17% copper, 8 to 16 oz. silver and $8.50 gold per ton. The ore carries an excess of iron, and smelts readily. Idle several years.

MANHATTAN CONSOLIDATED MINING & SMELTING CO. WYOMING.

Office: La Crosse, Wis. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Wm. Doerflinger, president; Chas. H. Freeman, vice-president; P. J. Bott, secretary; Herman Tillman, treasurer; F. R. Smith, superintendent. Organized Feb. 3, 1902, under laws of Wyoming, with capitalization $800,000, shares 10 cents par. Property has sundry pits and trenches, showing a vein of 4′ to 12′ width, giving ore assaying 3 to 30% copper.

MANHATTAN COPPER MINING CO. ARIZONA.

Dead. Merged, 1902, in Troy-Manhattan Copper Co. Formerly at Troy, Pinal Co., Ariz.

MANHATTAN COPPER MINING & MILLING CO. NEVADA.

Office: care of Hon. A. B. Lewis, president, 100 Broadway, New York, N. Y. Mine office: Pioche, Lincoln Co., Nev. E. F. Freudenthal, manager. Is controlled, through stock ownership, by the Nevada-Utah Mines & Smelters Corporation, and apparently succeeded the Manhattan Gold & Copper Mining Co. Lands, 2 groups, one east of Pioche and one in the Stampede Gap section. The Pioche group includes the Revenue, Telephone and Alps mines, with 100′ and 140′ shafts, showing ore assaying well in gold and silver. Stampede Gap property has auriferous and argentiferous copper and lead sulphides, opened by a shallow shaft and 2 tunnels, with circa 2,000′ of underground workings.

MANHATTAN DEVELOPMENT CO. ARIZONA.

Office: Postoffice Blk., Houghton, Mich. Mine office: Paradise, Cochise Co., Ariz. J. H. Rice, president; W. G. Rice, secretary and treasurer; preceding officers, Thomas F. Cole, Nathan M. Kaufman, Samuel R. Kaufman, Allen F. Rees and Norman W. Haire, directors; Fred. W. Hoar, superintendent. Organized March, 1905, under laws of Arizona, with capitalization $200,000, shares $10 par; $5.50 paid in.

Lands, 37 claims, area 600 acres, fully paid for, in the California district, carrying upwards of 2 miles of the outcrop of a mineralized zone lying west and north of the holdings of the Chiracahua Development Co. Development is by several shallow shafts, deepest 80′, and a 450′ crosscut tunnel, latter showing leached ore and a little high-grade ore, with indications of permanent values at greater depth. Management is good, and property is considered promising. Idle, but resumption planned for 1909.

MANHATTAN ELY COPPER CO. NEVADA.

Office: 25 Broad St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. Col. Luther Martin, president; Jos. H. Everett, vice-president; Willard B. Moore, secretary and treasurer; preceding officers, Jos. P. McQuaide,

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Mortimer C. Mack, F. S. Pheby and J. Arthur Keagy, directors. Organized 1907, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands, 10 claims, area 200 acres, in the western portion of the camp, not far from claims of the Giroux Consolidated.

MANHATTAN GOLD & COPPER MINING CO. NEVADA.

Dead. Lands sold, June 10, 1907, to Nevada-Utah Mines & Smelters Corporation. Formerly at Pioche, Lincoln Co., Nev.

MANHATTAN MINE. MAINE.

Letters returned unclaimed from former office, care of J. S. Moore & Co., owners, Portland, Me., and from former mine office, West Brookville, Hancock Co., Me. Property included the Manhattan and Tapley mines, showing ore assaying about 5% copper, which were reopened, 1907, after many years of idleness.

MANHATTAN MINING CO. IDAHO.

Letter returned unclaimed from former office, Oakesdale, Wash. Mine office: Saltese, Missoula Co., Mont. J. E. Bailey, president; O. H. Linn, superintendent. Lands, 10 claims, shortly northwest of the Monitor mine, on the Idaho side of the divide of the Bitter Root Mountains, opened by a 350′ tunnel, showing a 7′ vein assaying up to 12% copper and $8 gold per ton.

MANICA COPPER DEVELOPMENT CO., LTD. PORTUGUESE EAST AFRICA.

Office: Finsbury Pavement House, London, E. C., Eng. Mine office: Sierra Isataca, Macequece, Mozambique, Portuguese East Africa. W. E. Lane, secretary; W. M. Cairncross, mine manager. Organized May 26, 1902, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £115,110. Debentures, £10,000, at 6%.

Lands, 411 claims, area circa 900 acres, in the Sierra Isataca, midway between Macequece and Umtali, Rhodesia, lying 8 miles northeast of Umtali, near the Edmundian mine, but in Portuguese territory. Three copper outcrops have been located, one of which is a vein of about 4′ width, opened by a shaft, which, on the 300′ level, shows 3 distinct veins of copper ore with calcite gangue. Ore reserves are estimated at 12,000 long tons, of 7% average copper tenor. Lower levels also carry galena and gold ore, there being a narrow pay-streak of latter assaying up to 391 oz. gold per long ton. Planned, early 1908, installing a complete machinery plant, including a 20-ton mill and a hydro-electric power installation on the Zambesi River, 3 miles from mine.

MANICA COPPER EXTENSION, LTD. PORTUGUESE EAST AFRICA.

Dead. Registered, 1903, with capitalization £1,000. Formerly at Sierra Isataca, Macequece, Mozambique, Portuguese East Africa.

MANICA EXPLORERS, LTD. PORTUGUESE EAST AFRICA.

Offices: 615 Salisbury House, London, E. C., Eng. C. Hartridge, chairman; J. W. Youd, secretary. Organized Jan. 23, 1896, as reconstruction of Western Explorers, Ltd., and reorganized Dec. 3, 1904, under laws of Guernsey, with capitalization £100,000, shares £1 par; issued, £55,893. Lands include 200 copper claims, 770 gold claims, 16 acres of townsite lands and circa 25,000 acres of miscellaneous lands, said to be rubber-bearing. Idle.

MANILLA MINING CO. ARIZONA.

Office: care of N. L. Houston, manager, Peoria, Ills. Mine office: Ft. Huachuca, Cochise Co., Ariz. Lands are sundry claims in the Huachuca Mountains, opened by a 220′ shaft, showing argentiferous copper and lead sulphides. Has a steam plant, with hoist, pump and air-compressor. Idle.

MANITOU MINING CO. MICHIGAN.

Office: 12 Ashburton Place, Boston, Mass. Operating office: Calumet, Mich. Mine office: Delaware Mine, Keweenaw Co., Mich. Quincy A. Shaw, Jr., president; Rodolphe Agassiz, vice-president; preceding officers, Alexander

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Agassiz and Francis L. Higginson, directors; Jas. MacNaughton, general manager; Geo. A. Flagg, secretary and treasurer. Organized June 26, 1905, under laws of Michigan, with capitalization $500,000, shares $25 par. Fiscal year ending April 30, 1908, showed a debit balance of $194,971.

Lands, 38,693 acres, including the Delaware, Eagle River, Eagle Harbor, Montreal and New Jersey mines, all early-day mines of Keweenaw county.

The old Delaware mine, now known as the Manitou, and formerly known as the Conglomerate and Lac La Belle, has circa 3,700 acres of mineral lands and upwards of 17,000 acres of miscellaneous lands, with a water frontage of 10 miles on Lake Superior, and the entire frontage on Lac La Belle. This property sunk, under various ownerships, circa $3,700,000, before passing to the present company, and the old mine is exhaustively described in Vol. II. The old Delaware mine, opened on the Allouez conglomerate, has 4 shafts, of 300′ to 900′ depth, the Allouez bed underlying the greenstone, and dipping northward at an angle of 25° 30′. The old Delaware workings were unwatered, and found to give a fair showing of copper, and copper was found in the Meadow amygdaloid, underlying the conglomerate.

The Delaware tract was tested by diamond drill borings, and on an amygdaloidal bed, identified as the Kearsarge lode, 8 pits, deepest 65′, were sunk, giving a fair showing of copper. The Kearsarge bed is 7,800′ southward from the base of the greenstone.

Principal development of the Manitou is on an amygdaloidal bed, known as the Montreal River lode, lying 770′ south of the base of the greenstone bluff. The Montreal River bed dips at about 28° and is 12′ to 14′ in width, showing considerable copper, but work was suspended, 1907, as results were not satisfactory.

MANITOU MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Bonanza, Saguache Co., Colo.

MANSFELD'SCHE KUPFERSCHIEFERBAUENDE GEWERKSCHAFT. **GERMANY.**

Mine office: Eisleben, Prussian Saxony, Germany. Dr. Ferdinand Zirkel, Dr. Dittrich and Dr. Paul Wachler, executive committee; Bergrat Dr. Vogelsang, chief mine and smelter manager; Herman Schrader, smelter superintendent. Organized 1852, as a consolidation of numerous independent operators, and reorganized, April 10, 1876, with 69,120 shares. Employs circa 23,000 men, of whom 10% are at the smelter and 90% at the mines.

The Mansfeld mine was opened A. D. 1199, and under the Counts of Mansfeld attained a high state of development, and was immensely profitable, during the Fourteenth and Fifteenth Centuries, but the industry nearly suffered extinction during the Thirty Years' War. Activity was resumed in 1671, when the right of working the mines was declared free, this resulting in the building up of a great number of small independent operators. The present company was first formed, in 1852, as a consolidation of the various small mine operators and smelters, and the merging of many small interests has resulted in a nearly tenfold increase of production, from 2,660 metric tons in 1887.

The principal ore is slightly argentiferous chalcopyrite, associated with limited quantities of nickel and cobalt ores, occurring as speiss, disseminated in very fine grains through the kupferschiefer, a fine-grained bituminous shale. The kupferschiefer lies nearly horizontally, with a dip of 5° only, and is from 2′ to 3′ only in thickness, but covers nearly 200 square miles. Lying just below the kupferschiefer is an arenaceous shale, carrying chalcopyrite, and a limited quantity of copper carbonates. Owing to the thinness of the bed, and the great age and extent of the workings, it is necessary for miners to work on their sides, bellies or backs, as in coal mines, wearing boards upon their trunks and thighs, in order protect themselves from the rock floors. Owing to the

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great age and extent of the workings, the headings usually are 2 to 4 kilometers from the shafts, hence the actual mining is done under considerable disadvantages. The workings are of vast extent, and there are scores of old and abandoned shafts. Present mining operations are through 9 hoisting shafts, with a large number of shafts for water and ventilation. Among the new shafts are the Johannes, at Hohenthal, and the Hermann, at Helbra.

Equipment is very complete, including hoists and general mining machinery, and 6 duplex Weisse & Monski pumps. The company maintains independent machine shops, capable of repairing or building any mining or pumping machinery in use.

The Mansfeld has numerous reduction works, including 4 smelters for raw ores, 2 roasting smelters with acid plants, 2 matte smelting works, 2 refining furnaces, and one electrolytic refinery with desilverising plant. The various works have a total of 20 reverberatory furnaces. The principal smelters are the Krughütte, at Eisleben, with 4 furnaces; the Kochhütte, at Helbra, with 4 furnaces; the Eckardthütte, at Leimbach, with 4 furnaces, and the Kupferkammerhütte, at Hettstedt, with 3 furnaces. All of these furnaces are of circular shaft type, with forehearths, and use cold blasts, except the Kupferkammerhütte, where hot blast is employed to some extent. The Saigerhütte is a refining plant, and the Gottesbelohnunghütte has 10 reverberatory furnaces. The Eckhardthütte has one lead stack, producing a silver-lead matte, and making a little nickel speiss from resmelted flue-dust. The Eckhardthütte has 72 kilns and 5 lead acid chambers, and the Kupferkammerhütte has 62 kilns and 6 lead acid chambers, these works making 2,212 metric tons of 50° Beaumé sulphuric acid, in 1903, from the fumes of the ore and matte treated.

The method of reduction is by heap-roasting and calcining in shaft-furnaces. Roast-heaps are built about 60 meters long, 15.5 meters broad at the bottom and 3 meters broad at the top, and only about 1.50 to 1.75 meters high. The only fuel used is a little brushwood, at the edges and bottoms of heaps, and each heap is roasted 4 to 6 weeks. If the ore, as produced, carries many fines, these are screened, briquetted and added to the roast-heaps. The roasting reduces the ore 8 to 20% in weight, and the roasting is more for the elimination of carbon dioxide and bituminous matter than to throw off sulphur, the latter running only 2 to 5% in the raw ore, while the bituminous matter ranges 10 to 17%, and carbon dioxide 7 to 13%. There are 4 roast-stalls near the shafts, and at the furnaces the first-fusion product is a matte carrying circa 40% copper and 0.25% silver. This matte is broken up and roasted in 2 calcining kilns, and the roasted matte, with the addition of 5 to 10% raw matte, is smelted, in reverberatory furnaces, to white metal carrying 74 to 75% copper and 0.45 to 0.50% silver. The slags from the white metal carry 9 to 15% copper, and are returned to the shaft-furnaces. Slag is utilised extensively, in the manufacture of slag-brick and paving blocks.

The Krughütte, near the mine, is equipped with Steinbeck circular multiple-hearth automatic pyritic calciners, which use no carbonaceous fuel, except for preliminary charges. The Krughütte utilizes waste gases from the copper furnaces, for direct consumption in gas engines, the volume of gas amounting to about 21,000 cubic meters per hour, giving an available maximum efficiency of circa 4,400 h. p., with a mean of 2,700 h. p. The furnaces are connected with two gas mains, of 40" and 62" diameter, and gas is freed from dust by passing through counter-current washers, having spiral blades rotating at a peripheral velocity of about 165' per second, gas being brought into intimate contact with the water, which is separated by the action of the blades and turned in the opposite direction to the flow of gas. After washing, the gas contains only 0.003 grams of dust per cubic meter, against 17 grams in its original condition, and is led to a gasometer storing 18,000 cubic feet, whence

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it passes to the engines, of which there are two, of 1,200 h. p. each, with a third of similar capacity under erection.

The desilverizing plant, at the Saigerhütte, operates on the Ziervogel method, roasting the matte and retaining the silver as a sulphate, which is dissolved in water and the solution run over metallic copper, which precipitates the silver, the cement silver so secured being pressed and remelted to metal .999 fine. The final furnace product, after the extraction of the silver, is a blister copper of 99.7 to 99.8% copper tenor. In 1903 the Mansfeld smelters treated 696,354 metric tons of ore, making therefrom 40,179 tons of low-grade matte, the average tenor of the ore being 28.12 kgs. copper and 0.126 kgs. silver per ton.

The electrolytic refinery has about 5 metric tons daily capacity, with electrodes arranged on the multiple plan.

In addition to its mines and smelters, the Mansfeld company has extensive industrial undertakings of a collateral and subsidiary nature, the more important being extensive coal mines and coke works at Hamm, Westphalia, also alkali deposits and works.

Production, which was only 5,865,898 lbs. in 1867, increased to 11,230,234 lbs. in 1877, 29,176,800 lbs. in 1887, and 40,230,408 lbs. in 1897. Production for the past few years has been as follows: 42,600,278 lbs. in 1903, 41,824,320 lbs. in 1904, 43,824,141 lbs. in 1905, 40,108,000 lbs. in 1906, and 38,822,000 lbs. in 1907. The property is handled with great technical skill, and its ore bodies, by reason of their vast area, are among the largest known to man.

MANSFIELD MINING & SMELTING CO. ARIZONA.

Office: 812 Grand Ave., Kansas City, Mo. Mine office: Patagonia, Santa Cruz Co., Ariz. Employs 15 men. Roland E. Bruner, president; Hon. M. A. Fyke, vice-president; Arthur C. Sweet, secretary and treasurer; A. B. Richmond, general manager; preceding officers and Prof. Jean Robert Mbechel, directors. Organized May 29, 1906, under laws of Arizona, with capitalization $5,000,000, shares $1 par, issued, $4,578,110, on Aug. 15, 1908. On same date company had, cash on hand, $1,800, with $44,000 due on deferred stock payments, and was without accrued liabilities. Annual meeting, second Monday in January. Company is said to have authorized a $100,000 bond issue, at 6%, with circ. $20,000 issued, but reported, Aug. 15, 1908, no bonds outstanding.

Lands, 17 claims, unpatented, area 340 acres, also a 10-acre millsite, in the Wrightson district, 8 miles from the Sonora branch of the Southern Pacific railway, showing syenite, porphyry, dacite and rhyolite, carrying veins of 4' to 30' claimed width, said to be increasing in width and richness with depth. Ore is auriferous and argentiferous copper sulphides, and company claims that the average of numerous samples is 15% copper and .40 oz. silver, which would indicate that the property either lacks considerable ore bodies developed, or that the samples were taken more with a view to good assays than to exact averages.

Development is by the Fraction tunnel, on a vein claimed by the company to be 200' wide, and by the Sweet shaft, 360' deep, said to have ore opened on 2 levels, and the Black Cap shaft, showing some high-grade gold and copper ore, which apparently is limited in quantity. The mine was reported, May, 1907, to have 1,340' of workings, and was claimed, October, 1908, to have nearly one mile of workings.

Equipment includes various mine buildings and a store, with hoists at the two shafts.

The smelter, planned to have blown in June 15, 1908, was completed circa September, 1908, and is said to have cost $21,000. The smelter has a 80-ton matting furnace, and is considered thoroughly impracticable, by reason of its small size, and is a rather ridiculous installation to be made by a company with

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$8,000,000 capitalization. A little ore was shipped, 1907, to El Paso smelter, and is said to have given good returns. The Black Cap shaft is claimed to have enough ore to feed the present smelter, which would not be hard. One day's tonnage at the Anaconda works would run the Mansfield smelter for more than a year.

The company's advertisements and prospectus were very misleading. The prospectus states that 50% of those engaged in the copper industry succeed, which is absolutely untrue. Maps and drawings in page advertisements of the company showed shafts and ore that were purely imaginary, when the company had nothing but prospect holes, and the company promised dividends in its advertisements, which promise was absolutely indefensible. The press, or that portion of it that is available, has been filled with trivial news items regarding the company and its property. The management complains that former officials unloaded stock, to the detriment of the company. Mr. Richmond apparently has wasted no money in development, and is considered personally honest and competent, but the capitalization is excessive, development inadequate, and the company is regarded most unfavorably.

MINO MANTO VERDE. CHILE.

Mine office: Tierra Amarilla, Copiapó, Atacama, Chile.

MAORILAND COPPER CO., LTD. NEW ZEALAND.

Office: Christchurch, New Zealand. Mine office: Nelson, New Zealand. W. J. McMurtrie, manager; Edwin Bray, mine manager; Harley E. Cooper, smelter superintendent. Lands, 2,000 acres, including several different mines, carrying considerable native copper and rich secondary ores, connecting by good wagon road with the port of Nelson. Principal properties are the United Champion, which has 2 separate mines, carrying mainly chalcopyrite, opened by a 250′ shaft and various tunnels, showing a vein up to 14′ in width, early 1908 having 14,608′ of workings. The Monster mine, developed open-cast, shows auriferous chalcopyrite, giving average assays of 17% copper and 4 dwts. 17 grains gold per long ton. The Mount Claude mine, opened by tunnels, shows a vein of about 4′ width, carrying oxidized ores with a gossan up to 250′ width, said to give average assays of 5% copper and 3.8 dwts. gold per long ton. The Doctor mine shows considerable chalcocite, and some native copper, in a vein up to 11′ in width. Sample ore shipments, 1907, to Australia, from the United Champion mine, gave returns of 13% copper. A smelter, built 1908, is connected with the mines by a tramway.

MINA DE MARACÁS. BRAZIL.

Office and mine: care of Col. Pedro Gonçalves, owner, Maracás, Bahia, Brazil.

TOMÁS MARAMBIO. CHILE.

Office: Peña Blanca, Freirina, Atacama, Chile. Works office: Labrar, Freirina, Atacama, Chile. Property includes a number of mines and a reduction plant. The Santa Rosa mine, at Fragüita, 8 leagues from Peña Blanca, is 220 meters deep, with a vertical extension of 500 meters, opening a vein of 6′ to 7′ average width, having north and south strike, with dip of 45°, and produced, 1903, circa 400 metric tons of 20% copper ore. The Mina Verde, near the Santa Rosa, opened to depth of 130 meters, in 1903 produced 150 metric tons of 18% copper ore. The Mina Pequeña, 4 leagues from Peña Blanca, is opened to depth of 50 meters, with an oxidized zone of 30 meters, and in 1903 produced 200 metric tons of ore of 20% copper tenor. La Mina Serena, opened to depth of 70 meters, with horizontal length of 160 meters, in 1903 produced 200 metric tons of 20% copper ore. El Manto mine, opened to depth of 120 meters, with an outcrop traceable 500 meters, in 1903 produced 30 metric tons of 20% ore. La Mina Maria Luisa, 140 meters deep, in 1903 produced 135 metric tons of 20% ore.

A smelter, 4 leagues from Peña Blanca and 18 kilometers from a railroad,

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has reverberatory furnaces turning out Chile bars of 50% average copper tenor. Fuel is Australian coal, costing 30 pesos per metric ton, delivered. One ton of coal is required to smelt 1½ tons of ore, slags running 0.7 to 0.8% copper. Smelter employs circa 60 men, at average wages of 2 pesos daily. Production, 1903, was 4,450 metric tons of ore smelted, averaging 14.6% copper, making 1,335,326 lbs. fine copper.

MARAVILLA COPPER CO. ARIZONA.

Dead. Formerly at Safford, Graham Co., Ariz. Described Vol. VI.

MARBLE BAY MINING CO. BRITISH COLUMBIA.

Dead. Mine sold to the Tacoma Co. Formerly at Van Anda, Texada Island, B. C.

MARCIONHLLE y HANZA. PERÚ.

Office and mine: Morococha, Junín, Perú. Lands, 2 pertenencias, on which mining was begun 1902. Production, 1904, with average force of 25 men, was 97,355 lbs. fine copper, from ore averaging 12% copper tenor.

MARCUS D. COPPER MINING CO.

Dead. West Virginia charter forfeited, 1902.

COMPAÑIA MINERA MARIA DE COLLAHUASI. CHILE.

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized March 29, 1905, under laws of Chile, with capitalization 120,000 pesos, shares 100 pesos par.

COMPAÑIA MINERA LAS MARIAS DE COLLAHUASI. CHILE.

Office: Iquique, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized March 26, 1906, under laws of Chile, with capitalization £150,000, shares £1 par.

MARICOPA COPPER CO. ARIZONA.

Dead. Formerly had an office at 219 North Fourth St., St. Louis, Mo.

MARICOPA COPPER MINES CO. ARIZONA.

Dead. Formerly at Wickenburg, Maricopa Co., Ariz.

MARIE MINING CO. IDAHO.

Letter returned unclaimed from former office, care of R. B. Howard, president, Wallace, Idaho. Mine office: Osburn, Shoshone Co., Idaho. Walter Buell, superintendent. Lands, in McFarren Gulch, about one mile south of Osburn, adjoining the Gray, show 2 veins, one carrying outcrops of high-grade argentiferous galena, the other showing outcrops of argentiferous copper ore. Is developing by tunnel, and September, 1907, planned driving a lower tunnel, circa 1,400', starting same on property of the Black Traveler Mining Co.

MARIETTA GOLD MINING CO. IDAHO & WASHINGTON.

Office: care of Lawson Investment Co., 60 State St., Boston, Mass. Mine office: Mullan, Shoshone Co., Idaho. M. E. Lawson, president and general manager; H. C. Lawson, secretary. Organized under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands include gold claims in Ferry county, Washington, and the Atlas group of 5 claims, area 100 acres, in the Stevens Peak district of the Cœur d'Alenes, Idaho. Development is by a 250' tunnel, claimed to show a 20' ore body, averaging $50 per ton in copper, gold and silver values, which is a self-evident falsification of facts. Promised, 1903, dividends "within two years," which of course did not materialize. Apparently merely a bit of stock-jobbery, and moribund.

MARINOVITCH y LINGUARDO. PERÚ.

Office and mine: Morococha, Junín, Perú. Lands, one pertenencia, known as the Manuelita mine, which produced, 1904, with 10 men, ore of 17% average tenor, making 118,956 lbs. fine copper.

MARION MINING & MILLING CO. COLORADO.

Mine office: Beulah, Pueblo Co., Colo. Lands, on Marion Creek, circa 12

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miles southwest of Beulah, show a vein of 22' reported width, carrying copper, zinc and lead ores. Has a concentrator, said to have cost $75,000, and October, 1907, was said to employ 45 men.

MARITIME COPPER & REDUCTION CO. NEW BRUNSWICK.

Mine office: Goose Creek, St. John Co., N. B. Property is an old mine showing a considerable body of low-grade copper ore. Idle since 1903.

MARSHALL COPPER CO. ARIZONA.

Dead. Lost charter, 1903, and lands, 1903. Formerly at Clifton, Graham Co., Ariz. Described Vol. IV.

MARKHAM GULCH MINING CO. UTAH.

Letter returned unclaimed from former office, 53 Tremont St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Walter J. Orem, general manager. Organized Sept. 29, 1906, under laws of Maine. Is controlled through ownership of one-half of stock issue, by New Red Wing Mining Co., and is under same general management as the Utah-Apex and Utah Development companies.

Property is a 200-ton concentrator, on the site of the old Red Wing mill, which was running on ore from the New Red Wing mine, at last accounts.

MARQUETTE & ARIZONA MINING CO. ARIZONA.

Office: Marquette, Mich. Mine office: Bisbee, Cochise Co., Ariz. Emil Marks, president and general manager; Jos. J. Wirtz, secretary. Organized Dec. 6, 1902, under laws of Arizona, with capitalization $500,000, shares $5 par. Lands, 37 claims, area 740 acres, having a heavy conglomerate capping, similar to that of the Copper Glance, next west. Has a 560' two-compartment shaft, substantially timbered, passing through limestone showing considerable iron, much of it assaying about $2 gold per ton. The shaft has short north and south drifts on the 400' level, and one short drift on the 145' level. Has a 35-h.p. hoist. Idle since 1903.

MARQUETTE COPPER MINING CO. MICHIGAN & WYOMING.

Office: care of Ney Mikkels, secretary, Niles, Mich. R. M. Kenney, vice-president. Organized March, 1905, under laws of Oklahoma, with capitalization $500,000, shares $1 par. Lands, 120 acres, freehold, in Delta county, and 20 acres, leasehold, in Marquette county, Michigan, and 160 acres, government claims, in Uintah county, Wyoming.

ANGEL MARQUIEQUI. BOLIVIA.

Mine office: Coro Coro, La Paz, Bolivia. Mines, known as the San Miguel and Toldo, carry native copper in conglomerate strata. Has steam power and has been a small producer of barillas de cobre for some years.

MARSEILLES MINING CO. MEXICO.

Office: 210 Bacon Bldg., Oakland, Cal. Mine office: Ejutla, Oaxaca, Mex. Roy Mauvais, president; W. H. MacMeekin, managing director. Lands, sundry claims near Los Ocotes mine, undergoing development.

MARSHALL & RUSSELL GOLD MINING, MILLING & TUNNEL CO. COLORADO.

Mine office: Empire, Clear Creek Co., Colo. W. C. Marshall, manager. Organized 1901, under laws of Colorado, with capitalization $5,000,000, shares $1 par. Lands, 62 claims, developed by a 1,100' tunnel showing auriferous and argentiferous copper ores. Has water power.

GRUBE MARTINI. GERMANY.

Mine office: care of W. Von Vloten, Hoende in Wl, Rheinprovinz, Germany. Has spathic iron and chalcopyrite output being mainly iron ore, of which the production averages about 7,000 tons yearly. Has steam power and employs about 50 men.

MASCOMA COPPER CO. MONTANA.

Letter returned unclaimed from former office and mine, Mullan, Shoshone

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Co., Idaho. Organized 1907, under laws of Idaho, with capitalization $1,000,000, shares $1 par. Lands are in the Burns district of Missoula county, Montana. Idle.

MARY MINING CO. MEXICO.

Office: care of John E. Carnahan, Canton, Ohio. Mine office: Jesús María, Rayón, Chihuahua, Mex. Wm. M. Bicker, first vice-president; Mrs. Elizabeth Seaman, second vice-president; J. Worth Carnahan, secretary; W. O. Evans, general manager; Dr. Leandro Routh, superintendent. Lands, 2 groups, presumably 9 hectares, opened by tunnel, showing auriferous and argentiferous copper and lead ores, said to give average assays of circa 9.5% copper, with small lead, silver and gold values. Has planned a smelter with 50-ton and 75-ton blast-furnaces, and a 100-ton concentrator, but apparently has built neither mill nor smelter.

MARY SCHULTZ COPPER KING MINING & SMELTING CO. COLORADO.

Office: care of Dr. Carl I. Schultz, president, Cripple Creek, Colo. Mine office: Salida, Chaffee Co., Colo. E. J. Vanatta, secretary; D. Mary Schultz, treasurer. Organized under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands, 13 claims, on Red Mountain, Fremont county, Colorado, 11 miles northeast of Salida, opened by a 150 shaft and a 180' tunnel, showing considerable low-grade ore, with assays of 9 to 28% copper.

NEGOCIACIÓN MINERA MASCOTA, S. A. MEXICO.

Office: Ap. 840, Mexico, D. F. Mine office: Tequisistlán, Tehuantepec, Oaxaca, Mex. Emilio Maevers, president; Max von Duering, vice-president; Francisco Ponce de León, secretary and treasurer; R. W. Batelt, general manager. Organized Nov. 5, 1906, under laws of Mexico, with capitalization 300,000 pesos, shares 50 pesos par, divided into 2,000 free and 4,000 assessable shares. Assessments levied, $40,000. Lands, 262 pertenencias, in the mineral district of San Carlos Yautepec, including outcrops showing chalcopyrite and tetrahedrite giving average assays of 9.5% copper, 30 oz. silver and $5 gold per ton. Has steam power, with a 4-drill air-compressor. Fuel is wood. Nearest railroad, the National Tehuantepec, is 50 kilometers from the mine.

MASCOTA COPPER CO. MEXICO.

Office: 513 Germania Life Bldg., St. Paul, Minn. Mine office: Ameca, Jalisco, Mex. Employs 22 men. Chris. D. O'Brien, Sr., president; J. M. Bowler, vice-president; B. J. Mosier, secretary and treasurer; Chris D. O'Brien, Jr., general manager; preceding officers and Patrick Conley, directors; D. E. Baldwin, superintendent. Organized June, 1908, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, circa $100,000.

Lands, 46 hectares, in the Guachinango division of the Mascota district, 24 miles from Mexican Central railway, showing an 8' fissure vein in porphyry, traceable circa 2,000' and proven to depth of 486', giving average assays of circa 5% copper, 7 oz. silver and 6 grams gold per ton from oxide, carbonate and sulphide ores. Mine has a 300' shaft and a 375' tunnel, with 4,825' of workings, estimated to show 40,000 tons of ore, with 28,000 tons blocked out for stoping.

Equipment includes a 50-h. p. steam plant, with 3-drill Sullivan air-compressor, and there are 17 mine buildings, including a store.

A wooden stamp mill, of 25 tons daily capacity, has 10 Allis-Chalmers gravity stamps.

A small concentrator is equipped with 2 Overstrom tables, vanner, 4 slime tables and sizer.

The company plans continuing the tunnel to length of 2,000', and sinking 3 shafts, and possibly may build a small smelter.

MASCOTA MINING CO. MEXICO.

Office: Chicago, Ills. Mine office: Talpa de Allende, Mascota, Jalisco,

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Mex. Harry S. Church, vice-president and general manager. Lands, 32 pertenencias, known as the Ocotlán mine, 9 miles west of Talpa, in the cañon of the Ocotlán River, heavily timbered, furnishing fuel for ordinary mine operations. Mine shows a vein of 20′ to 60′ width, with a paystreak of 4′ to 20′, carrying auriferous and argentiferous copper and zinc sulphides. Development is by tunnels and shafts, showing a considerable quantity of ore. Property has been worked previously, by German and Mexican companies.

Power is furnished from the Ocotlán river. An experimental leaching plant was built in 1905. Smelter has roasting furnaces and a water-jacket blast-furnace. Heretofore the zinc values have been lost, but an effort is planned to save them. Property is considered promising. Presumably idle.

MASCOT COPPER CO. **ARIZONA.**

Offices: American Trust Bldg., Chicago, Ills., and Atlas Blk., Salt Lake City, Utah. Mine office: Dos Cabezas, Cochise Co., Ariz. Hon. H. H. Evans, president; David S. Stevenson, vice-president; J. C. Knapp, secretary; Geo. L. Ramsey, treasurer; L. G. Hardy, superintendent; E. A. Ely, assistant superintendent; Capt. B. W. Tibby, consulting engineer. Organized circa June, 1907, under laws of Arizona, with capitalization $10,000,000, shares $10 par, in $1,000,000 preferred and $9,000,000 common shares. Company has no connection with the Mascot Mining Co., operating in the same county.

Lands, circa 43 claims, including property formerly held by Dos Cabezas Consolidated Mines Co., said to be held under bonds aggregating circa $500,000. Lands show 5 parallel fissures, of about 70′ aggregate width, in addition to which the Skylight vein is claimed to be 200′ wide. Development is by the Consolidated tunnel, showing ore assaying 3 to 14% copper, with fair gold and silver values.

MASCOT MINING CO. **ARIZONA.**

Office: 1009 Majestic Bldg., Detroit, Mich. Mine office: Willcox, Cochise Co., Ariz. Christian Kern, president; Geo. F. Scheffer, vice-president; W. C. Rohns, secretary; J. A. Zahn, treasurer; Delos D. Jayne, general manager; C. W. Courtney, superintendent. Organized March, 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, circa $800,000. Company has no connection with the Mascot Copper Co., operating in the same county.

Lands, 35 claims, unpatented; area circa 700 acres, lying about 40 miles northeast of Willcox, in the Clark and Montezuma districts, on the western slope of the Graham Mountains, in the western part of Graham county. Principal holdings are partially owned outright, and balance paid for, except a $19,000 final payment on bond, payable by royalties from ore, and 5 additional claims are held under bond and lease, subject to a cash payment of $3,750. Lands, in 4 groups, within 4 miles of each other, show mainly granite, with some Carboniferous limestone, with frequent intrusive dykes of porphyry and rhyolite, carrying veins of 6″ to 20′ width, with copper and lead ores, occasionally with high silver and gold values, principal ores being malachite, azurite, chalcocite, chalcopyrite and galena, usually with gangue of quartz, but occasionally of decomposed limonite or hematite.

The Gold Cord group, 11 claims, shows a vein of 6″ to 22′ width, traceable 2,000′, opened to depth of 107′, with circa 1,300′ of workings. Ores are highly auriferous copper sulphides, assaying 1 to 3% copper only, with gold values up to circa $90 per ton, former shipments of circa 250 tons having given average returns of $58 per ton. Equipment at the Gold Cord includes a 30-h. p. boiler, pumps and a hoist.

The Iron Bell group, 9 claims, 3½ miles from the Gold Cord, carries a 3′ vein, opened by a 100′ shaft, showing ore assaying 1 to 15% copper and circa 1 oz. gold per ton.

The President group, 3 claims, about 1½ miles from the Gold Cord, shows

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porphyry and metamorphic granite, carrying a fissure vein of 3' to 4' width, having auriferous silver-lead ore, with quartz gangue, picked samples assaying up to 18 oz. gold per ton. Development is by a 180' shaft. The President ore is said to concentrate 10 into 1.

The Republic group, 5 claims, 2 miles from the Gold Cord, shows a vein of 4' to 22' width, carrying low grade ore giving assays in silver, lead and gold.

Buildings include an engine-house, smithy, boarding-house, and bunk-house. The company plans deepening the Gold Cord and President shafts.

MASCOT TUNNEL CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Has gold, silver and copper ores. Presumably idle.

MASHELL COPPER MINING & REDUCTION CO. **WASHINGTON.**

Office: 437 Banigan Bldg., Providence, R. I. Mine office: Etonville, Pierce Co., Wash. C. J. McCormick, president; J. M. Mansfield, secretary and treasurer. Limited development work has shown several small veins, giving good assay values in gold and copper. Idle since circa 1903.

MASON & BARRY, LTD. **PORTUGAL.**

Office: 87 Cannon St., London, E. C., Eng. Mine office: Pomarão, Alemtejo, Portugal. Jas. Francis Mason, J. P., M. P., chairman; W. H. Barry, deputy chairman and joint managing director; Edw. O. Barry, joint managing director and secretary; Wm. Neville, resident administrator; F. O. Harvey, consulting engineer.

Organized June, 1878, under laws of Great Britain and reorganized June 2, 1892, under laws of Great Britain, with capitalization £210,000, shares £1 par; issued, £187,172. Capitalization has been reduced, from £1,050,000, by returning to shareholders £1 per share, on 4 different occasions. Net profits, 1906, were £68,325, and dividends were £64,820; mining profits, 1907, were £61,216, and dividends were £55,551. Has paid dividends regularly since organization, these ranging from 15 to 65%. Recent dividends have been as follows: 13s. in 1901; 11s. in 1902; 7s. in 1903; 7s. in 1904; 7s. in 1905; 7s. in 1906; 6s. in 1907. The company has a staff pension fund.

Lands, near the Spanish boundary, are leasehold, lease having been renewed, 1908, for a 50-year term ending October, 1958.

The property, known as the San Domingos mine, originally was opened and extensively worked by the Romans, and has been operated by the present company, and its predecessors, since 1858. Development is by 3 shafts, of 340 meters depth each, sinking for the 370-meter level. Ore body is a mineral zone of about 200' width and proven length of circa 2,000', carrying lenses of cupriferous pyrite, averaging slightly under 1% copper and about 50% sulphur, principal values being in sulphur rather than in copper. With depth, the copper values of the ore decrease, slowly but steadily. The mine has had trouble from a fire on the 150-meter level, and the burning portion of the mine has been walled off.

The mine has about 700,000 tons of ore in teleras and tereros, containing circa 4,000 long tons fine copper. Ore reserves, at end of 1904, were 5,250,000 long tons, down to the 180 meter level, and are now materially larger.

There was a miners' strike, 1907, necessitating the calling out of troops, but this was ended in a week, with no serious damage done, some concessions being made to the workmen.

The company owns a railway to tidewater, with a shipping pier and tugs. Ore is sent to Great Britain, and, after burning for sulphur, the remaining cinder is leached for copper values.

Production was 6,088,320 lbs. fine copper in 1905 and 5,421,600 lbs. in 1906. Ore production, 1906, was 353,272 long tons, and in 1907 was 363,465

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long tons. The property is carefully managed, and has a long and honorable record as a producer.

MASON MANUFACTURING CO. **MICHIGAN.**

Works office: Houghton, Houghton Co., Mich. Livingston Whitney, president; Geo. F. Chauncey, vice-president and treasurer; Alfred Schwarz, manager. Organized circa August, 1905. Property is a 10-year lease of the Quincy sands, transferred August, 1907, from the Copper Concentrating Co. to the Mason Manufacturing Co. Is controlled, through ownership of entire stock, by the Houghton Concentrating Co., successor of the Copper Concentrating Co.

The mill is 72x122', with a wing of 38x58' containing the power plant, and stands upon sands wasted from the Quincy mill. Sands for reworking are taken from the lake by a 16x28' scow carrying a 12x24" pumphouse having a centrifugal sucker pump, connected by a 10" spiral pipe with the mill, the pipe having swing joints and being carried on bents. At the mill the sand is discharged into a launder, connecting with the boots of 6 endless-belt bucket-elevators, in 3 frames, each frame having 2 elevators, with 20" belts and buckets. Formerly the discharge from the elevating belts led to 6 roughing jigs, each with 5x15' sieves, which rejected about 80 to 85% of the material, leaving 15 to 20% for concentration. The sand retained was classified as coarse, fines and slimes, coarse sands being sent to crushing rolls and a Chilean mill, thence joining the fines and going to the finishing jigs. There were settling tanks for the slimes, the flow of diluted pulp through the tanks being very slow, settlers discharging through siphon tubes at the bottom, and slimes again going over oscillating tables. The company is using sundry inventions of the manager, who installed one section of 20 tables having Schwarz corrugated tops, and Schwarz classifiers. The Schwarz process is said to have been technically successful, but the general opinion of practical mill men is not especially favorable.

Power is furnished by a 250-h. p. gas engine, using producer gas, made from pea-coal. Equipment includes a 50-kw. generator for lighting and operating the sand-pump. Machinery is belt-driven throughout.

These works were designed for the largest tailings plant in the world, being of 2,000 tons nominal daily capacity, and Mr. Schwarz estimates that there are available 12,000,000 tons of tailings, assaying 0.42% copper, of which 70% is recoverable. There has been trouble with the gas producer, which has proven unreliable, and steam power may be substituted. The enterprise must be considered an experiment.

MASON VALLEY COPPER CO. **NEVADA.**

Dead. Was succeeded, January, 1907, by Mason Valley Mines Co. Formerly at Yerington, Lyon Co., Nev.

MASON VALLEY MINES CO. **NEVADA.**

Office: care of Geo. E. Gunn, general manager, Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. W. Mont Ferry, president; Jos. L. Lippman, vice-president; Frank Judge, secretary; Llewellyn Humphreys, consulting engineer; O. E. Cole, superintendent. Organized circa December, 1906, under laws of Maine, with capitalization $1,000,000, shares $1 par, as successor of Mason Valley Copper Co. Lands, 8 claims, 1 fractional, area 150 acres, including the Spragg mine, lying south of the Bluestone, showing a strong gossan, apparently opened on a contact deposit between porphyry and limestone, said to be of 70' average width, carrying a good showing of copper carbonates from surface, changing to sulphide ore, with excess of iron, at depth of about 100'. Has secured assays up to 55% in copper tenor, but principal values are in chalcopyrite, apparently averaging about 4% copper and $1 per ton in combined gold and silver values. Development is by a 1,000'

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tunnel. Has electric power and adequate mining equipment, employing circa 40 men. Property considered promising.

MASSASOIT GOLD & COPPER CO.

Office: 7 Water St., Boston, Mass. Location of lands, if any, unknown.

MASSASOIT MINING CO. UTAH.

Office: care of E. V. McGarrick, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Name changed, 1905, from Red Wing Extension Mining Co., to present title. Lands, 120 acres, adjoining the Red Wing, showing a 4' vein, giving average assays of circa 0.5% copper, 7% lead and 8.5 oz. silver per ton. Mine is said to show about 60,000 tons of ore. Idle several years.

MASS CONSOLIDATED MINING CO. MICHIGAN.

Office: 1105 No. 6 Beacon St., Boston, Mass. Mine office: Mass, Ontonagon Co., Mich. Mill office: Keweenaw Bay, Houghton Co., Mich. Employs circa 150 men. G. A. W. Dodge, vice-president; Wilfred A. Bancroft, secretary and treasurer; Jas. M. Wilcox, superintendent; preceding officers, Theo. O. Nicholson, John W. Lianell, Jr., Fred W. Hunton and Jerome P. Smith, directors; Jos. Satterley, mill superintendent; W. A. Brown, clerk; E. Fenner Douglass, engineer; Thos. Hall, mining captain; Samuel V. Bawlins, master mechanic at mine; Jas. Richards, master mechanic at mill.

Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,435,925. Paid in, $19. American Loan & Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent. Annual meeting, second Thursday in March. On Jan. 1, 1908, company had cash, accounts receivable and copper on hand, amounting to $128,454.04, with liabilities of $24,286.06, and on Oct. 1, 1908, had circa $80,000 cash on hand. In 1906 company lost, on operations, $193,696, and in 1907 loss was $59,378.

Present holdings of the Mass Consolidated include lands formerly held by various owners as five different mines. Considerable of the real estate stands in the name of the Ridge Mining Co., which, at last accounts, had not been wound up, though the Mass Consolidated is supposed to own practically all of the outstanding stock, and plans winding up the Ridge and transferring its property to the Mass Consolidated. The lands were secured largely through tax-titles, the principal property being the old Ridge mine, but the name Mass was taken in preference to Ridge, from one of the old mines, because the title to the Mass was clear, by purchase. The old Ogima Mining Co. was not wound up until after the Mass was organized, and the Ogima lands were held originally by tax title, but a better title was secured later. Circa 1863, the Ogima Mining Co. transferred, to the Evergreen Mining Co., all right and title to the Evergreen bed under the entire Ogima territory, in exchange for which the Evergreen deeded to the Ogima 16 acres of land from its northeast corner, adjoining the Ridge mine, to enable the Ogima to sink its shafts and work the cupriferous beds lying south of the Evergreen lode. The existence of this old agreement, between the Evergreen and Ogima, was unknown to the present management, at the time of taking charge, but notice was given by the Evergreen, in 1903, that mining on the Evergreen bed must be discontinued, when operations were transferred to the Knowlton and Butler lodes, the management keeping quiet about this trouble, in the hope of coming to an agreement with the Evergreen Mining Co., but such an agreement was not reached, and the entire matter became public March, 1908.

Mineral lands, area circa 2,400 acres, are in a very irregular but fairly compact tract, in Sections 33, 34 and 35, T. 51 N., R. 38 W., and in Section 1, T. 50 N., R. 39 W., bounded on the north by the Union, Adventure and farm lands, on the east by the Adventure, Toltec and Evergreen, on the south by

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the Flint Steel and the Knowlton mine of the Adventure, and on the west by the Flint Steel, Adventure and St. Mary's Mineral Land Co. Lands include three old mines, the Ridge, Mass and Ogima, also two old prospects, the Merrimac and Hazard, joint production of which, under previous managements, was 11,131,023 lbs. fine copper. The Ridge mine, operated 1850-1874, made 5,134,449 lbs. copper, and paid dividends of $100,000. The old Mass mine, opened 1856 and worked intermittently until 1886, secured a total output of 5,014,266 lbs. copper, and the Ogima, opened 1860 and closed 1868, made 982,308 lbs. copper. The Merrimac and Hazard were early-day explorations, without recorded production. These five properties are described, in detail, in Vol. II.

The Mass tract carries six of the seven cupriferous amygdaloids of the Evergreen belt, these varying greatly from point to point, but averaging about 10' width, with a sharp bend in their strike, this varying from N. 32° E., on the north, to N. 37° E. at the southern boundary. The dip of the lodes varies from 38° at the Ridge to 47° at the old Mass mine. The copper-bearing beds of the Evergreen belt on the lands of the Mass Consolidated are as follows, from north to south:

1. Knowlton. Carries heavy copper and stamp rock.

2. Mass. Lies 140' south of the Knowlton and carries a little heavy copper and stamp rock.

3. North Butler. Lies about 75' south of the Mass bed, and is wide and fairly mineralized in places.

4. Butler. Lies about 200' south of the North Butler, is 12' to 35' wide, and very bunchy, carrying mainly stamp copper, with occasional masses.

5. Ogima. Lies about 100' south of the Butler. Is mainly a stamp lode, with some barrel-work and occasional masses. Is 10' to 25' wide but shows little good ground.

6. Evergreen or Ridge. Lies about 250' south of the Ogima and is the best lode of the property, ranging 4' to 40' in width, and usually being richest where widest. Is very bunchy, but shows some excellent stopes, yielding heavy copper and stamp rock.

The Mass has openings on all of its copper-bearing beds, and rock is hoisted through the nearest shaft, lodes being connected by crosscuts on various levels. The Mass carries the outcrop of the lodes of the Evergreen belt for about 1½ miles. Shafts A and B are connected, on the Butler lode, down to and including the eighth level. The mine, as a whole, is notably rich in mass copper, and carries considerable silver values, but the ground is exceedingly bunchy, and ranges from very rich to absolutely barren. Considerable rock selection is made underground, and culls are used for filling.

Mining and tramming are done on company account, but, by a competitive system, introduced by Capt. Wilcox, exceedingly good results are secured. Daily, weekly and monthly reports of drilling and tramming are made, and laid before the workmen. As a result, the trammers are now averaging 18 tons daily, per man, as against 9 tons in 1906, while the drill-runners are doing practically double the work of two years ago, the lead in drilling being held by Wm. Hocking, aged 63, with an average of 50' to 60' of holes per shift, which is a phenomenal record, in such hard rock. The mine has an exceptionally good crew of men, and, in January, 1908, produced, with 148 men, including surface employes, 109 tons of stamp-rock per man, or about double the average production of the district as a whole.

A shaft, 1,757' deep, formerly known as the Ridge, has 8 compartments, sunk on the Evergreen bed and connected with the Butler lode by crosscuts on several levels. The Evergreen bed in this shaft runs 8' to 10' in width, showing considerable rock of good grade. The old shafthouse was burned,

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1905, and was replaced by a head-frame. Rock from this shaft goes by gravity, over an 875' tram, to the rockhouse at B shaft.

B shaft, 875' southwest of A, is old No. 3 Ridge shaft, cut down to 2-compartment size, and is bottomed at a depth of 1,857'. The levels are of varying depths, owing to the old workings having 60' levels, while some of the newer levels at the bottom are 135' apart. Deep levels permit a considerable saving in drifting through poor ground, and sub-drifts can be run wherever needed. B shaft is on the Evergreen lode, upon which the major portion of the openings have been secured, but the Butler has been reached by crosscuts on numerous levels, and shows some good stopes, and the North Butler supplies some fair stamp and barrel copper. The Knowlton bed has been opened also, by a crosscut on the 7th level, and shows good stamp-rock and considerable heavy copper. The main reliance, however, is upon the Evergreen, which is a strong amygdaloid, with plainly defined walls and a dip of 43°, showing some good stopes, of 20' to 25' width. The Evergreen, while exceedingly bunchy, and carrying heart-breaking stretches of almost barren ground, shows beautiful stopes occasionally.

C shaft, 2,148' southwest of B, with collar 100' higher, is 1,000' deep. This is the old Ogima shaft, cut down, retimbered and deepened, and is sunk on the Butler bed, which makes a fair copper showing, with crosscuts to the Evergreen. It is planned eventually to connect the workings of C with A and B shafts.

D shaft, circa 800' southwest of C, is only 150' deep, and is idle.

There are a number of old shafts, the 450' main shaft of the old Mass mine proper having 7 levels, opened on the Knowlton lode. This was pumped out, 1901, and the showing pronounced satisfactory. The Ogima lode has been opened at several points, by crosscuts from A and B shafts, and was found bunchy, though showing occasional good stopes.

The shaft-rockhouse at B is of wood, iron-sheathed, 48x65' in size, and 80' high, equipped with a steam hammer, 2 Blake crushers and a 12x24" Nordberg engine. C shaft has a 40x55' shaft-rockhouse. Rockhouses have been equipped with ingenious devices permitting automatic handling of rock, which clears itself by gravity, 4 men now doing the work formerly done by 14 men.

The central power-house, 48x150', of wood, iron sheathed, between A and B shafts, has a 24x48" Allis-Chalmers duplex hoist with 10' drums having 11' faces, grooved for 1½" cable, good for one-half mile depth, operating two 6-ton skips, one in each shaft, in counterbalance. The power plant includes a 50-drill Rand 2-stage cross-compound air-compressor, a 75-kw. dynamo for electric light, and two 250-h. p. Stirling boilers.

In addition to the usual mine buildings, there are about 60 good dwellings. The company also has a townsite, Mass City, which is the terminus of the Mineral Range railroad, and a station on the C., M. & St. P. railway, having a number of business houses.

Some diamond drilling was done, during 1905, on the belt of mineral beds parallelling the Evergreen belt and lying circa 2,000' north of the Knowlton lode. This belt includes the Minnesota conglomerate, Calico amygdaloid, and the branch veins associated with these two beds, as opened at the Michigan mine. A shaft has been sunk 130' on the Minnesota conglomerate, which gave a somewhat encouraging copper showing.

Considerable drilling was done, 1907-1908, in search of the amygdaloid opened by the Lake Copper Co., and the other copper-bearing amygdaloids from which the Adventure secured drill-cores. A drill-hole, bored from the fifth level of A shaft, cut a 12' bed carrying considerable copper, and other promising cores have been secured. Apparently there is some question as to

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whether the company can or cannot work the beds found by the Adventure drill borings, on 320 acres of the Mass lands.

The Mass mill is at Keweenaw Bay, on an arm of Lake Superior, at the junction on the Mineral Range and Duluth, South Shore & Atlantic railways, 16 miles south of Houghton and 34 miles northeast of the mine, with ample sand-room, deep water and immunity from heavy seas. The 90x232′ mill, built by the Wisconsin Bridge & Iron Co., is of steel frame on stone foundations. Equipment includes 2 Nordberg stamps, having vertical mortar-grates supplied with automatic hydraulic cleaning devices. Each head has a nominal stamping capacity of about 525 tons daily, with actual daily average duty of 480 to 500 tons. A Parnall-Krause atmospheric stamp of small size reduces oversize material from the stamp-mortars. The Mass did stamping for the Michigan, with one head, until Sept. 1, 1906.

The 30x60′ boiler-house, at the mill, is of wood, with iron sheathing and truss roof, housing two 225-h. p. Stirling boilers. Ashes and cinders are washed into the lake, through a launder.

The 40x70′ pump-house has a 16,000,000-gallon Nordberg vertical pump, fed from a 12x30′ well, with bottom 6′ 6″ below mean water-level, connected with a tunnel running 300′ under the bed of the bay to the intake.

A 1,000′ wharf, also serving as a breakwater, has 18′ of clear water at its end, equipped with three towers and derricks, capable of unloading coal vessels at the rate of 900 tons daily. Coal is taken from the wharf, in 3-ton cars, by a 14x20″ hoist, to a 1,500′ trestle of 20,000 tons storage capacity.

The mill also has a 30x40′ warehouse, with office in front, a smithy, machine shop and about a dozen dwellings, on a townsite platted by the company, this also having several business buildings.

Production has been as follows: 2,576,447 lbs. in 1903; 2,182,931 lbs. in 1904; 2,007,950 lbs. in 1905; 2,106,739 lbs. in 1906; 2,078,677 lbs. in 1907. During the latter half of 1908 the mine was making circa 110 tons of mineral monthly, which will give a decreased output for the year. For 1906, rock hoisted was 240,550 tons, of which 185,789 tons were stamped, yielding 3,055,175 lbs. of mineral, returning 2,106,739 lbs. fine copper. For 1907 rock hoisted was 231,018 tons, of which 204,599 tons were stamped, yielding 571,500 lbs. of mass copper and 2,334,820 lbs. of mineral, with a net production of 2,078,677 lbs. fine copper, the proportion of mass copper per ton stamped being 0.14%, percentage of mineral per ton of rock stamped, 0.57%, and percentage of fine copper secured, per ton of rock stamped, being 0.508, or 10.16 lbs. fine copper per ton. The Evergreen bed formerly was producing 75 to 80 tons of mineral monthly, but this has been reduced to about 25 tons per month, by reason of loss of the lode on the Ogima lands.

Costs of the Mass are very high on copper, owing to the low grade of rock stamped, but probably are the lowest in the Lake Superior district on the basis of rock tonnage. For January, 1908, costs were 83 cents per ton for mining, 17 cents for rail transportation and 35 cents per ton for milling, a total of $1.35 per ton. If the rock averaged three-fourths of 1% fine copper, the mine could be made to pay handsomely, but, unfortunately, outside of the Evergreen lode, only about one-third of the rock opened averages as high as 0.75% copper, balance of openings being in shafts, crosscuts and barren drifts. The local management of the Mass is exceptionally efficient, but it is obvious that the future hope of the property rests either in securing the right to mine the Evergreen lode, where now cut off, or in developing new beds carrying payable copper at the southern end of the property, in line with the important and highly promising discoveries of the Lake and Adventure mines.

MASSEY STATION MINING CO., LTD. ONTARIO.

Office: 2501-43 Exchange Place, New York, N. Y. Mine office: Massey

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Station, Algoma, Ont. John W. Thompson, president; Robt. McKay, secretary; Jos. Errington, general manager. Organized 1900, under laws of Ontario, with capitalization $1,000,000, shares $100 par. Is closely connected with the Orford Copper Co., which is controlled by the International Nickel Co., and is said to have expended circa $300,000 on development and equipment. Lands, 640 acres, also 160 acres miscellaneous lands, in Salter township, showing 6 ore bodies, of which 2 developed average 10′ width. One vein has been traced for 4,000′, and opened to a depth of circa 600′, by a shaft having 7 levels, opened 80′ apart, with considerable drifting on each level. This shaft develops a vein 9′ wide at surface, and 12′ at the bottom of shaft, carrying ore of 3 to 5% copper tenor, with traces of gold and silver, and occasional ore of much higher grade. Vein dips at 85°, and the mine is said to have upwards of 50,000 tons of ore blocked out for stoping.

The ore is a finely disseminated, siliceous chalcocite above, succeeded by bornite and in turn by chalcopyrite with similar gangue, not adapted to wet concentration, owing to excessive sliming, hence a 50-ton experimental oil concentrator, using the Elmore process, was installed. Mining plant includes 6½x8″ and 10x12″ Lidgerwood hoists, and a 6-drill Ingersoll-Sergeant air-compressor. Property considered promising and management good. Presumably idle.

MASTODON GOLD & COPPER CO. [illegible]

Dead. Had an office in Spokane, Wash., circa 1899.

GEWERKSCHAFT KUPFERBERGWERK MAXIMILIAN. GERMANY.

Mine office: Nieder-Ludgwigsdorf, Schlesien, Germany. Has 2 shafts, the Amalia of 75 metres, and the August of 25 metres. Employs 40 to 50 men and makes about 175,000 lbs. fine copper yearly.

MAY DAY MINING CO. UTAH.

Dead. Succeeded by May Day Mining & Milling Co. Formerly at Eureka, Juab Co., Utah.

MAY DAY MINING & MILLING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. John Dern, president; preceding officer, W. S. McCornick, Jas. Chipman, M. P. Braffet and N. S. Neilson, directors; C. C. Griggs, superintendent. Capitalization was increased, June, 1907, to $800,000, shares $1 par. Is controlled, through ownership of one-half of stock issue, by Uncle Sam Consolidated Mining Co. Former dividend ratio was 1% monthly, and dividend July, 1908, was 1½ cents per share, amounting to $12,000. Paid $64,000 in dividends in year ending Apr. 1, 1908, leaving a balance of $9,084.11, which is an extremely small working balance for a dividend-paying mine.

The mine is operated in connection with the Uncle Sam, and ore is extracted through the Uncle Sam shaft. The property is said to have a 15′ ore body, between the 100′ and 200′ levels. Principal values are in gold and silver, ore carrying a little copper, secured as a by-product.

The mill, rated at 50 tons daily capacity, was treating about 80 tons daily, July, 1908, on two 8-hour shifts. A tram-line has been built from the mill to the old dumps, which are to be concentrated.

Production, 1907, was 153 carloads of ore and 15 carloads of concentrates, valued at $151,337.35. Property is considered valuable and well managed.

MAYFLOWER MINING CO. MICHIGAN.

Office: 825-60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. H. F. Fay, president; Geo. C. Endicott, secretary and treasurer; preceding officers, John C. Watson, Manning Emery and Stephen R. Dow, directors. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $8 paid in. Annual meeting, third Wednesday in March.

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Lands, 840 acres, in Sections 7 and 8, T. 56 N., R. 32 W., also a millsite on Torch Lake. The Kearsarge mine lies to the north, Old Colony to the south and the South Kearsarge and Wolverine mines to the west. Exploratory work was begun in 1899 and ended March, 1906. No. 1, or Paull shaft, 400′ deep, has considerable drifting on the first and second levels, and a crosscut opens two parallel cupriferous amygdaloids, showing occasional patches of copper, but nothing of promise. No. 2, or Isle Royale shaft, 160′ deep, has several hundred feet of drifting and shows a bunchy amygdaloid, 10′ to 12′ wide, carrying more or less copper in a 2′ streak next to the hanging wall. No. 3, or Sandstone shaft, is 60′ deep, in a soft and badly broken amygdaloid, all of the strata near the Eastern Sandstone being much disturbed. No. 4 shaft, 580′ deep, starts from surface on an unnamed amygdaloid lying approximately 2,000′ east of the Kearsarge bed, and at a depth of 425′ runs into a parallel amygdaloid lying 90′ to the eastward of the first bed. The copper showing is poor. A fairly complete geological cross-section has been obtained by drill-borings.

Surface improvements include a hoist good for 600′, boilers and air-compressor, with necessary buildings.

Cash balance, Jan. 1, 1908, was $43,650.85, company having received, during 1907, $35,000 from sale of land, with total expenses for year of $1,492.86. Idle.

MAY MINING CO. **ARIZONA.**

Office: care of M. L. Heffelman, manager, Sidney, Ohio. Mine office: Mayer, Yavapai Co., Ariz. Lands, 4 claims, 3 miles south of Mayer, in the Big Bug district, adjoining the Arizona Exploration Co. Has a 237′ shaft, with hoist good for 600′.

MAYO MINING CO. **MEXICO.**

Office: care of John E. Carnahan, Canton, Ohio. Mine office: Jesús María, Rayón, Chihuahua, Mex. Carlos Smythe, manager. Capitalization $1,000,000. Is a twin of the Mary Mining Co. Lands, said to be 3 mines, presumably 3 pertenencias, carrying argentiferous and auriferous copper ore. Presumably idle.

MAZAPIL COPPER CO., LTD. **MEXICO.**

Office: 47 Peter St., Manchester, Eng. Mine office: Concepción del Oro, Mazapil, Zacatecas, Mex. Works office: Apartado 17, Saltillo, Coahuila, Mex. Employs circa 3,000 men. Wm. Purcell, managing director; P. E. O. Carr, general manager; John Cooper, general mine superintendent; T. S. Abbott, engineer. Organized February, 1891, under laws of Great Britain; reorganized Apr. 21, 1896, and capitalization increased, 1903, to £300,000, shares £10 par; issued, £240,000.

Lands, 530 hectares, in 8 groups, comprising about half copper and half silver-lead claims. Principal properties are the Aranzazu and Cabrestante, producing copper ores, the San Elijio, Naranja, Cajon, San Francisco and Protrero, which are silver-lead mines, and the Promontorio group, producing fluxing ores. Copper ores occur in irregular masses, in limestone, near granite-porphyry contacts. In 1907 a 1,500-meter tunnel was started, from Concepción del Oro, to tap the Aranzazu mines at 500 meters depth, 200 meters below the present workings. It is expected that this tunnel, in addition to developing large ore bodies, will give sufficient water for the concentrator. The various mines of the company have 83 different shafts and tunnels.

The concentrator, at the mine, is of 150 tons rated daily capacity, but the district is arid, and operations are hampered frequently by shortage of water.

The property has 3 Roe aerial tram-lines, one, of 7 kilometers length,

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built by Ropeways, Ltd., of London, having 28 tons hourly capacity, connecting the Aranzazu mine with the smelter at Concepción del Oro.

The company has two reduction plants, one at Concepción del Oro and one at Saltillo, former being somewhat antiquated. The Concepción del Oro works include a 150-ton concentrator and a 500-ton smelter having 3 copper furnaces. It was stated, August, 1907, that the company planned remodeling and enlarging this plant to 1,000 tons daily capacity, at a cost of circa $250,000.

The Saltillo smelter, completed 1906, does a general custom business, in addition to treating ores of the company. Equipment includes electric power, with alternating current generators direct-connected to 2 Harrison-Fleming Corliss tandem-compound condensing air-compressors. The Saltillo plant has 4 blast furnaces and one reverberatory, and a converter department with 4 stands.

The company maintains 3 hospitals, with a staff of physicians, and owns extensive general stores for supplying the needs of its workmen.

The company controls the Ferrocaril Coahuila y Zacatecas, with 78 miles of main line, running from Concepción del Oro to Saltillo, and the company is said to plan building an aerial tram, to connect the mines with a railroad at San Pedro Ocampo.

Production has been as follows: 6,108,123 lbs. fine copper in 1903; 6,496,000 lbs. in 1905, and circa 7,250,000 lbs. fine copper, 7,000 tons pig lead, 1,200,000 oz. silver and 3,000 oz. gold in 1906, secured from 132,000 metric tons of ore, averaging circa 3.5% copper, 13 oz. silver and 0.02 oz. gold per ton.

MAZATZAL COPPER CO. ARIZONA.

Office: Jerome, Ariz. Mine office: Payson, Gila Co., Ariz. Jos. J. Shaw, president and general manager; J. N. Boardman, vice-president; E. A. Macpherson, secretary and treasurer; preceding officers, H. Cram, A. J. Murietta, C. H. Hooker, John Henry, D. W. Scott and A. H. W. Eckstein, directors; A. Stegman, superintendent.

Organized Jan. 6, 1907, under laws of Arizona; with capitalization $1,500,000, shares $5 par; issued, circa $1,065,000. Annual meeting, in January.

Lands, 33 claims, in process of patenting, area circa 650 acres, also a 5-acre millsite and sundry other lands, giving total holdings of 700 acres, circa 9 miles from Payson, in the Tonto basin, Mazatzal district, very difficult of access, about midway between Jerome and Roosevelt, and circa 80 miles northwest of Globe, from which point the property is best reached, at present.

Property shows various ore bodies, of which one, under development, apparently is a series of lenses, of about 35′ average width, traceable circa 1,000′ and proven to depth of 180′, with slate hanging and porphyry foot, carrying cuprite, azurite, malachite and copper glances, estimated to average 5.5% copper, 3% lead, 2 oz. silver and 40 cents gold per ton. Development is by a 40′ shaft and by tunnels of 470′, 435′ and 400′.

Equipment includes a 50-h. p. steam plant, with double-drum hoist and a 2-drill Ingersoll air-compressor, with 5 buildings.

Company plans sinking the shaft 200′, and extending No. 3 tunnel, known as the Bull Frog, and driving a tunnel to a second ore body. Property considered promising and management good.

MAZE MINE. JAPAN.

Mine office: Terado-muri, Nishi-Kambara-gori, Echigo, Japan. Mine, opened A. D. 1688, has several small veins, averaging 12″ width, carrying chalcopyrite and pyrite, frequently associated with sphalerite and galena, lying mainly in propylite. Ore yields 1% to 22% copper, with careful selection. Production, which decreased for some years, was 110,582 lbs. fine copper in 1900. No later returns of output and mine probably idle.

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MAZEPPA CONSOLIDATED MINING CO. **MEXICO.**

Dead. Was succeeded by Aguila Amalgamated Mining Co. Formerly at Hostotipaquillo, Ahualulco, Jalisco, Mex.

McALLISTER-ROWLAND COPPER MINING CO. **WASHINGTON.**

Dead. Property was an option on property of Ethel Consolidated Mines Co. Formerly at Index, Snohomish Co., Wash.

McCABE EXTENSION MINING & SMELTING CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: McCabe, Yavapai Co., Ariz. Reese M. Ling, president; E. B. McDowell, secretary. Organized July 14, 1906, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, adjoining the McCabe mine, have a 300' shaft. Company suffered internal dissensions, during which the original promoters stepped from under. Idle some years and apparently moribund.

McCONNELL COPPER MINING CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Lands, 10 claims, from which a little ore ranging as high as 50% copper has been produced in the past. Presumably idle.

McDONALD-ELY COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Ely, White Pine Co., Nev. David Keith, president; Col. Enos A. Wall, vice-president; Frank Knox, treasurer; Geo. W. Parks, secretary; preceding officers; Hon. Thos. Kearns, Frank K. Wescott and W. G. Lamb, directors; D. C. McDonald, manager. Organized November, 1906, with capitalization $5,000,000. Lands, 27 claims, area 425 acres, in the eastern part of the Ely district; 7 owned outright and 19 held under bond and lease, showing a prominent blowout. Mine is opened by tunnel and several shafts, including the Mill shaft of 40' and the Golden Gate shaft of 225', showing auriferous copper ore. Has steam power and a 6-drill air-compressor, with a 100-ton mill and cyanide plant remaining from former mining operations for gold. Management is composed of experienced and successful mining men.

McGREGOR COPPER CO. **AUSTRALIA.**

Office: Queen St., Brisbane, Queensland, Australia. Organized under laws of Queensland with capitalization £250,000, shares 10s. par. Idle.

McGREW & SCHWARTZ LEAD & COPPER CO. **ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. Has shafts of 80' and 100', showing good ore, and was developing at last accounts.

McKECHNIE BROS. **ENGLAND.**

Works office: Widnes, Lancashire, Eng. Works include an electrolytic refinery, of about 10 short tons daily capacity, having three 75-kw. generators and 234 tanks, with multiple arrangement of electrodes.

McKINLEY CONSOLIDATED MINES CO. **NEVADA.**

Dead. Succeeded the McKinley Mining & Smelting Co., of unfortunate memory, and was succeeded by the Willard-Ely Copper Co. Formerly at Ely, White Pine Co., Nev.

McKINLEY MINES, LTD. **BRITISH COLUMBIA.**

Office: care of A. M. McKenzie, secretary, Rossland, B. C. Mine office: Franklin, Boundary district, B. C. B. Lequime, president; H. W. Warrington, vice-president; C. L. Hammond, managing director; A. D. McPhee, superintendent. Lands, 4 claims, on the north fork of Kettle River, about 20 miles above Grand Forks, having an 80' tunnel, said to show a vein of 12' extreme width, carrying low to medium grade auriferous and argentiferous copper ore. Property considered promising. Idle.

McKINLEY MINING & DEVELOPMENT CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Iron Springs, Yavapai Co., Ariz. Chas. E. McKinley, president and general manager; Geo. P. Ireland, vice-

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president; Dr. H. T. Southworth, secretary; W. H. MacKay, treasurer; preceding officers and LeRoy Anderson, directors. Organized 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 38 claims, area 760 acres, including the Dixie group, 6 claims, showing veins of 5' to 15' width, carrying auriferous and argentiferous copper ore, and the Peacock group, 11 miles south of Prescott, in the Copper River district, carrying a vein of 60' estimated width, said to give average assays from surface ore, of 3.7% copper, with good gold values, and assays up to 15% copper, 5 oz. silver and $6 gold per ton, from sulphide ores in a 200' shaft.

Company reports that it has steam, electric, water, gasoline and air power, with 2 hoists and a $60,000 order placed for a complete mining equipment, including air-compressors. Has 12 buildings. Management plans installing a 30-stamp mill and continuing development work on a considerable scale. Employs about 20 men, and plans increasing forces materially.

McKINLEY MINING & SMELTING CO. NEVADA.

Dead. Succeeded, circa 1906, by McKinley Consolidated Mines Co., also dead. Formerly at Ely, White Pine Co., Nev. Described Vol. VI.

McMILLEN-STONEWALL MINING CO. ARIZONA.

Office and mine: Globe, Gila Co., Ariz. V. Y. Smith, president and general manager; H. L. Coombs, treasurer. Organized March 27, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 32 claims, circa 20 miles east of Globe, carrying 3 miles of the strike of the Stonewall Jackson vein, of 40' to 100' width. The Stonewall Jackson mine, worked prior to 1883, is said to have produced about $500,000 worth of ore, carrying mainly silver values. Development is by the 3-compartment 200' McMillen shaft, and the old 600' Stonewall Jackson shaft, latter showing no stoping done below 230'. Equipment includes a 5-stamp mill and cyanide plant.

MEADOW MINING CO. MICHIGAN.

Office: 50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. Wm. F. Fitzgerald, president; John Brooks, secretary and treasurer; Wesley Clark, agent. Organized 1898, under laws of Michigan, with capitalization $1,500,000, shares $25 par, as a reorganization of corporation of same name organized 1863, under special Michigan charter. Lands, 301 acres, adjoining the Humboldt and Phœnix mines, carrying the Ashbed lode, which was first opened 1851, with a little mining previous to 1860. The Ashbed is crossed by several transverse fissures, showing pits of prehistoric miners, and a little copper has been obtained therefrom. Fully described Vol. II.

MEADOW MOUNTAIN MINING CO. COLORADO.

Offices: Aspen, Colo., and Bangor, Me. Mine office: Crystal, Gunnison Co., Colo. F. O. Beal, president; J. T. Stewart, vice-president and general manager; Victor Brett, secretary; J. T. Bowler, treasurer; W. Parker Nelson, assistant secretary and treasurer; preceding officers and C. W. Coffin, directors; John Meters, mine superintendent. Organized under laws of Colorado, with capitalization $100,000, shares $1 par.

Lands, 6 claims, area 70 acres, also a 5-acre millsite, in the Rock Creek district, carrying 5 fissure and contact veins, latter between limestone and shale, of which 2, under development, average 5' width and carry chalcopyrite giving average assays of 3.5% copper, 4% lead, 23% zinc, 6 oz. silver and $1 gold per ton. Has shafts of 100', 130', and an 800' tunnel, with about 2,750' of underground openings, estimated to show 1,000 tons of ore blocked out for stoping. Has gasoline power.

MEDICINE BOW'S MINES CO. WYOMING.

Office and mine: Centennial, Albany Co., Wyo. Employs 3 men. Jas. Christensen, president; G. B. Simmons, vice-president and superintendent;

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Wm. Benton, secretary, treasurer and general manager; preceding officers, Corlett Downey and Ralph W. Morse, directors. Organized Sept. 19, 1903, under laws of Wyoming, with capitalization $100,000, shares $10 par.

Lands, 10 claims, unpatented, area 200 acres, also a 5-acre millsite, in the Holmes district, showing syenite, granite, diorite and limestone, ore bodies occurring as fissures in syenite and granite, and as contact deposits between limestone and serpentine. There are 8 ore bodies, of which one, known as the Cuprite vein, under development, is of 15′ average width, traceable circa one mile, carrying chalcocite, bornite and chalcopyrite, with some oxidized ore, estimated by company to average 5% copper, 3 oz. silver and $4 gold per ton. Test shipments have returned 7 to 15% copper, 2 to 12 oz. silver and $3 to $18 gold per ton. Development is by 10 pits and shafts of 10′ to 80′ depth, and a 960′ tunnel. The company estimates 40,000 tons of ore in sight, with 16,000 tons blocked out for stoping. Property was idle, 1905-1907, but was reopened, 1908, on a small scale.

MEDINA COPPER CO. **ONTARIO.**

Office: 520 University Blk., Syracuse, N. Y. Mine office: El Dorado, Hastings Co., Ont. Organized under laws of Washington, with capitalization $750,000, shares $1 par, practically as successor of the Medina Gold Mining Co., which went out of business suddenly, after paying several dividends, presumably unearned. Apparently has disposed somehow of its lands at El Dorado, to the Ontario Copper Co., which is practically under the same management. Is not regarded favorably.

MEDINA GOLD MINING CO. **ONTARIO.**

Dead. Succeeded, circa 1907, by Medina Copper Co. Formerly at El Dorado, Hastings Co., Ont. Described Vol. VI.

MEDORA MINE. **MICHIGAN.**

Owned by Keweenaw Copper Co.

MEGORRIS COPPER CO. **ARIZONA.**

Mine office: Silver Bell, Pima Co., Ariz. Mervin Rice, president; W. H. Coe, secretary. Capitalization, $600,000. Lands, sundry claims, in the Old Hat district, said to show good ore. Not favorably regarded, idle some years and apparently moribund.

MEGUNTICOOK GOLD & COPPER MINING CO. **COLORADO.**

Office and mine: Lake City, Hinsdale Co., Colo. P. G. Dawson, local director, at last accounts. Capitalization $400,000, shares $5 par. Idle and apparently hopelessly insolvent.

GRUBE MEHLBACH. **GERMANY.**

Letter returned unclaimed from former office, Wellmünster, Hessen-Nassau, Germany. Has auriferous and argentiferous lead, copper and zinc sulphides, with steam and electric power.

MELBA MINING CO. **ARIZONA.**

Dead. Formerly at Patagonia, Santa Cruz Co., Ariz.

MELCZER MINING CO. **MEXICO.**

Office: 1104-27 William St., New York, N. Y. Mine office: Pesqueira, Ures, Sonora, Mex. Company holds direct title to property formerly claimed by the Copete Mining Co., and transferred later thereby to Copete Consolidated Copper Co. For further light on a complicated and rascally situation, see Copete Mining Co.

MELKEDALEN COPPER MINES, LTD. **NORWAY.**

Dead. Reorganized, 1904, as Melkedalen, Ltd. Formerly at Evenaes, Ofoten Fjord, Tromsö, Norway.

MELKEDALEN, LTD. **NORWAY.**

Office: 23 Leadenhall St., London, E. C., Eng. Mine office: Evenaes, Ofoten Fjord, Tromsö, Norway. Geo Book Mee, chairman; W. A. Stearns,

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secretary; J. D. Holman, consulting engineer. Organized Apr. 26, 1904, under laws of Great Britain, as a reconstruction of the Melkedalen Copper Mines, Ltd., with capitalization £125,000, shares 10s. par; issued, £78,103. Lands, 440 acres, freehold. An electric railroad, connecting mines with the sea, was under construction, 1908. Mill, near Rosevanden, rated at 150 tons daily capacity, was begun June, 1907. Company plans operations on the basis of a yearly production of 60,000 tons of iron pyrites and cupriferous pyrites, to be exported.

MELROSE COPPER MINE. **AUSTRALIA.**

Office: 10-114 Pitt St., Sydney, Australia. Mine office: Condoblin, Cunningham Co., N. S. W., Australia. H. Ernest A. Miller, managing director and secretary; Geo. Eason, treasurer; preceding officers and Samuel Solomons, directors; Malcolm Darrach, mine superintendent. Organized Dec. 1, 1903, under laws of New South Wales, with capitalization £12,000, shares £5 par.

Lands, 2 claims, area 120 acres, held under 21-year lease from the crown, at 5s. royalty per acre yearly, with option of renewal, also a 10-acre water-right, in the Melrose and Condoblin districts. Property is well timbered, but water is scarce, nearest permanent water being the Lachlan River, 26 miles south. The government railway is 29 miles distant. Mine was first known as the Boone West, and later as the Anaconda.

Property shows uptilted Silurian slates, merging into schistose slate, carrying fissure veins with chutes, of which 4 are proven, these ranging 6′ to 20′ in width, 30′ to 50′ in length, and depth, proven on the Southern chute, of 280′. Development is by shafts of 95′, 280′, 65′ and 100′, and by a tunnel. No. 1 chute carries 3′ of chalcocite and 3′ of mixed ore. No. 2 chute has a paystreak carrying cuprite and chalcocite, balance of vein carrying chalcopyrite, of circa 4% tenor, with combined gold and silver values of circa 16s. per long ton, with gangue of altered iron sulphides. No. 3 chute shows 6′ of lead and copper ores. Values are erratic, ranging from 2.5 up to 30% copper, with a general average, for pay ore, of 6 to 8% copper, circa 3 oz. silver and 2 dwts. gold per ton. Management estimates about 15,000 long tons of ore in sight, with circa 8,000 tons blocked out for stoping.

The mine has no machinery equipment, using horsepower and windlass. Property considered promising.

MEMPHIS COPPER CO. **NEW MEXICO.**

Office: 601 Postal Bldg., Kansas City, Mo. Mine office: Organ, Donna Ana Co., N. M. J. I. McCullough, president and general manager; J. R. Bowersox, vice-president; Hill P. Wilson, secretary; F. M. Johnson, treasurer; preceding officers, C. B. Gill, G. F. Sanford, J. T. Wallace and A. M. Peck, directors. Organized June, 1905, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Has 2 shafts, of circa 175′ each, and shipped from same, 1905, ore worth $7,965, averaging 17.5% copper and 7 oz. silver per ton. Presumably idle.

MEMPHREMAGOG MINING CO. **QUEBEC.**

Mine office: Bolton Centre, Brome Co., Quebec. Property is the Smith mine. Idle some years.

LORENZO MENA. **CHILE.**

Office: Cabildo, La Ligua, Aconcagua, Chile. Mine office: Nipa, La Ligua, Aconcagua, Chile. Lands include La Mina Cata, at El Quenado, 9 kilometers from Cabildo, showing a vein of 6′ to 7′ average width, in granite, with strike N. 20° W., and dip of 78°, carrying cupriferous pyrite with calcite gangue, averaging only 4 to 5% copper tenor, and available mainly as a fluxing ore. Production, 1903, was circa 1,800 metric tons of 4% ore, secured by 35 men. La Mina Santa Rosa y Anexas has a vein of 2′ to 3′ width, opened to depth of 140′ and length of 200 meters, producing, 1903,

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circa 30 tons of 30% ore, after hand selection. Production, 1903, estimated at 125,000 lbs. fine copper.

MENDOCINO COPPER KING MINING CO. **CALIFORNIA.**

Mine office: Yorkville, Mendocino Co., Cal. Has slight development, by tunnel. Idle since circa 1903.

MENDOZA CONSOLIDATED COPPER CO. **MEXICO.**

Office: 709-104 North Spring St., Los Angeles, Cal. Mine office: La Paz, Sur, Baja California, Mex. Juan H. Mendoza, president; Jesse J. MacDonald, general manager. Has auriferous and argentiferous lead and copper ores, carrying values mainly in the precious metals. Has a mill with crushers, 10-stamps and a Huntington mill. Was said to employ circa 150 men, at one time, which probably was an overestimate. Idle at last accounts.

MENLO PARK COPPER MINING CO., LTD. **NEW JERSEY.**

Dead Formerly at Menlo Park, Middlesex Co., N. J.

SOCIEDAD ANOMINA COBRES DE MENORCA. **SPAIN.**

Offices: Gran Via, 32, Bilbao, Spain. Mine office: Mercadal, Mahón, Menorca, Spain. Cirilo de Gana, president; Fernando Olascoaga, vice-president; Manuel de Ozamir, secretary; Esteban Puego, managing director; Baron de Prisbuer, purchasing agent; Santiago de Arechago, consulting engineer. Organized October, 1901, under laws of Spain, with capitalization 2,000,000 pesetas, shares 250 pesetas par, 35% paid up.

Lands, 411 hectares, including the Rubia, Partida, Emilia and other copper mines, at the base of Mt. Toro. Presumably idle.

JOSÉ DEL C. MENSES. **CHILE.**

Mine office: El Cobre, La Ligua, Aconcagua, Chile. Property is La Nueva and La Esperanza mines, showing a vein of 2 meters average width with northeasterly-southwesterly strike, carrying sulphide ores. In 1903 produced circa 600 tons of 5% copper ore with 14 men.

AKTIESELSKABET MERAKER GRUBER. **NORWAY.**

Office and mine: Meraker, Trondhjem, Norway. P. C. Seelberg, chairman; Edmund Harbitz, vice-chairman; Fr. Krohg, secretary; R. Sivertsen, treasurer; Joh. C. Andresen, managing director; M. Rasmussen, superintendent; Harold Dahl, mill superintendent. Organized 1906, under laws of Norway, with capitalization 1,200,000 kroner, shares 500 kroner par. Ore carries 1.5 to 6% copper, and 45 to 47% sulphur. Company plans an ultimate yearly productive capacity of 50,000 metric tons of ore.

MERCEDES COPPER CO. **MEXICO.**

Office: care of J. K. Franklin, Nogales, Ariz. Mine office: Santa Cruz, Magdalena, Sonora, Mex. Under development with a small force since circa 1905.

MERCER-SAN RAFAEL MINING CO. **MEXICO.**

Mine office: Tapalpa, Sayula, Jalisco, Mex. Lands are on the eastern slope of the Sierra Cacoma, circa 21 miles west of Ayutla. Topography is rugged, and claims are well located for development by tunnel. Property shows a wide belt of quartzite and diorite. Mine is an antigua, ores carrying gold, silver and copper values, with a little lead and zinc. Equipment includes a water-power installation, 5-stamp mill, cyanide plant and patio, and a concentrator is planned.

MERCER SYNDICATE. **ARIZONA.**

Mine office: care of W. H. Mercer, P. O. Box 56, Globe, Gila Co., Ariz. Lands, sundry claims, in vicinity of the Five Points property, on which a shaft was sunk in 1906. Presumably idle.

MERISSKI WORKS. **RUSSIA.**

Office: care of R. A. Richner, Batum, Russia. Mines office: Kutais, Russia. Production, 1899, was 164,092 lbs fine copper. Presumably idle.

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MERRILLA COPPER MINING CO. **AUSTRALIA.**

Mine office: Goulburn, N. S. W., Australia. Has a 124′ shaft, with crosscut at 112′, expected to cut ore.

MERRIMAC COPPER CO. **COLORADO.**

Dead. Formerly claimed to be located at Taylor, Colorado, which is not a postoffice.

MERRY ENGLAND SYNDICATE. **NEW GUINEA.**

Mine office: Port Moresby, New Guinea. Property, adjoining the Astrolabe, was under development, on a small scale, early 1908.

MESA MINING & REDUCTION CO. **ARIZONA.**

Dead. Formerly at Mesa, Maricopa Co., Ariz.

MESCALERO MINING & MILLING CO. **NEW MEXICO.**

Mine office: Roswell, N. M. Mine office: Parsons, Lincoln Co., N. M. J. A. Ryan, president; J. A. Cottingham, secretary; John S. Lenox, general manager; James E. Hunt, superintendent; John Kinnie, mill superintendent. Mine, developed by a 400′ tunnel, carries auriferous and argentiferous copper ores. Has steam and electric power, 20-stamp mill, concentrator, 100-ton cyanide plant and 50-ton smelter. Presumably idle.

MESCAL MINING CO. **ARIZONA.**

Office: Southern Trust Bldg., Little Rock, Ark. Mine office: Jerome, Yavapai Co., Ariz. Employs 10 men. Capt. Samuel B. Adams, president; Wm. M. Kavanaugh, treasurer; preceding officers, C. Traves Drennen, J. E. Leeper and Walter C. Miller, directors; J. Prather, secretary; Jas. F. Mowles, superintendent. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par.

Lands, 7 claims, 3 patented, in Mescal Gulch, near Mingus Mountain, showing fissure veins in slate and contact deposits between slate and diorite. Main ore body, of circa 3′ width, traceable circa 1,600′, opened to depth of 245′ by an 85′ shaft and tunnels of 220′ and 900′, with circa 1,200′ of workings, shows chalcopyrite assaying 1 to 2% copper, with a trace of gold.

Property has 5 buildings. Company plans continuing development by tunnel, and eventually sinking a shaft.

MESCAL MINING & MILLING CO. **ARIZONA.**

Dead. Formerly at Providence, Yavapai Co., Ariz.

MESSINA COPPER EXTENSIONS, LTD. **TRANSVAAL.**

Office: P. O. Box 1955, Johannesburg, Transvaal. Organized under laws of Transvaal, with capitalization £3,000, shares £1 par; fully issued. Lands, 100 base metal claims, on the government farm Mondfarlan No. 1435, near the Limpopo River, in the Zoutpansberg district, Transvaal. Nearly out of cash and reorganization proposed, at last accounts.

MESSINA (TRANSVAAL) DEVELOPMENT CO., LTD. **TRANSVAAL.**

Offices: 6 Princes St., London, E. C., Eng. Mine office: Berkenrode, Zoutpansberg, Transvaal. Arthur M. Grenfell, chairman; preceding officer, J. S. P. Samborne, J. P. Grenfell and R. J. Frecheville, directors; Wm. J. Challis, secretary; Chas. Stuart, chairman local board; C. H. Norman, secretary local board; J. M. Calderwood, consulting engineer; A. J. Fraser, mine manager.

Organized Jan. 30, 1905, under laws of Great Britain, with capitalization £110,000, increased, Jan. 27, 1908, to £200,000, shares £1 par. Debentures, £50,000 authorized, £43,500 issued, at 6%, and company authorized, 1908, an issue of £210,000 convertible debentures, at 6%, for retirement of outstanding debentures, acquisition of additional lands and general development.

Lands are 1,200 claims, on the farm Berkenrode, held under a 99-year lease from the Transvaal government, also 3 freehold farms, with a total area of circa 14,000 acres, to which the farm Vogelsang, adjoining the farm Berken-

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rode, and carrying the extension of the Messina ore bodies, was added, 1903. Lands formerly were in dispute with the Oceana Consolidated Co., Ltd., but satisfactory titles have been secured. Lands are near the Limpopo River, and water is available at fairly shallow depth. The property carries some timber fit for mining and building purposes, with good timber circa 50 miles distant.

The property shows extensive remains of ancient workings, with scoria from old smelting operations. Formation is mainly granite, carrying a mineralized zone of circa 1,300′ width, having 5 parallel veins, traceable several miles. There are two main ore bodies, of which the north main lode has been proven for 1,700′ length and the south main lode for 2,400′. Ore is largely chalcocite, with considerable bornite and chalcopyrite, and the property shows very high grade ore in quantity.

The mine is opened by 7 shafts, mainly shallow, No. 3 shaft being 315′ deep, with 3 levels opened, the bottom level, at 300′, showing a 42″ vein of chalcocite, giving average assays of 25.25% copper. Workings, July 1, 1908, aggregated 11,774′ in length, and for year ending June 30, 1907, development was 220′ of sinking and 3,328′ of drifting and crosscutting. Ore reserves, Jan. 1, 1908, were estimated at 15,423 long tons, averaging 24.04% copper, with 4,236 tons of second grade ore, assaying 11.06% copper, on surface. On July 1, 1908, the mine had upwards of 7,000 tons of high grade ore blocked out, for stoping. The figures of ore reserves are conservative, and, despite the exceedingly high average assay tenor, the estimates of values are reliable.

Equipment includes a double hoist and 3-drill air-compressor. Property has a number of good buildings, including shops, engine houses and dwellings for officials. Wood and coal are scarce, but it is thought that coal exists on the Rhodesian side of the Limpopo River.

The 50-ton mill, designed by Mr. Calderwood, begun work May 1, 1908. Equipment includes a Blake crusher, delivering ore to a 70-ton bin, whence it is fed automatically to coarse crushing rolls, and delivered therefrom to a bucket elevator, which leaves crushed ore at the top of the mill, whence it is delivered through spout to the first of a series of 4 revolving trommels having water sprays. Mill equipment includes Hartz jigs, 2 Wilfley tables and classifiers. The mill has a monthly productive capacity of about 250 long tons of concentrates, averaging 64.06% copper, with rich middlings and slimes accumulated for future treatment. The mill has reservoirs for water supply, obtained from the mine and a well, and fuel is gas, obtained from a Tangye suction gas producer plant, retorting charcoal.

Transportation facilities are poor, consisting mainly of donkey wagons from the mine to Pietersburg, via Brak River, a distance of 180 miles, with a freight rate of £6 per ton. A new government wagon-road will aid greatly, and a railroad to the district is projected by the Transvaal government.

There is a shortage of native labor, which has hampered operations materially.

The management plans building a small smelter, to have a reverberatory furnace, and such a smelter should pay for itself within a short time, owing to high freight rates, though the scarcity of fuel might render smelting difficult and costly.

Considerable production has been secured, under disadvantageous circumstances, ore being hand-cobbed and brought up to high tenor on picking-tables and hand jigs. Production, for two years ending Dec. 31, 1907, was 2,616,000 lbs. fine copper. For fiscal year ending June 30, 1907, production was 2,967 long tons of ore, averaging 23.9% copper, by assay, of which 768 tons, 10 cwts., assaying 60.66% copper, were shipped to London, yielding 1,044,219 lbs. fine copper, realizing £24,626 and returning a net profit of £14,832. For fiscal year

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ending June 30, 1908, ore shipped averaged 58.03% copper, and yielded gross returns of £33,102.

The Messina is a property of exceptional promise, and has been excellently handled. It is the principal and only important copper producer of the Transvaal, and bids fair to develop into a large and profitable mine.

METALS MILLING CO. **ARIZONA.**

Mine office: Walker, Yavapai Co., Ariz. Geo. C. Marrs, superintendent. Property is the Shelton group, carrying auriferous and argentiferous copper ores. Has steam and electric power and 10-stamp mill.

COMPAÑIA METALURGICA. **CHILE.**

Office: Santiago de Chile. Mine office: Chuquicamata, Calama, Antofagasta, Chile. Organized March 9, 1905, under laws of Chile, with capitalization 2,500,000 pesos, shares 100 pesos par.

COMPAÑIA METALURGICA NACIONAL. **MEXICO.**

Is the Mexican incorporation of the National Metallurgical Co.

METATES MINING CO. **MEXICO.**

Letter returned unclaimed from former office, Columbus, Ohio. Mine office: Guadalupe de los Reyes, Cosalá, Sinaloa, Mex. Organized December, 1902, with capitalization $1,000,000, shares $1 par. Is controlled, through stock ownership by Sinaloa Exploration Co. Lands are circa 80 miles north of Mazatlán. Apparently moribund.

METHOW GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 77 Jamieson Blk., Spokane, Wash. Mine office: Winthrop, Okanogan Co., Wash. W. D. Scott, president; J. N. Tewinkel, secretary and treasurer. Organized, 1889, under laws of Washington, with capitalization $90,000, shares 5 cents par. Lands, 8 claims, area 150 acres, showing fissure veins in metamorphosed conglomerates of Huronian age, carrying sulphide ores assaying 9% copper, 2 oz. silver and $5.50 gold per ton, developed by a 52′ shaft and three tunnels, longest 564′. Has available water power and timber. Idle several years, except for annual assessment work.

METROPOLITAN MINING CO. **WASHINGTON.**

Mine office: Berlin, King Co., Wash. Ores carry gold, silver and copper. Has water power. Idle several years.

COMPAÑIA METALURGICA MEXICANA. **MEXICO.**

Office: 82 Beaver St., New York, N. Y. Mine offices, Sierra Mojada, Monclova, Coahuila, Mex., and Concepción del Oro, Mazapil, Zacatecas, Mex. Works office: San Luis Potosí, S. L. P., Mex. Employs circa 1,300 men. Robert S. Towne, president and treasurer; Geo. Foster Peabody, first vice-president; A. Foster Higgins, second vice-president; Chas. J. Nourse, Jr., secretary and assistant treasurer; Donald C. Brown, general manager; Geo. H. Carnahan, general mine superintendent; J. L. Saint-Dizier, assistant superintendent; C. M. Van Cleve, smelter superintendent; Frank W. Carnahan, engineer; T. L. Carnahan, local superintendent at Concepción del Oro; J. M. Williams, Jr., local superintendent at Sierra Mojada; W. K. Woodruff, local superintendent at San Luis Potosí.

Organized 1890, under laws of New Jersey, with capitalization $4,000,000, shares $100 par, in $1,000,000 cumulative 8% preferred, $1,250,000 guaranteed 6% second preferred, and $1,750,000 common stock. Bonds, $2,000,000, at 5%; sinking fund, 2% per annum of outstanding bond issue. Morton Trust Co., New York, registrar. Annual meeting, first Monday in June.

Property interests are extensive, including control of numerous subsidiary mining, transportation and land companies, among the more important being the Sombrerete Mining Co. and the Mexican Lead Co., at Sombrerete, Zacatecas, Mex., and the Montezuma Lead Co., Alvarez Lead & Timber Co., Mexi-

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can Mineral Railway Co. and Potosí & Rio Verde Railway Co. The company owns extensive tracts of timber lands, and has steam and electric power.

The Veta Rica mine, at Sierra Mojada, produces silver-lead and copper ores, latter averaging circa 3% copper, 5% zinc and 20 oz. silver per ton. Development is by a 600′ main shaft, and values are mainly in lead and silver.

The Cerro Prieto and adjoining mines, at Concepción del Oro, are developed by tunnels, producing auriferous copper ores.

The San Pedro and San Pablo mines are important producers.

The smelter, of circa 750 tons daily capacity, has a modern equipment throughout, including 12 furnaces for reduction of gold, silver and lead ores, and a special copper department of 100 tons daily capacity. The works have steam and electric power, and employ circa 1,000 men. The company is a large producer of lead and silver, with considerable outputs of copper and gold, secured mainly as by-products.

MEXICAN-AMERICAN SMELTING CO. **MEXICO.**

Letter returned unclaimed from former office, 24 Broad St., New York, N. Y. Works office: Guaymas, Sonora, Mex. Supposedly is controlled by Greene Gold-Silver Co. Property is a smelting plant, nominally rated at 250 tons daily capacity, apparently incomplete, and never blown in.

MEXICAN-ARIZONA MINING CO. **ARIZONA.**

Dead. Absorbed, 1903, by New England & Clifton Copper Mines of Arizona. Formerly at Clifton, Graham Co., Ariz.

MEXICAN COPPER CO. **ARIZONA.**

Dead. Formerly at Martinez, Yavapai Co., Ariz.

MEXICAN COPPER CO. **MEXICO.**

Mine office: Salinas del Peñon Blanco, Salinas, San Luis Potosí, Mex. Has steam and gasoline power and a small smelter. Idle.

MEXICAN COPPER REDUCTION CO. **MEXICO.**

Office: care of J. A. Haralson, vice-president and general manager, Mexico, D. F. Works office: San Luis de la Paz, Guanajuato, Mex. R. Marsans, president; J. E. Hartman, secretary; preceding officers, E. Benoit and O. C. Omer, directors. Property apparently consists of a patented process of reduction, by which the company expects to reduce ores without fluxes.

MEXICAN COPPER SYNDICATE, LTD. **MEXICO.**

Dead. Formerly had an office at St. George's House, Eastcheap, London, E. C., Eng.

MEXICAN DEVELOPMENT CO. **MEXICO.**

Office: 69 Wall St., New York, N. Y. Mine office: Coapa, Morelia, Michoacán, Mex. Geo. Buckman, president; G. E. Fauquier, vice-president; C. D. Knapp, Jr., secretary and treasurer. Organized 1906, under laws of Maine, with capitalization $2,000,000. Is a holding company only, controlling, through stock ownership, the Santa Emilia Copper Co.

MEXICAN EXPLORATION & MINING CO. **MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: Sauqui de Batuc, Ures, Sonora, Mex. Organized 1908, to take over all rights and concessions of the Yaqui Development Co. Has authorized a $1,500,000 bond issue. Is said to control, through ownership of 51% of issued stock, the Douglas Copper Co., and apparently was organized to finance the Douglas Copper Co. and its allied and subsidiary corporations. Lands are reported to be mineral rights to 2,165 square miles, including a number of antiguas.

MEXICAN INVESTMENT & DEVELOPMENT CO. **MEXICO.**

Office: 82 Wall St., New York, N. Y. Operating office: Guanajuato, Gto., Mex. Mine office: Autlán, Jalisco, Mex. Employs 150 men. Dwight Furness, president and general manager; B. Morgan Esler, vice-president; Wm. Eaton, secretary and treasurer; S. N. Craig, superintendent; H. P. Wherry, mill super-

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intendent. Organized under laws of Arizona, with capitalization $300,000, shares $5 par.

Lands, 158 acres, also miscellaneous lands of 2,100 acres, former including the Agua Blanca mine, area 40 hectares, 30 miles northeast of Autlán and about 75 miles from a railroad. The Agua Blanca, opened circa 1860, by John and Edward Blake, and the leading copper mine of Mexico for two decades, shows diorite and andesite, carrying fissure veins with a brecciated zone of 30′ to 50′ width, traceable 2,000′, carrying mainly chalcopyrite of 4 to 5% copper tenor, the Agua Blanca being unique among the copper mines of the district in carrying neither gold nor silver values.

Development is by a 150′ shaft and a 1,000′ tunnel, showing about 30,000 metric tons of ore.

Equipment includes a 75-h. p. steam plant at the mine, 25-h. p. hoist and 12 mine buildings, including a 20x40′ stone machine shop.

The 100-ton concentrator, 50x150′, of wood, has an 80-h. p. steam plant, 2 Sturtevant crushers of 200 tons daily capacity, 3 rolls, four 3-compartment jigs, 2 Wilfley tables and one slime table, putting about 8 into 1, and producing circa 300 tons of concentrates monthly, which are shipped, by mule, to Amaca, thence by rail to Aguascalientes smelter.

A hydro-electric power installation has been given tentative consideration. Company plans continuing development, and hopes to produce about 1,000,000 lbs. fine copper in 1909. Property considered valuable and management good.

MEXICAN MINERALS CO., LTD. **MEXICO.**

Office: 28 Budge Row, London, E. C., Eng. Letter returned unclaimed from former mine office, Zimapán, Hidalgo, Mex. S. Crowder, managing director. Organized under laws of Great Britain, with capitalization £36,000; issued, £31,507. Debentures, £10,000. Lands, 300 hectares, including the Montezuma mine, carrying auriferous and argentiferous ores of copper, developed open-cast, with a hydro-electric power installation. Idle several years and moribund.

MEXICAN MINES CORPORATION. **MEXICO.**

Office: 25 Broad St., New York, N. Y. Mine office: Baca, Hidalgo, Chihuahua, Mex. C. L. Graves, general manager; W. D. Pearce, resident manager; E. J. Ernest, mine superintendent. Organized under laws of Maine, with capitalization $3,500,000, and is protocolized in Mexico. Lands are 4 groups, including the Ventura mine, about one-half mile from the Mina Cigarrero, having a 230′ three-compartment shaft, showing fissure veins carrying streaks of auriferous and argentiferous copper below commercial grade. Is said to have developed a little ore of commercial tenor.

MEXICAN MINES SYNDICATE, LTD. **MEXICO.**

Letter returned unclaimed from former mine office, Cusihuriáchic, Iturbide, Chihuahua, Mex. Chas. Moffat, manager. Property is La Reina mine, carrying argentiferous and auriferous lead and copper ores, latter secured in small quantities, as a by-product. Has gasoline power and 3 Huntington mills.

MEXICAN MINING & DEVELOPMENT CO. **MEXICO.**

Office: 511 Baker Blk., Springfield, Mo. Mine office; Ocotlán, Oaxaca, Mex. S. W. Grant, president; J. A. Taylor, vice-president; C. E. Davis, secretary; H. Parmenter, treasurer; C. C. Goldsworthy, mine superintendent. Capitalization $1,250,000

MEXICAN MINING, REFINING & EXPLORATION CO. **MEXICO.**

Office: 501 L. W. Hellman Bldg., Los Angeles, Cal. Mine office: Hermosillo, Sonora, Mex. Employs 25 men. Wm. T. Calderwood, president and general manager; F. H. Vahrenkamp, vice-president; F. C. Lamb, secretary and treasurer; preceding officers, Chas. S. Montgomery, F. L. Wiles and E. B. Lovie, directors; F. Smith, superintendent; H. H. Light, engineer. Organized

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Apr. 20, 1904, under laws of Arizona, with capitalization $5,000,000, shares $1 par.

Lands, 104 hectares, in 2 groups, first being the Creston de Cobre, circa 25 miles west of Hermosillo, said to be an antigua dating from the eighteenth century. This group shows 5 ore bodies, of which 3, under development, are reported by the company as of 30′ to 40′ width, carrying oxidized and sulphide ores of copper and lead assaying 7% copper, 50% lead, 80 oz. silver and $8 gold per ton. Development is by 5 shafts, of circa 1,000′ aggregate depth, and by a 300′ tunnel, estimated to show 100,000 tons of ore, which seems entirely too high. Property has a 30-h. p. steam plant, with 2 hoists.

Lands also include La Cobriza group, at Soyopa, area 4 hectares, said to show a 16′ vein with a 7′ paystreak carrying ore of 10 to 25% copper tenor, with silver values.

MEXICAN MINING SYNDICATE. **MEXICO.**

Dead. Formerly at Acuitzio, Morelia, Michoacán, Mex. Described Vol. VII.

MEXICAN SMELTER CO. **MEXICO.**

Office: Chicago, Ills. Works office: Pedricefia, Cuencamé, Durango, Mex. Property is a 50-ton furnace, built on the patents of Jas. E. Anderson, using petroleum for fuel.

MEXICAN SMELTING CORPORATION. **MEXICO.**

Office: 678 Salisbury House, London, E. C., Eng. Works office: Monclova, Coahuila, Mex. Maj.-Gen. G. de la Poer Beresford, chairman; A. F. Roberts, secretary Organized Aug. 29, 1908, under laws of Great Britain, with capitalization £150,000, in 100,000 ordinary shares of £1 par and 1,000,000 shares of 1s. par. Debentures, £200,000 first-mortgage profit-sharing debentures at 6½% authorized; £15,600 issued. Lands, circa 3,000 acres. Company is said to plan a $1,000,000 smelter, to compete with the American Smelting & Refining Co.

MEXICAN SMELTING & REFINING CO. **MEXICO.**

Works office: Taxco, Alarcón, Guerrero, Mex. Lawrence Tatum, president and general manager; Fredk. M. Perkins, superintendent. Lands, 200 hectares, including several antiguas, principal being the San José mines, carrying auriferous copper ores, with values mainly in silver. Has gas power, and a 60-ton smelter with water-jacket blast-furnace and a small refining furnace.

MEXICAN UNION MINING CO. **MEXICO.**

Office: 753 Monadnock Bldg., Chicago, Ills. Mine office: Unión de Tula, Autlán, Jalisco, Mex. Newton B. Storer, president; Chas. G. Thompson, secretary; Wm. H. Lees, general manager; B. W. Sweet, mill superintendent and engineer. Organized April, 1902, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 100 pertenencias, area 247 acres, in the Ayutla district, including the Soquite Prieto mine, having a 30′ fissure vein, with laterals, in limestone, opened by a 275′ shaft, showing carbonate ores, chalcocite and chalcopyrite giving assays of 7% copper, 10 to 50 oz. silver and from a trace to $10 gold per ton. Has a 75-h. p. steam plant and is said to have contracted for the development of a water power. The 35-ton concentrator has a 7x9″ Dodge crusher, one train of rolls, one 5′ Huntington mill and 3 Overstrom tables.

MEXICAN WESTERN DEVELOPMENT CO. **MEXICO.**

Office: 71 Broadway, New York, N. Y. Mine office: Chamela, Jalisco, Mex. John Hays Hammond, president; Maj. Frederick R. Burnham, general manager. Lands include the Rosario, La Luz and other mines, in the Bramador district.

MEXICOLA GOLD-COPPER MINING CO. **COLORADO.**

Dead. Formerly at Howard, Frémont Co., Colo., and Cripple Creek, Teller Co., Colo. Described Vol. VII.

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MEYER-CLARK-ROWE MINES CO. **ARIZONA.**

Mine office: care of A. N. Forbes, agent, Tucson, Pima Co., Ariz. Lands, 7 claims, area 140 acres, known as the San Xavier group, 20 miles south of Tucson, showing argentiferous lead, zinc and copper ores. Is claimed to have 10,000′ of openings. Presumably idle.

MIAMI COPPER CO. **ARIZONA.**

Dead. The first company by this name, having Samuel L. Gibson as president, was organized 1905, with capitalization $500,000, shares $1 par, and was succeeded, Nov. 30, 1907, by present company of same name. Formerly at Globe, Gila Co., Ariz.

MIAMI COPPER CO. **ARIZONA.**

Office: 42 Broadway, New York, N. Y. Mine office: Globe, Gila Co., Ariz. Employs circa 150 men. Adolph Lewisohn, president; J. Parke Channing, vice-president; Julius H. Susmann, treasurer; preceding officers, Wm. H. Nichols, Jacob Langeloth, Walter T. Rosen and Ralph C. Lupton, directors; Herman Cook, secretary; Louis A. Wright, general manager; F. C. Alsdorf, assistant general manager; N. O. Lawton, mine superintendent; H. Kenyon Burch, mill superintendent; Edw. C. Taylor, clerk.

Organized Nov. 30, 1907, under laws of Delaware, with capitalization $3,000,000, shares $5 par, fully issued and fully paid. Is controlled, through ownership of one-half of stock, by General Development Co. National Copper Bank, New York, registrar; Bankers Trust Co., New York, transfer agent. Shares are listed on the Boston stock exchange. Annual meeting, third Wednesday in April.

Lands, 22 claims, partly fractional, area 200 acres, in process of patenting, also 100 acres in mill and smelter sites, giving total holdings of circa 300 acres, in the Red Springs district, 6 to 8 miles west of Globe. Property includes water rights on Pinal Creek, carrying abundant water for a large mill.

The property shows an area of highly silicified Pinal schist, at or near the point of contact with Schultze granite. The schistose area shows strong evidences of shearing, and mineral occurs as veinlets and coatings of chalcocite on the brecciated material, with some chalcopyrite showing on the 470′ level. The ore body is leached above a depth of 220′, and is somewhat similar to the Ely and Bingham porphyry deposits, but is higher in average tenor, the mean of numerous assays being 2.9% copper.

Development is by two 3-compartment shafts, known as the Red Rock and Red Springs, a third shaft of 220′ depth, and a new 4-compartment main working shaft. The mine had 7,677′ of workings Oct. 15, 1908.

Principal developments are on the Red Rock shaft, which cut commercial ore at 220′, and was 720′ deep Nov. 1, 1908, with levels opened at 270′, 370′ and 470′, and with plats cut for levels at 570′ and 670′. The 270′ level of this shaft shows about one acre of ore of commercial tenor, while the 370′ level, only 100′ lower, shows a very much larger ore body, and the 470′ level shows a still greater increase. The exact dimensions of the payable area of ore have not been determined on either the 370′ or 470′ levels, but the entire development is under about 20 acres of ground, with the certainty of further payable ore beyond the limits yet proven, and a strong likelihood that workable ore will be found to extend to the Red Springs shaft, to the northward. The schist, at a depth of 570′, apparently averages about 1.5% copper only, and it is likely that the limits of payable ore in large quantities will be reached at approximately 500′, though it is not unreasonable to expect a considerable tonnage of commercial ore at various points below this depth. On Nov. 1, 1908, the workings in this shaft had blocked out, on 3 levels, circa 4,500,000 tons of ore, with about 2,500,000 tons additional practically blocked out, and with about 10,000,000 tons fairly in sight.

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The Red Springs shaft, 2,150' northwest of the Red Rock shaft, was circa 348' deep Oct. 15, 1908, and shows ore of about the same grade as the Red Rock shaft, with good prospects of developing a large ore tonnage, and a reasonable chance of proving a continuous ore body between the two shafts.

Extraction is to be through a 14x18' main working shaft, with 4 compartments, sunk outside of the proven mineral zone, in order to render it immune from drawing. This shaft will operate two 8-ton skips, and will have circa 2,000 tons daily productive capacity.

Equipment includes a 250-h. p. hoist and air-compressor, pumps, etc., and a heavy equipment will be given the 4-compartment shaft. Buildings include a general store, for the convenience of employes.

Survey has been made for the extension of the Gila Valley, Globe & Northern railway to the mine, and this is to be built in 1909.

Careful study is being given to the matter of reduction, and an experimental mill has been built, with one Nissen stamp, 2 Johnson vanners and 5 Wilfley tables. A careful study is being made of the porphyry mills of Utah and Nevada, and it is not likely that the company's concentrator will be in operation before 1910. The mill will be built at the mine, and water pumped in from Pinal Creek, which is the correct method. The company's first plans called for a first-unit mill of 1,000 tons daily capacity, but ore has been developed so rapidly, and in such enormous quantities, that two units may be built, as soon as the metallurgical processes are fully decided upon. The ore concentrates readily 10 into 1, and possibly may concentrate 12 or even 15 into 1, though necessarily with higher tailings losses, and the ratio of concentration will be determined by the mean between the point of highest concentration and that of lowest losses. The company's estimates, which are conservative throughout, having been prepared by Mr. J. Parke Channing, are based on a final copper extraction of 2% only, from ore of 2.9% average copper tenor, but it is probable that, in actual practice, extraction will average better than 40 lbs. per ton, and possibly as high as 45 lbs. per ton, or 2.25%.

An initial milling unit of 1,000 tons daily capacity would give the property a productive capacity of 12,000,000 to 15,000,000 lbs. fine copper yearly, while a 2,000-ton mill would make it possible to produce 25,000,000 to 30,000,000 lbs. fine copper per annum. Mr. Channing estimates that copper can be laid down in New York for 9 cents per pound, and his figures are entitled to exceptional weight, for the reason that similar predictions by the same authority, made in the earlier stages of development, have been fully verified in the cases of the Tennessee and Nevada Consolidated, where Mr. Channing laid bare to the public figures, and deductions therefrom, that usually are withheld, thereby proving the courage of his convictions, and reaping the reward of confidence due the man whose forecasts come true.

The Miami was unique among American copper mines in the method of its flotation. The company advertised extensively, in the daily press, its advertisements being strong, but conservatively worded. As a rule, advertised stocks in the United States are put out by utterly irresponsible parties, though the British method of promotion calls for extensive advertising. The company secured $1,000,000 additional by selling its treasury stock, September, 1908, and is in a strong position financially. The Miami is a property of altogether exceptional promise, and is practically certain to make a very large and profitable mine, while the management is thoroughly experienced and capable, with the prestige of success in other fields.

MICHIGAN-ARIZONA COPPER CO. **ARIZONA.**

Office: 2 Ingersoll Block, Lansing, Mich. Mine office: Bonita, Graham Co., Ariz. Emory W. Olds, president; John Holbrook, vice-president; Dr. Ely F. Allen, secretary; Jacob Stahl, treasurer; preceding officers and M. H. Jewell,

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directors. Organized June 17, 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 80 acres, in the Sulphur Springs Valley, at the foot of Graham Mountain, showing two 8" parallel veins of ore assaying up to 29% copper, with traces of gold and silver, opened by a 42' shaft.

MICHIGAN & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Office: 905 Metropolitan Life Bldg., Minneapolis, Minn. Mine office: Helvetia, Pima Co., Ariz. C. C. Prindle, president; R. M. Bennett, vice-president; Chas. W. Sexton, secretary and treasurer. This company reorganized the Helvetia Copper Co., under a plan of reconstruction explained in Vol. V. Property is a considerable share interest in the Helvetia, and about 40 undeveloped claims adjoining the Helvetia.

MICHIGAN-ARIZONA MINING CO. **ARIZONA.**

Office: 17 First St., Muskegon, Mich. Mine office: Mammoth, Pinal Co., Ariz. S. H. Hamilton, president and general manager; James Hamilton, vice-president; Theo. P. Swift, secretary, treasurer and engineer. Organized Aug. 22, 1904, under laws of Arizona, with capitalization $5,000,000, shares $1 par.

Lands, 7 claims, area 140 acres, in the Bunker Hill district, 22 miles from a railroad, showing fissure veins, and impregnations in the granite, and, at times, in brecciated masses of country rock, with porphyritic intrusions. Has a 50' shaft and tunnels of 93' and 150', showing cuprite, melaconite, malachite, chalcocite and occasional chrysocolla, giving average assays of 29.2% copper, 5 oz. silver and $1.20 gold per ton. Company planned a small concentrator. Presumably idle.

MICHIGAN BOY MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

MICHIGAN & COLORADO MINING & MILLING CO. **COLORADO.**

Office: Colon, Mich. Mine office: Florissant, El Paso Co., Colo. W. H. Wagner, president; J. W. Bryant, vice-president; Dr. A. J. Kiser, secretary; A. C. Himebaugh, treasurer; John M. Kellogg, general manager. Organized Dec. 10, 1902, under laws of Michigan, with capitalization $500,000, shares $25 par. Annual meeting, first Tuesday in December.

Lands, 14 claims, area 280 acres, also a 5-acre millsite and sundry water rights. Succeeded to properties of Colorado Springs Copper Mining & Tunnel Co., and Blue Mountain Copper Mining Co., circa January, 1906. Development is by tunnel. Presumably idle.

MICHIGAN COPPER & GOLD MINING CO. **UTAH.**

Office: 404 West Third South St., Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Michael H. Osborne, president; L. C. Johnson, secretary. Organized December, 1902, under laws of Utah, with capitalization $300,000, shares $1 par. Lands, 4 claims, area 80 acres, known as the New York group, in the San Francisco district, near the Horn Silver mine, opened by a 40' shaft. Idle several years, except for assessments levied.

MICHIGAN COPPER MINING CO. **MICHIGAN.**

Office: 15 William St., New York, N. Y. Mine office: Rockland, Ontonagon Co., Mich. Employs 360 men. Jos. E. Gay, president; C. R. Corning, vice-president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; Samuel Brady, superintendent; Barney F. Shearer, mill superintendent; C. N. Haight, engineer; Adolph Priess, mining captain; Henry Stubensky, clerk; S. S. Jennison, master mechanic.

Organized Jan. 5, 1899, under laws of Michigan, with capitalization $2,500,000, shares $10 par; $19 paid in. Last assessment, $2, was levied March 10, 1908. American Loan & Trust Co., Boston, transfer agent; Old Colony Trust Co., Boston, registrar. Annual meeting, first Tuesday in May.

Lands, 4,870 acres of mineral territory, 1,466 acres of timber and miscellaneous lands, and a 150-acre millsite, giving total holdings of 6,686 acres,

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mineral lands being in Sections 1, 2, 3, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26 and 27, Town 50 North, Range 30 West. The main tract is 3 miles east and west by 4½ miles north and south, in addition to which there are four scattering tracts to the westward, one of 40 acres, two of 80 acres each and one of 160 acres, all carrying the outcrop of the Calico amygdaloid. The Michigan lands include the old Minnesota, Rockland and Superior mines. The Superior made 567,331 lbs. fine copper, 1856-1869 and 1876-1879. The Rockland, lying next east of the Minnesota, was operated 1853-1870, making 6,210,309 lbs. fine copper, from the Minnesota contact vein, which averaged about 2' width and carried considerable silver, in that mine. The old Minnesota mine, opened 1847, closed 1870, made 34,704,668 lbs. fine copper, and paid dividends of $1,820,000.

The Minnesota, or Minesota mine, as it was then spelled, was discovered by a line of prehistoric pits, in one of which was a 6-ton mass of copper, raised on skids, on top of which grew a hemlock tree having nearly 400 rings of annual growth. Immense masses of virgin copper were taken from the Minnesota, the largest, found 1856, measuring 12' 6"x18' 6"x46', weighing 527 short tons, and requiring the work of 20 men for 15 months in cutting it into pieces small enough for hoisting. The Minnesota was opened on a contact vein, having a gangue of quartz, epidote and calcite, with an amygdaloidal hanging and conglomerate footwall, both impregnated with copper near the contact. Miners called the Minnesota a conglomerate mine, because more copper was found in the footwall than in the denser amygdaloidal hanging-wall. The richest ground occurred near the "counter vein," a transverse fissure. The Minnesota had 10 shafts, deepest circa 1,100'. Four central shafts were sunk from surface on the North Minnesota fissure, which joined the contact vein at circa 300' depth. The Minnesota had a 40-ton mill, with gravity stamps, but the production was mainly from masses, and the smaller pieces of native metal called barrel-work. In 1870 the old Minnesota company met, sumultaneously, low prices for copper, a pinching of the vein, and the necessity for more powerful hoists, and gave up the struggle. The openings above the adit level, being free from water, were worked by tributors, for years afterwards, and yielded hundreds of tons of mass and barrel copper, affording evidence that a large amount of heavy copper must remain in the lower stopes, then inaccessible to tributors, because filled with water, and these also should yield considerable stamp rock, left unmined in the days when nothing under 3% rock paid for milling.

The Michigan mine is a combination of two entirely new mines and a reopened old mine, its shafts being sunk on the Calico amygdaloid, a bed outcropping 140' north of the Minnesota contact vein, and a few feet north of the North Minnesota fissure. In addition to the Calico lode, Minnesota contact, North contact and Branch vein, all more or less developed by the present workings, the Michigan tract carries the Knowlton, Mass, Ogima and South Amygdaloid beds, also an unnamed amygdaloid farther south, these latter belonging to the Evergreen belt, worked a few miles to the northeastward by the Mass and Adventure mines. The Knowlton, or northernmost of the Evergreen series of parallel lodes, lies circa 1,000' south of the old Minnesota shafts, and a 7' amygdaloid, supposed to be the Butler, opened to some extent in Peninsula Bluff, 2,000' south of B shaft, shows heavy copper and stamp rock. There are 3 old shafts on the Butler lode, also an adit cutting several parallel cupriferous beds. There also are copper-bearing amygdaloid outcrops north of the Calico bed, on which no work has been done.

The Calico amygdaloidal bed parallels the contact vein of the old Minnesota mine, which has been reopened to some extent by crosscuts. The country rock is a melaphyr trap, and the Calico bed ranges from almost a trap to nearly a conglomerate, carrying considerable felsite, with occasional sandstone

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and large patches of prehnite, epidote and calcite. The strike of the Calico bed is approximately N. 68° E., with a dip of about 47° to 50° at the bottom of the mine. The Calico bed is 5′ to 25′ in width, with an average of about 9′ in the upper workings, but, on the 2,000′ level is only 4′ to 6′ wide, though rich in copper. Most of the copper in the upper workings occurs in a 2′ to 3′ paystreak near the footwall, though occasionally patches of good ground occur in the center, and on the hanging-wall. The Calico copper carries a little silver, and is mostly in nodules, called shot-copper, with occasional barrel-work and some small masses, the heavy copper occurring mainly near the intersections of numerous cross-fissures that are filled with clay gouge. The bed is strong, standing well without timber, and is sinuous, both as to strike and dip, with very irregular walls, the amygdaloid bed merging into the trap footwall by almost imperceptible degrees. There also is a marked tendency on the part of the Calico to split, the "footwall vein" being rich in such cases, but leaving the main bed very lean in copper. There also is a "hanging-wall vein," and branch veins, in addition to which are the Minnesota contact and North Minnesota fissure veins, within 140′ distance of the Calico.

The "Branch Vein" lies between the Calico amygdaloid and the Minnesota contact vein, closely underlying the former on the fifth level, but steadily receding therefrom until it touches the contact vein just above the thirteenth level, rolling away therefrom again at greater depth. The "Branch Vein" is narrow, being 3′ to 5′ in width, but very rich, and is now the largest producer of heavy masses of native metal in the Lake Superior district, a 20-ton mass, found 1905, having been the largest mass of native copper secured from any Lake Superior mine for some years. The eastern drifts of the "Branch Vein" makes the best showing, as a rule. The "Branch Vein" is thought to be identical with the "North Vein" formerly worked in the Rockland mine, now a part of the Michigan, tributary to C shaft. The "Branch Vein" yield about 30 lbs. fine copper per ton and furnishes about one-third of the tonnage and one-half of the copper production of the mine, product being approximately one-third heavy copper and two-thirds stamp copper. The "Branch Vein" dips at approximately 58° and carries largely mass and barrel copper with considerable stamp rock. The "Branch Vein" has been traced for about 2 miles and has considerable reserve openings. The heavy copper from the "Branch Vein" is in pieces weighing from a few hundred lbs. up to 20 tons each, and 2 men using pneumatic chisels are employed steadily, cutting these masses into pieces sizable for hoisting.

The mine has about 10 miles of workings and is opened by 3 shafts, all sunk on the Calico bed, reaching the other copper-bearing beds and veins by crosscuts. The mine works 45 drills. With the exception of the ninth level, all levels down to the twelfth have reached the northern boundary of the Calico bed.

A shaft, the westernmost, lies about 1,000′, on the strike of the bed, from the boundary line of the National mine. This shaft is 7x18′ inside of timbers, with 3 compartments and is 2,030′ in depth. The Calico is as wide as 18′ in places, in some of the upper levels, and shows some excellent ground. A crosscut on the 14th level, sent to the contact vein of the old Minnesota, found the latter to average about 4′ in width, and to be rich in copper for a distance of about 150′ only.

B shaft, 985′ east of A, with 2 compartments, is 1,781′ in depth, and has not been deepened for several years. The Calico bed runs 20′ to 25′ wide in places in the upper workings, and the lower levels show some good stopes. This shaft has a Burnham sinking pump, with capacity to lift 400 gallons per minute from a quarter-mile depth. The old Minnesota mine was unwatered, from B shaft, by diamond drill holes, bored across at each successive

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level. The old workings were found in very bad shape, after three decades of neglect. The contact vein is reached also by crosscuts on the 11th and 13th levels, below the bottom of the old workings, showing a vein of 20′ width, with 6′ to 7′ on the hanging-wall carrying copper in fair quantities.

C shaft, 1,353′ northeast of B, is 1,650′ in depth, and rock production was begun therefrom circa February, 1908. The formation is somewhat more settled than to the westward. Adjoining C shaft is an old shaft of the Minnesota, of circa 676′ depth, with collar 90′ below the collar of C shaft.

There is room on the main tract of the Michigan for an additional shaft west of A, and the great extent of the landed holdings provides ample room for opening mines on any other available cupriferous bed that may be developed on any part of the company's lands.

The shaft-rockhouses at A and B are duplicates, each having 300-ton storage bins, and were partially remodeled, 1908, and given double dumps, the lower for poor rock. Equipment of each includes a 50-h. p. Nordberg engine, two 18x24″ crushers, one 13x20″ crusher and a steam-hammer for mass and barrel work.

The engine-house, 50x115′, stands midway between shafts A and B. The A section has a 24x60″ Webster, Camp & Lane double-cone straight-face hoist, with a 7′ drum having a 15′ face, carrying 4,000′ of cable and capable of raising 4-ton skips in counterbalance at 3,500′ per minute from a depth of 3,500′. The hoisting cable passes around solidly anchored sheaves, giving a straight pull at each shaft. The B hoist, installed 1905-1906, is a 24x60″ Allis-Chalmers duplex-cylinder straight-face hoist, operating 2 drums in balance, or separately, also good for 3,500′ depth. The hoist at C shaft, formerly at B, is 13x15″, with 6′ drums. The boiler-house, between the two sections of the engine-house, has four 165-h. p. Burt locomotive firebox boilers, with room for a fifth, also a 1,000-h. p. Cochrane feed-water-heater and purifier. The power-plant includes a 40-drill Ingersoll-Sergeant two-stage air-compressor. A 12-drill Norwalk air-compressor and a 10-drill Ingersoll-Sergeant air-compressor, displaced by the new compressor, have been installed in the basement of the engine-house, as auxiliaries.

The machine shop is 30x60′, and other mine buildings include a stone smithy, carpenter shop, warehouse, office building, and a 22x50′ changing house. Water is secured from the old Minnesota dam, the mine and location having mains and hydrants, with a Knowles pump in the basement of the power-house capable of raising a 5″ stream against a 400′ head, and an auxiliary Deane pump, 200′ distant, capable of raising a 5″ stream against a head of 425′. There are acetylene gas plants in the power-house and in each rock-house, and a 250′ coal-trestle, with inclined tunnel and tramway underneath, leading to the boiler-house. All buildings are connected by a private telephone system, and the mine is served by the Mineral Range railroad.

In view of the very promising developments of the Lake Copper Co., and the rich drill cores secured by the Adventure, diamond drilling was begun July, 1908, in search of the extensions of these beds in the southwest quarter of Section 14. The Michigan lands carry about 3 miles of the hypothetical extension of the veins opened by the Lake and cut by the diamond drill of the Adventure, and the prospects of finding payable ore bodies in this territory are excellent, as the field is practically unexplored. The diamond drill, late 1908, cut 3 fine-grained metamorphosed conglomerates, somewhat resembling the Calumet conglomerate, each carrying copper in somewhat encouraging quantities. The drill also cut a 12′ amygdaloid, from which the sludge assayed 1.29% copper, and cores from several other beds carried copper in promising quantities, though none were notably rich.

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The Superior mine, about one mile east of the present workings, is a property of some promise.

Production was begun Nov. 12, 1903, with a leased head, at the Mass mill. This was surrendered Sept. 1, 1906, since which date rock has been stamped at the Atlantic mill.

Work was begun April, 1906, on a new mill, to cost circa $200,000, about one mile north of the Mass mill, on Keweenaw Bay, with ample water frontage for the wasting of sands. Construction was suspended, late 1907, on account of unsettled financial conditions, but was resumed in 1908. The mill, of steel, under construction by the Wisconsin Bridge & Iron Co., is 97x177' in size, and is to have a 750-ton Nordberg steeple-compound stamp, with Woodbury jigs. The rock-bins are of exceptionally large size, and the equipment will include a 5-stamp gravity battery and 10 Overstrom tables, installed by the Michigan company in the Mass mill.

The mill is to have a central power plant, with a separate boiler building, of concrete, equipment including an engine, 3 Atlas boilers and a Sturtevant economizer.

The power plant will have a coal trestle, from which coal will be dumped in two piles, flanked by two tunnels, through which coal will be trammed in cars to the boiler-house. At the top of the trestle there will be a hoist, to take cars from the railroad to the bins.

Water will be secured from Keweenaw Bay, through a 1,200' tunnel, nearly completed, connecting with a 76' shaft at the millsite. Instead of having a separate boiler-house for the pumps, there will be a motor-driven pump, taking energy from the generator in the mill. It is estimated that the new mill will save about one cent per pound on the cost of finished copper. The copper of the Michigan has the highest electrical conductivity of any Lake Superior brand, showing, on test, conductivity up to 103.

Production, in pounds of fine copper, has been as follows: 275,708 lbs. in 1903; 2,746,127 lbs. in 1904; 2,891,796 lbs. in 1905; 2,875,341 lbs. in 1906; 2,665,404 lbs. in 1907. Production, October, 1908, was 193 tons of mineral, from 600 to 700 tons of rock stamped daily, and production for 1908 should be approximately 3,000,000 lbs., the largest yet secured. Rock stamped was 140,225 tons in 1906, and 150,407 tons in 1907, returns being 20.5 lbs. fine copper in 1906 and 17.72 lbs. in 1907. Total expenses in 1907 were $645,056, including $183,671 for new construction. Costs, less construction, per ton of rock treated, were $2.84 in 1904; $2.63 in 1905; $2.79 in 1906 and $3,06 in 1907. Costs per pound of fine copper, exclusive of construction, were 21.5 cents in 1904; 18.9 cents in 1905; 20.5 cents in 1906 and 17.72 cents in 1907. With the aid of the new mill the property should be able to make a considerably improved showing, and the prospects of finding payable copper beds in the southern portion of the Michigan territory are excellent. The management of the property is of the best, throughout.

MICHIGAN & MONTANA COPPER MINING & SMELTING CO. — **MONTANA.**

Office: Kalispell, Mont. Mine office: Altyn, Teton Co., Mont. J. M. Harris, manager, at last accounts. Lands, some distance from rail transportation, carry auriferous and argentiferous copper ores, giving fair assays. Is said to have a 100-ton concentrator. Idle.

MICHIGAN & MONTANA DEVELOPMENT CO. — **MONTANA.**

Office: care of E. J. Rompf, secretary and treasurer, Houghton, Mich. Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Capt. Richard Edwards, president; Thos. F. Burgan, vice-president; preceding officers, Jas. T. Healy, W. A. Burritt and Thos. O. Bennetts, directors. Organized March, 1907, with capitalization $500,000, shares $10 par. Lands,

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4 claims, held under bond and lease, in the Park Cañon district of Butte, said to show a 75′ lode. Idle and presumably moribund.

MICHIGAN & MONTANA MINING & DEVELOPMENT CO. **MONTANA.**

Office: Escanaba, Mich. Mine office: Wickes, Jefferson Co., Mont. Clark Kirkpatrick, president; J. F. Carey, secretary; Jas. A. McKillican, superintendent. Organized 1905, with capitalization $20,000, and reorganized with capitalization $100,000.

Lands, 5 claims, including the Blue Bird mine, formerly operated for silver, showing a vein of 4′ to 6′ width, opened by a 1,200′ tunnel, giving assays of 5 to 7% copper, 5% lead, 23 oz. silver and $2.80 gold per ton. Property has electric power and employs circa 20 men.

MICHIGAN & NEW MEXICAN MINING CO. **NEW MEXICO.**

Office: Ishpeming, Mich. Mine office: Nogal, Lincoln Co., N. M. W. A. McIver, deceased, was president. Lands are known as the Mildon group. Idle and apparently moribund.

MICHIGAN-NEW MEXICO COPPER CO. **NEW MEXICO.**

Office: Grand Rapids, Mich. Letter returned unclaimed from former mine office, Lordsburg, Grant Co., N. M. J. L. Hamilton, president; C. R. Luton, secretary and general manager. Lands, 4 claims, area 80 acres, known as the Dakota-Pearl mine, in the Burro Mountains, carrying ore assaying up to 8.5% copper, 5 oz. silver and $4 gold per ton. Has a 280′ shaft, and planned installing a 50-ton leaching plant and smelter, but failed to do so. Idle several years and apparently moribund.

MICHIGAN SMELTING CO. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Works office: Houghton, Houghton Co., Mich. Wm. A. Paine, president; Chas. H. Paine, vice-president; Frederic Stanwood, secretary and treasurer; Frederick I. Cairns, general manager; preceding officers and John R. Stanton, directors; Frank Klepetko, consulting engineer; John Mugford, superintendent.

Organized 1903, under laws of Michigan, with capitalization $500,000, shares $25 par. Is controlled through ownership of entire stock issue, by 6 mining companies, the Copper Range group holding 12,000 shares and the Stanton companies 8,000 shares, holdings in shares being as follows: Champion, 4,400 shares; Trimountain, 4,400; Baltic, 3,200; Mohawk, 3,200; Wolverine, 3,200; Atlantic, 1,600. No dividends have been paid, profits being turned back into improvements.

Property is a reduction plant, 3 miles west of Houghton, near the old Atlantic stamp-mill, with frontage on Portage Lake. It was designed by Frank Klepetko and is the largest and most modern smelter in the Lake Superior district, with capacity of 90,000,000 lbs. fine copper yearly.

The plant is terraced throughout, permitting economical and largely automatic handling of material. The terraces for the different structures are sand-graded, with stone retaining walls. Mineral is delivered to the works in 40-ton bottom-dumping steel cars, by the Copper Range railroad, which also hauls away the refined copper, for shipment from the Copper Range wharves, in Houghton.

The 3,000-ton mineral storage bins, holding ten days' supply for the works, are located on the upper terrace. Mineral is dehydrated in rotary dryers, by waste gases from the furnaces, taken to the furnaces in tram-cars and dumped into hoppers on the charging floor. Coal-trestles, on an upper plateau, hold 15,000 tons of hard and soft coal, with separate storage compartments for charcoal, sand and limestone. Tunnels under the coal-trestle lead to the boiler-rooms and furnaces, fuel being delivered in tram-cars, loaded cars descending by gravity.

The 160x205′ reverberatory furnace building, of steel and brick, with

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truss roof, and two 5-ton traveling cranes, has 6 furnaces, 2 being 16x36′ each, two 14x23′ each, one 15x18′, and one 16x40′, of 100 tons daily capacity. The two 16x36′ furnaces were built 18x50′, over all, but gave so much trouble that they were cut down to 40′ length.

Alternating with the larger reverberatories are one 300-h. p. and two 200-h. p. Stirling water-tube boilers, heated by waste gases from the furnaces. After leaving the boilers the waste gases are drawn through a 6x8′ subterranean flue, with arched roof, up the hill to a 150′ smokestack with base 100′ above the furnace building.

From the reverberatories molten copper goes to 2 blast furnaces, on a lower level to the north, where blister copper is cast mechanically, in moulds, upon a circular table, cooled in water and carried by a link-elevator to the loading platform. The cupola building is 40x70′, of steel and brick, with two floors. Slags are carried mechanically to the sampling mill, and reduced in a 30-ton crusher of 1,000 tons daily capacity, for resmelting. The waste slags from the final fusion are granulated by jets of water, and discharged through launders, to low ground northward, for grading.

The combination machine-shop and power-house, of steel and brick, has a complete equipment of shop tools, driven by an independent engine, and a 300-h. p. Nordberg horizontal tandem-compound engine driving a 200-kw. generator actuates the rotary blowers for the blast-furnaces. Electric power is used extensively, for operating the drying plant, cranes, casting machinery and lighting, and actuates 3 specially designed Jeffrey electric locomotives, of 100-ton draw-bar pull, taking current from overhead trolleys and hauling 8 pressed steel Sheffield mineral and coal cars, tracks reaching practically every part of the plant.

Miscellaneous buildings include a combination two-story and basement office and laboratory, of brick, heated by exhaust steam, also a 40x60′ iron-sheathed frame warehouse, barn, etc. The plant has two 50′ track-scales, of 150 tons capacity each, one for mineral and one for coal and flux, with smaller scales at other points. Water is obtained from the old Atlantic dam, on Cole's creek, through a 4,300′ flume, with capacity of 5,000 gallons per minute, leading to a 50,000-gallon water-storage tank, located 100′ above the works, giving good pressure at all points.

The works are treating the mineral of six mines, each of which is smelted separately, and are turning out circa 5,500,000 lbs. of refined copper monthly. The sixth reverberatory will give a monthly capacity of 10,000,000 lbs. fine copper, providing for growth of the mines for some years to come. In August, 1907, these works broke a world's record for casting from a single furnace, by turning out a charge containing 375,000 lbs. fine copper. This work was done by a crew of ten men, of whom 5 attended the furnace, and one operated the casting machine, while 4 men were required to inspect, sort and load the ingots in cars.

The Michigan smelter is well planned and well handled, the results secured being creditable alike to the designer and the management.

MICHIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Option surrendered and company wound up, 1905. Formerly at Pearce, Cochise Co., Ariz. Described Vol. V.

COMPAÑIA METALURGICA DE MICHOACÁN. **MEXICO.**

Works office: Ocampo, Zitácuaro, Michoacán, Mex. O. F. Westlund, manager; C. W. Carpenter and F. M. Flynn, superintendents. Property is a 10-year lease on the reduction plant of the Michoacán Mining & Railway Co., Ltd. Smelter, known as Los Trojes, rated at 250 tons daily capacity, has a 44x163″ water-jacket blast furnace and 8 Baker blowers, burning coke and charcoal in equal quantities, charcoal being made from the company's own

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timber. Power plant includes two 4′ Pelton water wheels, operated under a head of 450′, and a small electric plant, with a 150-h. p. auxiliary steam plant. Idle, with indifferent prospects of resumption.

MICHOACÁN RAILWAY & MINING CO., LTD. **MEXICO.**

Office: 2 Suffolk Lane, Cannon St., London, E. C., Eng. Mine office: Angangueo, Michoacán, Mex. Henry W. Foster, M. P., chairman; G. A. Mitchell, secretary; Jas. W. Malcolmson, consulting engineer. Organized Jan. 29, 1889, under laws of Great Britain, with capitalization £105,364, shares $1 par, in £21,015 A cumulative 7% preference shares, £12,190 B non-cumulative 7% preference shares, £70,745 ordinary shares and £1,414 founders' shares; issued, £99,370. Debentures, £27,090, in a 4% prior lien, and £103,000 in 4% mortgage bonds. Railway rights originally held have been disposed of, remaining property being sundry mines and mineral lands, leased, 1906, to Compañía Metalurgica de Angangueo for 10 years.

MICHOACÁN SAN FRANCISCO COPPER MINES SYNDICATE, LTD. **MEXICO.**

Dead. Voluntarily liquidated, March, 1902. Formerly in Michoacán, Mexico.

MICULICICH i VALENTINE. **PERÚ.**

Mine office: San Tadeo, Yauli, Junín, Perú. Lands, 2 pertenencias, known as the Mina Gertrudis, opened 1897, having a vein with strike of N. 51° E. and nearly vertical dip, of about 2 meters width, with paystreak of 60 centimeters to 1 meter, carrying ore averaging 14% copper and 1,000 grams silver per metric ton, balance of vein carrying circa 5% copper and 300 grams silver per metric ton. Production, 1904, was 2,455 metric tons of ore averaging 14% in tenor, yielding 757,950 lbs. fine copper. Employs circa 50 men.

MIDDLEMARCH COPPER CO. **ARIZONA.**

Office: 212 Henne Bldg., Los Angeles, Cal. Mine office: Middlemarch, Cochise Co., Ariz. H. Bert Ellis, president; M. M. O'Gorman, vice-president and general manager; Wm. Le Moyne Wills, secretary; preceding officers, Richard Gird, Wm. King Gird and F. S. Austin, directors; Broadway Bank & Trust Co., Los Angeles, treasurer; Edw. K. Kelly, mine superintendent.

Organized Apr. 26, 1907, under laws of California, with capitalization $1,000,000, shares $1 par; increased, March 28, 1906, to $3,000,000, shares $100 par. Annual meeting, first Monday in April.

Lands, 68 claims, area 1,360 acres, in the Dragoon Mountains, showing 6 practically parallel contact deposits, between limestone and granite-porphyry, having a generally northwesterly strike, with dip of 42° to 54°. Two ore bodies under development, of 30′ to 80′ width, show oxidized ores, succeeded by sulphides, mainly chalcopyrite, with some chalcocite.

Development is by shafts of 210′, 248′, 100′, 165′, 65′, 50′, 120′, 90′ and 40′, and by tunnels of 625′, 150′, 367′, 450′, 390′ and 170′, giving about 2 miles of workings, estimated by company to show 200,000 tons of ore, with 100,000 tons blocked out for stoping in the Missouri mine, with ore in other properties, but not extensively developed. The ores of the Missouri are base at depth, and deficient in iron and lime, while not sufficiently pyritic to concentrate well.

Equipment includes a 300-h. p. steam plant, 50-h. p. hoist and 4-drill Laidlaw air-compressor. There are 12 buildings, including a 30x38′ engine-house, 32x38′ boiler-house, 30x38′ machine shop and 20x30′ smithy.

The reduction plant includes a concentrator and smelter under one roof, 40x100′ in size. The concentrator has an 8x12″ Blake crusher, 2 Huntington mills, 2 rolls, 2 Bartlett tables, 1 slime table and 3 sizers. The concentrator, of 40 to 60 tons rated daily capacity, receives ore by tram from the mouth

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of the Missouri tunnel, 300′ distant. When operated the smelter made matte averaging 55 to 70% copper, 20 to 100 oz. silver and 0.25 to 2 oz. gold per ton.

The company plans development of sulphide ores in the lower levels, and erection of a larger smelter. Property considered promising.

MIDDLE RANGE MINING CO. **MICHIGAN.**

Office and mine: care of Thos. L. Chadbourne, president, Houghton, Houghton Co., Mich. Capitalization $500,000, shares $25 par. Idle since circa 1895.

MIDDLE SWANSEA MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Richard B. Shepard, president; E. A. Shepard, secretary and treasurer; preceding officers, Dana T. Smith, Harrison O. Shepard and John M. Condon, directors. Lands adjoin the Eureka-Swansea Extension. Presumably idle.

MIDLAND GOLD & COPPER MINING & REDUCTION CO. **UTAH.**

Office and mine: Hot Springs, Box Elder Co., Utah. Geo. B. Dean, president; F. J. Hirt, vice-president; Albert Swingewood, secretary and treasurer; Daniel Convery, manager. Organized 1904, with capitalization $1,000,000, shares $1 par. Lands, 14 claims, 2 miles from Hot Springs, in the Sierra Madre district. Idle several years.

MID MOONTA COPPER MINES, LTD. **AUSTRALIA.**

Dead. Reconstructed, Oct. 29, 1901, as Moonta Central Copper Co., Ltd. Formerly at Moonta, Daly Co., South Australia.

MIEDNOROUDIANSK MINE. **RUSSIA.**

Described under title Rudianski mines.

MIEDZIANKA MINE. **AUSTRIA.**

Office: Kielce-Checiny, Galicia, Austria. Laszczynski Brothers, owners. The property is an old mine, circa 55 miles north of Cracow, abandoned for nearly a century, until taken over by the present owners. The mine shows a belt of cupriferous limestone, of about 150′ width, traceable for 1¼ miles, reported to carry copper ore in streaks of ½″ to 1″ thickness only, ore being mainly chalcocite, with some azurite and malachite, having a gangue of calcspar and quartz, ranging 15 to 45% in copper tenor. The property has been proven to a depth of 150′.

On reaching surface, ore is hand-picked, crushed by rolls and moulded into blocks, with 5% of clay for a binder, bricks being dried by waste heat from the furnace, and partially roasted in a kiln.

The reduction plant is of an experimental nature, and of small capacity only. Roasted ore is crushed fine and leached in lead-lined tanks with spent liquor from the electrolytic baths containing about 5% of free sulphuric acid, giving, as a product, a liquor containing about 5% copper and 1% free acid. This is put through a filter-press, then goes to electrolytic tanks having insoluble anodes of lead plates, in cloth bags, with thin copper cathodes. Current is 1,000 amperes, at 2.5 volts, giving a current density of 1 ampere per square decimeter of cathode surface. Deposition of copper is about 1.1 gram per ampere-hour, nearly equal to the theoretical deposit, and power consumed, per kilogram of copper deposited, is 2.48-kw.-hours. Liquor is exhausted in about 36 hours, when it is returned to extraction baths, for treatment of fresh ore. Cathodes remain in the bath for about one month, when the deposit becomes 1″ to 1¼″ thick. Product is said to be of greater purity than ordinary electrolytic copper. The process is simple, and requires but a single trained workman for its operation.

MIHARA MINE. **JAPAN.**

Office: Mihara-mura, Chitsuki-gori, Bitchu, Japan. Production was 136,266 lbs. fine copper in 1903, and 293,045 lbs. in 1906.

MILAN MINING & MILLING CO. **NEW HAMPSHIRE.**

Office: 120 Exchange St., Portland, Me. Mine office: West Milan, Coos

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Co., N. H. Employs circa 35 men. J. B. Carper, president and general manager; R. C. Bradford, secretary and treasurer. Organized August, 1906, under laws of Maine, with capitalization $125,000, shares $100 par. Reported, Feb. 21, 1908, having $100,000 cash on hand.

Lands, 240 acres, freehold, also 140 acres timber lands. Mineral lands show serpentine, with fissure veins in schist, carrying chalcopyrite associated with pyrite, there being 2 veins under development, these averaging about 20′ width, with northwest and southeast strike, giving average assays of about 3% copper, 5% zinc, 1 to 3 oz. silver and 44% sulphur. Has shafts of 40′ and 260′, and 4 short tunnels, with about one-half mile of underground openings, estimated to show 200,000 tons of ore, with 25,000 tons blocked out for stoping. Work was begun by present company August, 1906.

Equipment includes a 150-h. p. steam plant, with 35-h. p. hoist, 4-drill air-compressor, machine shop, carpenter shop, crusher house, several dwellings, etc., with total of 11 buildings. Has a 40x60′ wooden concentrator building, with one jaw-crusher and 4 Wilfley tables. Is served by the Grand Trunk railroad, ¼ mile from the shaft, connected by siding. Production, 1906, was about 11,000 tons of pyrites and 100 tons of 20% copper ore, produced at an average cost of about $1.50 per ton. Company plans installation of new machinery in mill and adding 6 Wedge furnaces, with chlorination works.

MILFORD COPPER MINING & SMELTING CO. **UTAH.**

Office: 5 Walker Bank Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Geo. H. Dern, president; Chas. E. Hudson, secretary and treasurer; Frank H. Lathrap, general manager. Organized 1902, under laws of Utah, with capitalization $300,000, shares $1 par. Lands, 11 claims, area 220 acres, near the O. K. mine of the Majestic. Idle and apparently moribund.

MILFORD GOLD & COPPER MINING CO. **UTAH.**

Mine office: Milford, Beaver Co., Utah. Long idle and apparently moribund.

MILLER MINING CO. **MEXICO.**

Dead. Was succeeded, circa August, 1908, by Kansas-Cananea Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

MILLER MINING, MILLING & SMELTING CO. **UTAH.**

Mine office: American Fork, Utah Co., Utah. Russell Benedict, president. Property, in American Fork Cañon, formerly was leased, but work was resumed by company circa July, 1908.

CHAS. S. MILLS & CO. **MEXICO.**

Office and mine: Hocasitas, Ures, Sonora, Mex. Chas. S. Mills, general manager. Lands, 103 hectares, known as La Colorada group, also a 6-hectare millsite, showing 5 veins, ranging 2′ to 100′ in width, occurring as fissures in porphyry and as contacts between porphyry and phonolite, carrying gold, silver, copper, nickel, cobalt and platinum. Mine has a 100′ shaft and a 440′ tunnel, steam power and a 20-ton stamp-mill and concentrator. Nearest railroad, 25 miles, is the Sonora branch of the Southern Pacific. Idle since 1905.

MILTON COPPER CO. **MICHIGAN.**

Dead. Wound up 1902. Formerly at Victoria, Ontonagon Co., Mich. Described Vol. II.

MILWAUKEE-MONTANA NATURAL BRIDGE GOLD & COPPER MINING CO. **MONTANA.**

Dead. Was promoted by C. T. McElroy. Formerly at Contact, Park Co., Mont.

MILWAUKEE & NEW MEXICO MINING CO. **NEW MEXICO.**

Office: 97 Wisconsin St., Milwaukee, Wis. Mine office: Tres Piedras,

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Taos Co., N. M. J. D. Draught, secretary and treasurer. Property is known as the Sardine group. Presumably idle.

MILWAUKEE-PALMER MOUNTAIN GOLD & COPPER MINING CO. **WASHINGTON.**

Dead. Formerly at Loomis, Okanogan Co., Wash.

MINDOULI MINE. **FRENCH CONGO.**

Mine office: Comba, via Brazzaville, French Congo. Lands, in the Kouilou-Niari basin, circa 300 kilometers from the coast, show cupriferous sandstone overlying limestone, surface ores being mainly malachite, with some cuprite, both argentiferous. These deposits were worked by the natives, in a primitive way, for centuries, and a considerable trade once existed in copper and copper utensils, but this became extinct with French occupation. Mine probably is unworkable under modern conditions without railroad transportation, now lacking.

MINE DEVELOPMENT ASSOCIATION. **NEW MEXICO.**

Mine office: Socorro, Socorro Co., N. M. W. H. Bullard, president; H. A. True, secretary; Cony T. Brown, manager. Property includes the Stonewall Jackson mine, carrying zinc-lead ores, also sundry copper-zinc-lead lands.

COMPAÑIA MINERA DE MINAS NUEVAS. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Has auriferous and argentiferous copper ore, with steam power, employing circa 30 men at last accounts.

MINERAL CREEK COPPER CO. **ARIZONA.**

Dead. Formerly at Globe, Gila Co., Ariz.

MINERAL CREEK MINES CO. **ARIZONA.**

Letter returned unclaimed from former office and mine, Globe, Gila Co., Ariz. A. J. Kaltenbach, president; E. E. Kaltenbach, vice-president; Harold E. Bierce, secretary and treasurer. Organized 1907, under laws of Arizona, with capitalization $250,000, shares $10 par.

MINERAL CREEK MINING CO. **ARIZONA.**

Dead. Operated circa 1881. Formerly at Red Rock, Pinal Co., Ariz.

MINERAL CREEK MINING & SMELTING CO. **WASHINGTON.**

Office: 515 California Bldg., Tacoma, Wash. Mine office: Mineral, Lewis Co., Wash. Adrian F. Kirkpatrick, president; Chas. H. Little, secretary. Organized June 14, 1901, under laws of Washington, with capitalization $2,000,000. Ores carry gold, silver, lead and copper. Has water power and a 20-ton smelter. Idle several years.

MINERAL FARM MINING CO. **IDAHO.**

Office: Spokane, Wash. Mine office: Mullan, Shoshone Co., Idaho. Daniel McQuarrie, president; M. J. McHugh, vice-president; Irvin D. Whitmore, secretary and treasurer; Louis C. Jaquish, manager; preceding officers, E. G. Ellis, D. R. Beck and M. Robert Weidner, directors. Lands, 11 claims, 8 patented, circa 1½ miles from Mullan, showing a fissure vein of 100′ reported average width, opened by 3 tunnels, No. 3 being 115′ long.

MINERAL HILL CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 331 Fourth Ave., Pittsburg, Pa. Mine office: Tucson, Pima Co., Ariz. M. S. Isherwood, president; Boon Ingells, vice-president; E. B. Reeser, secretary, treasurer and superintendent; E. N. Ray, general manager. Organized March, 1904, under laws of Arizona, with capitalization $3,000,000, shares $1 par, as successor of Azurite Copper & Gold Mining Co.

Lands, 26 claims, 12 patented, area 520 acres, in the San Xavier district, 18 miles southwest of Tucson, including the Azurite group of 13 claims, said to have produced $550,000 worth of ore under former ownership, the American group of 8 claims, and the Mineral Hill group of 5 claims. The mine is said to show a large body of sulphide ore, of concentrating grade, averaging about 3.5% copper.

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Development is by 74 pits and open-cuts, 8 tunnels, mostly short, longest being 250′, and 48 shafts, mostly shallow, 5 deepest being 130′, 125′, 150′, 345′ and 200′, mine having a total of circa one mile of workings, claimed to have blocked out, in the lower levels, 100,000 tons of 5% sulphide ore, which figures are considered unduly high.

The property is said to have a 150-h. p. steam plant, with hoists good for 350′ and 2,000′.

There is an antiquated smelter having a 30-ton water-jacket blast-furnace, which is of no present value, and the company was said, April, 1908, to have contracted for a 100-ton concentrator, but in 1907 it was stated that a 500-ton smelter had been ordered, this not proving true. It was claimed, by fiscal agents, who made some exaggerated statements, that the cost of mining and transportation to smelter was $4.50 per ton. In 1907 the mine shipped circa 2,500 tons of selected ore, of circa 3.5% copper tenor, to the Douglas smelter, yielding 169,538 lbs. fine copper and 1,478 oz. silver. Property is considered promising, though ore is low in grade.

MINERAL HILL COPPER & GOLD MINING CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Lands, 36 claims, having circa 1,000′ of workings, showing auriferous and argentiferous lead and copper ores.

MINERAL HILL COPPER SYNDICATE, LTD. **ARIZONA.**

Dead. Formerly at Huron, Yavapai Co., Ariz.

MINERAL HILL MINING CO. **WASHINGTON.**

Offices: 49 West 125th St., New York, N. Y. Mine office: Conconully, Okanogan Co., Wash. Dr. Jacob May, president; A. R. Lacey, secretary; E. P. Wheeler, superintendent. Lands, 20 claims, having a 1,800′ tunnel said to cut 3 veins carrying argentiferous copper and lead ores, mainly argentiferous tetrahedrite. Has steam power, ore bunkers with crusher and a saw-mill, with an available waterfall, rated at circa 4,000-h. p. It was expected, early 1907, that company would be merged in the Washington Consolidated Copper Co. Idle at last accounts.

MINERAL HILL MINING & SMELTING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, 237 Twelfth St., San Francisco, Cal. Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, manager. Lands, 5 claims, opened by a 535′ tunnel showing gold-copper ore. Has water power. Idle.

MINERAL HILL TUNNEL & COPPER MINING CO. **WASHINGTON.**

Office: 1140 Old South Bldg., Boston, Mass. Mine office: Danville, Ferry Co., Wash. Albert Vittum, president. Organized 1906, with capitalization $1,500,000, shares $1 par, as successor of Minnehaha Copper-Gold Mining Co. Is controlled, through ownership of majority of stock, by Boston Consolidated Mining Co.

Lands, 8 groups, lying at average distance of circa 2 miles south of the international boundary line, in the Wannicutt Lake district of Okanogan county, Washington, and in Ferry county, Washington. The Minnehaha group, 4 claims, area 70 acres, has several shafts, deepest 250′, and a 206′ tunnel, showing a vein of low grade auriferous copper ore with a 12″ pay-streak of ore of good tenor. Shipped some ore, December, 1904, to the Granby smelter, that gave net returns of circa $250 to $400 per car.

MINERAL MINING CO. **OREGON.**

Mine office: Huntington, Baker Co., Ore. Has a tunnel, showing copper ore, also a small smelter. Idle.

MINERAL MINING & SMELTING CO. **NEVADA.**

Office: Reno, Nev. Mine office: Palisade, Eureka Co., Nev. Lands, sundry claims, on Mineral Hill, midway between Eureka and Palisade, said to show a 16′ vein, carrying auriferous and argentiferous copper and lead

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ores, giving assays up to $1,108 per ton in gold. Is said to have started a 60-ton smelter. Idle.

MINERAL MOUNTAIN MINING CO. **ARIZONA.**

Dead. Operated circa 1902. Formerly at Calabasas, Santa Cruz Co., Ariz.

MINERAL MOUNTAIN MINING CO., LTD. **NEW MEXICO.**

Mine office: Steins, Grant Co., N. M. Has argentiferous lead and copper ores. Idle several years and apparently moribund.

MINERAL POINT MINING CO. **COLORADO.**

Mine office: Marble, Gunnison Co., Colo. Lands include the Carbonate group, carrying auriferous and argentiferous copper ore. Has gasoline power and a 50-ton smelter. Presumably idle.

MINERAL POINT MINING CO. **IDAHO.**

Mine office: Osburn, Shoshone Co., Idaho. S. V. Osburn, manager. Lands, south of Osburn, adjoining the Marie, have 2 tunnels, lower showing a 12' vein of tetrahedrite.

MINERS COPPER CO. **MICHIGAN.**

Dead. Merged, March, 1899, in Isle Royale Copper Co. Formerly at Houghton, Houghton Co., Mich.

MINERS' SMELTING CO. **UTAH.**

Letter returned unclaimed from former office, 42 Broadway, New York, N. Y. Works office: Garfield, Salt Lake Co., Utah. Organized July, 1907, under laws of Maine, with capitalization $10,000,000. Property is a smelter-site, well located, at Lake Point, circa 2 miles west of Garfield Beach, on the southern end of Great Salt Lake, on which it was planned, early 1908, building a 3,000-ton smelter, at an estimated cost of $2,000,000. Company is said to have a 10-year contract for smelting the ores of the Silver King Coalition.

MINES DEVELOPMENT CO. OF NEVADA. **NEVADA.**

Office and mine: Lovelock, Humboldt Co., Nev. John T. Reid, president, treasurer and general manager; Patrick K. Reid, vice-president; Paul G. Reid, secretary and superintendent; preceding officers, Emmet E. Reid, R. C. Moore, J. Thies, Peter Ancher, E. B. Loring and John O'Kane, directors. Organized Sept. 1, 1904, under laws of Arizona, with capitalization $750,000, shares $1 par; issued, $300,000.

Lands, 5 claims, area 100 acres, in the Juniper Mountain district, showing various fissure veins, of which 2, of about 4' average width, under development, show chalcocite, bornite and tetrahedrite, giving average assays of 2% copper, 11 oz. silver and $3.50 gold per ton. Development is by a 30' shaft and a 185' tunnel. Is practically idle, except for annual assessment work, but company plans resumption on a considerable scale.

MINESOTA MINING CO. **MICHIGAN.**

Dead. Lands now owned by Michigan Copper Mining Co. Paid large dividends. Formerly at Rockland, Ontonagon Co., Mich. Very fully described, under title Michigan Copper Mining Co., Vol. II.

MINES VENTURE SYNDICATE. **CALIFORNIA & OREGON.**

Office: 327 Pacific Electric Bldg., Los Angeles, Cal. E. Shirley Wilson, president; J. Munroe Layman, general manager. Organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands are sundry undeveloped copper claims in Modoc county, California, and Lake county, Oregon.

MINGINEW COPPER SYNDICATE, LTD. **AUSTRALIA.**

Dead. Formerly at Mingenew, Western Australia.

MINGUS MOUNTAIN COPPER CO., LTD. **ARIZONA.**

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. R. A. Thomas, president; Thos. E. Metcalf, vice-president; W. W. Thomas, second vice-president; J. R. Thomas, secretary and treasurer; A. M. McDermott, assistant secretary; preceding officers, W. B. Simmons and W. B.

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Metcalf, directors; Thomas Brothers & Metcalf, managers. Organized March, 1900, under laws of Arizona, with capitalization $3,000,000, shares $1 par; issued, $2,350,000.

Lands, 38 claims, area 750 acres, fairly timbered and watered, in the Black Hills district, 12 miles south of Jerome, the nearest railroad point, showing 3 fissure veins carrying oxide and sulphide ores, one vein, having a claimed extreme width of 40′ and said to be traceable 4,000′, giving good surface showings of carbonate ores, assaying up to 16% copper. Development is by shafts of 120′, 250′ and 370′, with several tunnels, giving a total of 3,670′ of workings. Company estimates average tenor of ore at 8% copper, with small gold and silver values, which is thought too high.

Equipment includes a 50-h. p. steam plant, with 2 hoists good for 1,000′ each, and several mine buildings. Company is out of cash and apparently in a bad way.

MINING EXPLORATION CO., LTD. **ARGENTINA.**

Office: 19 New Union St., London, E. C., Eng. Operating office: 1128 Agustinas, Santiago de Chile. Works office: Tinguiririca, Chile. Col. Sir Thos. Hungerford Holdich, K. C. M. G., chairman; Wm. Rich, consulting engineer; Frank Lumley, general manager; F. A. Bagnell, secretary. Organized Sept. 29, 1900, under laws of Great Britain, with capitalization £175,000, shares £1 par; issued, £205,000.

Lands include La Victoria and Las Choicas mines, which are in Argentina, circa 60 miles from Tinguiririca, Chile, which is the nearest rail point, and, although lands are in Argentina, operations, to all practical effect, are in Chile. Las Choicas mine, on the eastern slope of the Andes, shows considerable rich ore carrying high values in both silver and copper, and was estimated, 1908, to have in sight 100,000 long tons of ore averaging 8% copper and 50 oz. silver per ton, which figures are considered high. Development is mainly by tunnels.

The reduction plant, on the Rio Tinguiririca, has water power available for development. Company ordered, 1907, material for a 53-kilometer railway, of 60-cm. gauge, from the Choicas mine to the reduction works, which include a 100-ton mill and smelter, expected to begin smelting late in 1908. A wagon-road for traction engines has been built from Tinguiririca to the mine. Property is considered promising.

MINNEAPOLIS COPPER CO. **MEXICO.**

Mine office: 550 Security Bank Bldg., Minneapolis, Minn. J. W. Christy, general manager; Tom. L. West, resident manager. Lands are near the Belen and Transvaal mines. Has gasoline power. Was developing, 1908, with a small force.

MINNEAPOLIS COPPER MINING & MILLING CO. **WYOMING & MONTANA.**

Dead. Formerly at Boulder, Jefferson Co., Mont., and Encampment, Carbon Co., Wyo.

MINNEHAHA COPPER-GOLD MINING CO. **WASHINGTON.**

Dead. Absorbed, 1906, by Mineral Hill Tunnel & Copper Mining Co. Formerly at Danville, Ferry Co., Wash. Described Vol. VI.

MINA MINNIE. **CHILE.**

Mine office: Higuera, La Serena, Coquimbo, Chile. T. H. Everitt, Juan Bade and J. Aldai, owners and managers. Lands, 1 pertenencia, area 5 hectares, circa 13 miles north of Higuera, showing a vein of 10′ width at surface, producing carbonate ore of 10% average tenor. Mine is opened by 2 adit levels, and ore is sold to Sociedad Minera San Juan. Employs 16 men.

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MINNIE GULCH MINING & TUNNEL CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Ores carry gold, silver and copper. Has steam power. Idle several years.

MINNIE HEALY MINING CO. **MONTANA.**

Dead. Property sold, 1906, to Butte Coalition Mining Co. Formerly at Butte, Silver Bow Co., Mont.

MINNIE MABEL GOLD & COPPER MINING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo.

MINNIE MINING & MILLING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Long idle and presumably out of business.

MINONG MINING CO. **MICHIGAN.**

Dead. Was the most important copper mine on Isle Royale, having made 498,650 lbs. fine copper. Formerly on Isle Royale, Mich. Described Vol. II.

MINONG RANGE COPPER CO. **WISCONSIN.**

Dead. Succeeded, 1906, by Rudolph Land Co. Formerly at Gordon, Douglas Co., Wis. Fully described Vol. III.

MINT GROUP. **WASHINGTON.**

Office: care of D. F. Strobeck, owner, Spokane, Wash. Mine office: Meyers Falls, Stevens Co., Wash. Lands, on Gold Hill, show 3 veins, of 8' to 25' width, giving assays up to 8% copper, 5 oz. silver and $8 gold per ton. Idle several years.

MIRANDA HERMANOS. **PERÚ.**

Office and mine: Cajamarca Cajamarca, Perú. Mine, known as the Negritos, carries rich argentiferous copper ore, and is reputed to be highly profitable.

MISKWABIK DEVELOPMENT ASSOCIATION, LTD. **MICHIGAN.**

Dead. Lands sold, March, 1907, to Ojibway Mining Co. Formerly at Phœnix, Keweenaw Co., Mich. Described Vol. VI.

MISSIZONA GOLD & COPPER CO. **NEVADA.**

Mine office: Las Vegas, Lincoln Co., Nev. D. F. Watson, manager. Lands are on the Colorado River, near the Sears mine.

MISSOULA & COEUR D'ALENE COPPER CO. **IDAHO.**

Letter returned unclaimed from former mine office, Murray, Shoshone Co., Idaho. Property, on the old Murray trail, known as the Cook & Barnes group, has a 600' tunnel with a 480' back, showing a fissure vein, apparently of fair width, carrying copper ore.

MISSOULA COPPER MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Robert R. McCormick, president and general manager; Thos. G. Kennedy, secretary and treasurer; J. A. Bushnell, superintendent. Capitalization increased, 1907, from $100,000 to $1,500,000, shares $1 par. Lands, 20 claims, 2 fractional, in Deadman's Cañon, 4 miles east of Mullan. Has 2 tunnels, longest 1,000', and is continuing the Independent tunnel 700' into Missoula ground, to open a wide ledge of quartzite showing occasional stringers of high-grade copper carbonates. Has secured ores assaying up to 30% copper. Has electric power and an 8-drill air-compressor.

MISSOURI & ARIZONA COPPER MINING CO. **ARIZONA.**

Office: 733 R. A. Long Bldg., Kansas City, Mo. Mine office: Mayer, Yavapai Co., Ariz. A. A. Whitney, president; B. A. Stiles, vice-president; B. E. Stevenson, secretary; E. C. Cooper, treasurer. Organized 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, area 100 acres, in the Big Bug district, claimed to have a shaft showing sulphides assaying 4.5% copper and $2 gold per ton, with a trace of silver. Is not regarded favorably.

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MISSOURI COPPER CO. **MISSOURI.**

Dead. Formerly had an office, circa 1903, at 50 State St., Boston, Mass.

MISSOURI COPPER MOUNTAIN MINING CO. **MISSOURI.**

Office: 323 West 7th St., Sedalia, Mo. Mine office: Sullivan, Crawford Co., Mo. L. M. Barnard, president; W. H. H. Myers, secretary. Capitalization $1,000,000, shares $100 par. Lands, 74 acres freehold and 690 acres leasehold. Mine, worked in a small way, before 1850, has 4 shafts and tunnels of 240′ and 1,000′, showing carbonate ores, with hematite gangue and heavy clay gouge, claimed to average about 10% copper. Has steam power and concentrator with a Blake crusher, 18″ and 22″ rolls, 4 New Century jigs, Card concentrating table and hydraulic classifiers. Smelter has a 40-ton Allis-Chalmers water-jacket furnace, with Root blower. Country rock is magnesian limestone, ore body having a good gossan capping, with vein showing chalcopyrite and pyrite in the sulphide zone. Idle several years and apparently moribund.

MISSOURI & MEXICAN MINING CO. **MEXICO.**

Office: Dwight Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. Geo. A. Wittig, president; Leo N. Leslie, secretary. Lands, 370 acres, on the Yaqui River, 9 miles northwest of Suaqui de Batuc, and circa 100 miles from a railroad, said to show ore carrying values of $60 to $300 per ton. Idle several years and apparently moribund.

MITCHELL COPPER MINING CO. **MONTANA.**

Letters returned unclaimed from former office, Missoula, Mont., and from former mine office, Florence, Ravalli Co., Mont. Organized July, 1907, under laws of Montana, with capitalization $1,000,000.

MITCHELL DEVELOPMENT CO. **ARIZONA.**

Dead. Liquidated, 1906. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vols. IV and V.

MITCHELL MINING CO. **MEXICO.**

Office: 52 Wall St., New York, N. Y. Mine office: Chilpancingo, Bravos, Guerrero, Mex. John A. I. Cassidy, president; Thos. H. Anderson, vice-president; Wm. F. Fluhrer, treasurer; preceding officers, Samuel V. Woodward, Martin F. Morris, B. F. Cole, Robt. E. Morrison, Geo. W. Burleigh and Philip S. Dyer, directors; J. McD. Mellen, secretary; E. D. Elson, general manager; E. E. Noon, mine superintendent.

Organized Apr. 16, 1902, under laws of Arizona, with capitalization $5,000,000, increased circa August, 1906, to $8,000,000, shares $10 par. Holds lands through La Dicha Mining & Smelting Co., S. A., organized under laws of Mexico. Controls, through ownership of stock, La Dicha & Pacific Railroad Co., which has an issue of $1,000,000 bonds, at 6%, said to have been underwritten by large shareholders of the Mitchell, and guaranteed, both principal and interest, by the Mitchell Mining Co. Knickerbocker Trust Co., New York, registrar. Annual meeting, first Monday in April.

A 5% dividend was declared, December, 1905, but this proved a promised dividend only, payable in bi-monthly installments of 1%, of which only the first and second installments were paid, in January and March, 1906, the pretext for passing further payments being the cost of enlarging the plant, etc. Geo. Mitchell, promoter of the company, and its former president, is said to have voted himself two years' back salary, at $25,000 per annum, just before quitting office.

Lands, 1,800 pertenencias, area 4,446 acres, in 7 groups, forming a parallelogram of 1 by 7 miles, with axis of the tract along the strike of the vein, in the districts of Bravos and Tabares, circa 40 miles in an air-line from Acapulco. There are also circa 18,000 acres of plantation lands, and 164,000 acres of virgin timber lands, including some good oak, yellow pine and hardwoods. The district is fertile and healthy, with an excellent climate, the temperature

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averaging 74° F. El Rincon ranch, area 18,000 acres, is said to have 8,000 coffee trees, 16,000 cacao trees, pineapples, oranges, etc., besides raising vegetables and cereals, and grazing large herds of cattle and flocks of sheep, furnishing all food supplies for the workmen at the mine.

In addition to the copper property, the Mexican lands of the company include deposits of coal and iron ore, also mineralized veins carrying gold and silver values.

Principal mining property is La Dicha group, said to carry a continuous vein of sulphide ore upwards of 5 miles in length, continuity being proven by a heavy gossan capping, and by exposures where a series of mountain streams have cut the vein, at intervals of a quarter to a half mile, claimed width of the ore body being 150′ to 225′, with a granite footwall and schistose hanging. The vein is said to have been exposed to a depth of 745′ at one point, by a stream cutting through. Below the gossan, and above the base zone constituting the great bulk of ore, is a layer of 1′ to 6′ of chalcocite, assaying up to 74% copper tenor. The vein matter is essentially chalcopyrite, pyrite and pyrrhotite.

The Rio Alcaparosa parallels a considerable portion of La Dicha vein, receiving as affluents numerous smaller streams that have cut across the vein at approximately right angles, wearing down new beds, sometimes for hundreds of feet, affording perfect cross-sections of the ore body.

Development is by 8 shafts and 4 tunnels, with circa 3 miles of workings, all shafts and tunnels being reported to be in ore. Principal developments are between shaft No. 1 and tunnel No. 8, a distance of circa 2,800′. Shafts are the following depths: No. 1 is 65′; No. 2 is 151′; No. 3 is 130′; No. 4 is 253′; No. 5 is 74′; No. 6 is 690′; No. 7 is 338′; No. 8 is 470′; No. 9 is 640′; No. 10 is 85′; No. 11 is 356′, and No. 12 is 308′. All shafts are of 2-compartment size, solidly timbered and equipped with temporary wooden shafthouses, iron-sheathed. Development is mainly by tunnels, of which Nos. 4, 6, 8 and 9 have tram-tracks. At different times various officers of the company have claimed 12,000,000 to 18,000,000 tons of ore in sight, and former President Mitchell claimed to shareholders that the ores of the mine would average 6% copper. In August, 1904, the company claimed to have 861,975 tons of ore blocked out for stoping, with 6,898,636 tons in sight. These figures were gross exaggerations, though the mine has large ore bodies, and the original claims of President Mitchell that the ore would average 6% copper tenor were modified to a later claim that the mine had 2,500,000 tons of ore blocked out averaging above 4%, and 6,000,000 tons averaging better than 3.5% in copper tenor. In view of many past exaggerations these claims must be viewed with deep suspicion.

Mine equipment is light, owing partially to the development of the mine by tunnels. The power plant includes two 40-h. p. and two 120-h. p. hoists, 2 Rand air-compressors and 12 power drills.

Buildings include a general store and a considerable number of cabins for employes. The supply of native labor is said to be ample, and fairly efficient, wages ranging from 29 cents to 42 cents, gold, per day.

The Rio Papagalla, circa 3 miles from the southern end of the mine, has an available head of 200′, if reached by a tunnel of about 1,000′ length, estimated as capable of developing 8,000 h. p. in the dry season, and there is a smaller horsepower available on the Rio Alcaparosa, for which it is claimed that a 350-h. p. installation was ordered, but it cannot be learned that this was received. The management had a cheerful way of stating as facts things that should have been facts, but were not.

The smelter, located at a 75′ waterfall, has a 200-ton Mitchell economic hot-blast furnace, and it was claimed that a 300-ton blast-furnace of the same

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make was being installed, March, 1906, but apparently the second furnace failed to materialize. Blast is furnished by 3 Connersville blowers. The converter plant, of 25 tons daily capacity, has one stand and 3 shells, and was put in commission circa August, 1906. Fuel was coke, wood and charcoal.

La Dicha & Pacific Railroad, planned to be 83 miles long, from the mines near Chilpancingo to Puerto Marquez, 10 miles south of Acapulco, has been surveyed, and it was claimed, early 1906, that contracts were let for grading and laying steel. Apparently work actually was begun May, 1906, but at last accounts the first section of 30 miles was uncompleted, and none of the line in operation.

Production, 1905, was estimated, 1906, by the Copper Handbook, at 3,000,000 lbs., with the statement that the estimate might be too high, which it undoubtedly was, as the company dealt consistently in exaggerations regarding production, as well as all other features of operation. The company is said to have shipped 201,000 lbs. of copper, 1906, via Panamá, which may or may not have been true.

The company was said, 1906, to have given up the Point Vesuvius group, on Galena Bay, Prince William Sound, Alaska, but it is not certain that these lands were held by the Mitchell Mining Co., as the boundaries separating this company from the other Mitchell promotions were very hazy.

The company formerly held the Schultz mine and adjoining properties, near Globe, Gila county, Arizona, but threw up its bonds.

On June 13, 1908, Geo. Mitchell assigned, to the Mitchell Mining Co., the company's note to him for $156,875.93, issued to cover alleged advances made personally by Mitchell to La Dicha Mining & Smelting Co., S. A. Two reorganization committees were appointed, 1907, and apparently these are pulling at cross purposes. Company's property was attached, October, 1908, by Frederick Cuthbertson, for $57,291. The company apparently is hopelessly involved, and the miserable manner in which the property has been managed is highly discreditable to Mitchell and all others connected with the promotion. The outcome fully verifies the criticisms of the Copper Handbook, made in Vols. V, VI and VII.

MITSU BISHI GOSHI-KWAISHA. **JAPAN.**

Office: Mitsu Bishi Bldg., Yaesucho Itchome, Kojimachi-ku, Tokio, Japan. Branch office: 10 Aioicho, Itchome, Kobe, Japan. Mine offices are given in detailed mine descriptions following. K. Nambu, president; S. Harada, vice-president; S. Sho, secretary; R. Tayakawa, treasurer; A. Yamada, general manager; K. Kimura, manager Kobe office.

The company is an extensive producer of copper, its principal mines being the Yoshioka, Arawaka, Makamine, Ikuno, Sawatari, Omodani, Mozumi, Takara and Sado, with various smaller properties.

The Osaruzawa mines are at Hanawa, Kazuno, Rikuchu, Japan. K. Ishihara, superintendent; K. Okamoto, smelter superintendent; W. Matsuhashi, mine superintendent; K. Ikeda, mill superintendent; T. Kawamura, engineer. Lands, circa 1,000 acres, also 200 acres of miscellaneous lands adjoining. Mines are very ancient, having been opened in the Eighth Century, but were worked for gold only, until circa 1650, when copper ores were developed. Ore is mainly chalcopyrite, with occasional bornite and a little native copper, associated with pyrite and small quantities of sphalerite, galena and hematite. Occasionally native gold is found, mixed with the copper ores, and in a quartz fahlband, gold values occurring mainly in the upper workings. The veins are very numerous, ranging from 5" to 30' in width, with average width of 3'. The veins, which are very persistent in strike, and hold workable to an average depth of 500', traverse Tertiary shales and tuffs, with intrusive augite-andesite and liparite. Development is by 8 working shafts, deepest 470', and 7 main

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tunnels, longest 7,500′, the mines having upwards of 15 miles of workings. The smelter has two 40-ton water-jacket blast-furnaces and a 250-h. p. electric plant, turning out blister copper of 99.09% tenor. The Osaruzawa mines employ circa 1,000 men, and, in 1,200 years of operation, have produced immense quantities of gold, silver and copper. Production was 2,448,000 lbs. fine copper in 1902; 2,817,152 lbs. copper, 142,492 grams silver and 6,161 grams gold in 1906, and 2,537,710 lbs. copper, 204,313 momme silver and 2,600 momme gold in 1907.

The Yoshioka mine is at Fukiya-mura, Kawadami-gori, Bitchu, Japan. M. Fujioka, general superintendent. The mine, opened 1806, was worked continuously, but never became a considerable producer until taken over, 1873, by present owners. The property was very difficult of access until a new road was built by the Mitsu Bishi company. Ore is chalcopyrite, associated with sphalerite, pyrite and pyrrhotite, with quartz gangue, and averages, after dressing, 9% copper. Ore occurs in veins in country rocks of clayslate, sandstone and schalkstein, traversed by porphyry dykes. Production was 1,081,346 lbs. fine copper and 1,722,000 momme silver in 1900; 1,674,648 lbs. fine copper and 2,011,725 grams silver in 1906, and 1,809,679 lbs. fine copper, 461,170 momme silver and 1,080 momme gold in 1907.

The Arakawa mine is at Arakawa-mura, Senhoku-gori, Ugo, Japan. M. Ooye, general superintendent. This property, formerly known as the Ugaiwa mine was reopened 1871, and, after passing through various hands, was bought, 1896, by the present owners. Country rocks, of Tertiary and Quaternary ages, include hornblende-andesite, liparite and propylite, carrying numerous parallel veins in propylite, with strike approximately northeast and southwest. Production has been as follows: 566,268 lbs. fine copper in 1900; 1,200,215 lbs. in 1906, and 1,645,921 lbs. in 1907.

The Hisanichi mine is at Arakawa-mura, Senhoku-gori, Ugo, Japan. M. Ooye, general superintendent. This property, near the Arakawa, shows 6 main veins; the largest, known as the Ugaisawa, of about 24′ average width, carries about 8′ of payable ore, and occasionally branches into several smaller veins. The 5 other workable veins range 5′ to 7′ in width. Ore is chiefly argentiferous chalcopyrite, associated with pyrite, frequently carrying native copper, cuprite and chrysocolla, associated with pyrite, sphalerite and galena, with quartz gangue. The property has water and electric power, and a 50-ton smelter, employing circa 1,200 men. Production, 1900, was 1,734,522 lbs. fine copper.

The Ikuno mines are at Ikuno, Tajima, Japan. T. Hori, general manager. These properties employ circa 1,000 men. Mines were discovered A. D. 807, and were extensively worked, 1596-1620, under the direction of the Tokugawa government, but were taken over, 1868, by the Imperial government, and sold, 1896, to the present owners. The three principal mines of this group are the Tasei, Kanagase and Kasei. The Tasei mine has a main vein of 14′ average width, with numerous branches traversing liparite, propylite and Tertiary tuffs, carrying native gold, argentite, and silver, malachite, chalcopyrite, sphalerite and galena, associated with pyrite. The Kanagase mine, near the Tasei, has the same country rocks, but is traversed by basalt dykes, a great fault-seam, 30′ to 40′ in width, filled with brecciated country rock, showing 6 veins carrying native copper, bornite, chalcopyrite, tetrahedrite, argentite, sphalerite, galena, pyrargyrite and stibnite. The Kasei mine shows diorite, traversed by liparite and propylite dykes, the metalliferous veins, occurring in diorite, carrying chalcopyrite and native silver, with ores of lead, zinc and antimony. The properties have steam, water and electric power. Production of the Ikuno mines has been as follows: 984,355 lbs. fine copper, 1,260,932 momme silver and 5,620 momme gold in 1900; 1,435,234 lbs. fine copper in 1903; 1,845,091 lbs. fine copper, 6,368,010 grams silver and 131,794 grams gold in 1906;

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1,979,789 lbs. fine copper, 1,499,664 momme silver and 22,596 momme gold in 1907.

The Makamine mine is at Kitakata-mura, Higashi-Usuki-gori, Hyuga, Japan. This property is an old mine, idle for many years, until reopened, circa 1896, by the Mitsu Bishi company. Ore is chalcopyrite, associated with pyrite, averaging 3.5 to 4% in copper tenor. The property has been modernized in equipment and methods. Production has been as follows: 1,208,282 lbs. fine copper in 1900; 1,933,227 lbs. in 1903; 1,275,097 lbs. in 1906; 1,179,212 lbs. in 1907.

The Omodani mine is at Kami-Anana-mura, Ono-gori, Echizen, Japan. This property, opened A. D. 1350, has numerous small veins, none exceeding 4' in width, carrying bornite, chalcopyrite, sphalerite and galena, all argentiferous and showing occasional native silver. Production has been as follows: 614,438 lbs. fine copper and 103,682 momme silver in 1900; 432,248 lbs. copper and 1,043,115 grams silver in 1906; 502,331 lbs. copper and 282,723 momme silver in 1907.

The Sawatari mine is at Kitakata-mura, Higashi-Usuki-gori, Hyuga, Japan. This property, adjoining the Hibira mine, carries small lenses of ore in Paleozoic clayslate and sandstone. Production was 137,191 lbs. fine copper in 1900 and 227,684 lbs. in 1903. There is no later production reported, and mine probably is idle.

The Kamioka mine is at Funatsu, Yoshiki-gori, Hida, Japan. Bichru Matsuda, superintendent. The property is essentially a silver-lead mine, making copper as a by-product. Ores are mainly argentiferous chalcopyrite, arsenopyrite, galena, sphalerite and pyrite, associated with occasional malachite and chrysocolla. The mine has steam and electric power, and a small smelter, employing circa 600 men. Production has been as follows: 8,475 lbs. fine copper, 537,487 kin lead and 148,670 momme silver in 1900; 46,621 lbs. fine copper and 3,704,437 grams silver in 1903, and 84,331 lbs. fine copper and 1,336,239 momme silver in 1907.

The Sado mines are at Arakawa-cho, Sado, Japan. Y. Uriu, general superintendent. This property, 425 miles from Tokio, on the Island of Sado, formerly was owned by the Mikado and operated as a sort of government mining school, until 1898, when bought by the Mitsu Bishi company. The mines carry auriferous and argentiferous copper ores, being primarily gold and silver mines, with a little copper secured as a by-product. Equipment includes steam, water and electric power, with an exceptionally good plant of modern mining machinery. Production has been as follows: 12,730 lbs. fine copper, 3,098,265 grams silver and 374,899 grams gold in 1906; 12,812 lbs. fine copper, 963,753 momme silver and 109,344 momme gold in 1907.

Production by all mines of the company was 12,727,944 lbs. fine copper in 1905, and 13,535,458 lbs. copper, 19,084 kgs. silver and 578 kgs. gold in 1907. The Mitsu Bishi is one of the four large copper mining companies operating in Japan, and, like the others, is exceptionally progressive. Success has not been won by the possession of mines of exceptional value, though the company has some excellent properties, but rather by the utilization of the most modern methods and appliances in mining and metallurgy, directed by the best technical skill available.

MITSUI & CO. **JAPAN.**

Mine office: Funatsu, Yoshiki-gori, Hida, Japan. C. Tanikawa, superintendent. Property is the Mozumi mine, near the Kamioka of the Mitsu Bishi Goshi-Kwaisha. The Mozumi mine, opened A. D. 1573, is primarily a silver-lead mine, but a little copper is secured as a by-product. Production, 1906, was 119,044 lbs. fine copper and 858,900 grams fine silver.

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In addition to metalliferous mines, Mitsui & Co. are extensive miners of coal, and their various properties are well equipped and handled with technical skill.

MITTERBERG COPPER CO., LTD. **AUSTRIA.**

Office: 16 St. Helens Place, London, E. C., Eng. Mine office: Innsbruck, Tyrol, Austria. Chas. C. Turnbull, J. P., chairman; Gerald B. Elkington, J. P., vice-chairman; H. Read Smith, secretary; preceding officers, Jacques Oppenheim and G. Muir Ritchie, directors; Robt. Addie, consulting engineer; Henry Merton & Co., commercial agents. Organized Dec. 14, 1905, under laws of Great Britain, with capitalization £200,000, shares £1 par; issued, £175,000. Paid a 1s. dividend early 1907.

Lands, 10 mining claims and 10 prospecting claims, area 1,551 acres, also 3,304 acres of timber lands, 15 miles from Bishofshofen, midway between Salzburg and Innsbruck, in the Austrian Tyrol. The Mitterberger mine shows argillaceous Silurian schists, limestone and dolomite, carrying 3 parallel veins, known as the Josephi, Johanni and Marien, of 6′ to 9′ average width, carrying auriferous, argentiferous and nickeliferous chalcopyrite, associated with arsenopyrite, pyrrhotite and siderite, with gangue chiefly of quartz. The veins do not carry synchronous values, there being only one payable lode in any given cross-section, mineral values switching from one vein to another at intervals. The veins carry high values in stringers of 1″ to 30″ width, with balance of ore body payable throughout the vein, at the points mineralized, ore averaging circa 3% in copper tenor.

The Mitterberger mine is an old property, and has extensive underground workings, estimated to show 3,000,000 tons of ore, with circa 400,000 long tons blocked out for stoping, but these estimates are considered high. The mine is developed exclusively by tunnels, with small concentrators at the portals.

The reduction works, at Ausserfelden, include a mill, in which it was said, 1907, that an Elmore vacuum flotation process was being installed, and an antiquated smelter, which the company is said to plan reconstructing upon a modern scale. It is said also that the new management plans sinking two shafts, to open the mine at depth.

Production, under former ownership, was about 600 long tons of fine copper yearly, and for the first 9 months of operation, ending early 1907, production under present management was 473 long tons of fine copper, and a small quantity of bluestone, showing that the new owners apparently are making no more copper, despite the very high capitalization, than was made formerly. The arrangements of the company with the directors are considered unfavorable to the corporation, and the management has been sharply criticised, by Austrian mining publications of good standing, which complain that a raft of relatives and place-seekers were turned loose on the property.

MITTERBERGER KUPFER GEWERKSCHAFT. **AUSTRIA.**

Mine office: Innsbruck, Tyrol, Austria. Is controlled, through stock ownership, by Mitterberg Copper Co., Ltd., and property is described under title of that company.

COMPAÑIA MINERA MIXTA MICHOACANA. **MEXICO.**

Mine office: Ario de Rosales, Ario, Michoacán, Mex. Tomás González, manager. Has gold, silver and copper ores, employing circa 60 men at last accounts.

MIZPAH CONSOLIDATED COPPER & GOLD MINING CO. **NEVADA.**

Mine office: Mizpah, Elko Co., Nev. T. J. Duddleson, president; H. P. Crist, secretary and treasurer; Henry Darlington, manager. Lands, in the southeastern portion of Elko county, 5 miles east of a railroad, have a 70′ two-compartment incline shaft, planned to be sunk 250′, said to show ore assaying 17% copper and $7 per ton in combined gold and silver values.

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MIZPAH COPPER CO. **NEVADA.**

Dead. Organized circa February, 1907, and was succeeded, 1907, by Ely National Copper Co. Formerly at Ely, White Pine Co., Nev.

MIZPAH COPPER & GOLD MINING CO. **NEVADA.**

Mine office: Mizpah, Elko Co., Nev. Has secured assays of 12 to 20% copper, with combined gold and silver values of $8 to $20 per ton.

MIZPAH COPPER KING MINING CO. **NEVADA.**

Mine office: Mizpah, Elko Co., Nev. J. H. Wilson, president; Hon. John Donaldson, vice-president; C. C. Shettles, secretary and treasurer; Chas. Young, superintendent; preceding officers, W. E. Young, Chas. S. Watson and A. E. Strong, directors. Organized 1907, under laws of Arizona, with capitalization $1,000,000. Lands, 5 miles from Nevada Northern railway, show quartzite and granite-porphyry dykes, carrying a 3′ fissure with ore assaying up to 32% copper, 23 oz. silver and $10 gold per ton, opened by a 60′ shaft and 100′ tunnel.

MIZPAH COPPER MINING CO. **IDAHO.**

Office and mine: Palouse, Whitman Co., Wash. C. E. Frederick, president; J. C. Northrup, vice-president; H. C. Johnson, secretary; W. F. Chalenor, treasurer. Organized October, 1906, under laws of Washington, with capitalization $1,500,000. Lands, in the Hoodoo district of Latah county, Idaho, have about 1,000′ of workings, main tunnel showing high-grade cuprite, azurite and malachite, all argentiferous and of good copper tenor. Expended, 1907, about $20,000, and plans a 2,000′ aerial tramway to connect with a branch railway.

MIZPAH MINES & REALTY CO. **NEVADA.**

Dead. Was organized circa March, 1907. Formerly at Ely, White Pine Co., Nev.

MIZUSAWA MINE. **JAPAN.**

Owned by Furukawa Mining Co.

MOAB COPPER MINING CO. **N. UTAH.**

Office and mine: Moab, Grand Co., Utah. Organized Nov. 2, 1905, under laws of Utah, to take over claims in the La Sal district. Apparently idle since birth.

MOBILE MINE. **GEORGIA.**

Mine office: Pierceville, Fannin Co., Ga. Is an old and slightly developed property, idle many years.

MINA MOCTEZUMA. **MEXICO.**

Mine office: San Juan de Guadelupe, Durango, Mex. Ramón Gaitan, owner and manager. Mine, opened by tunnel, carries argentiferous lead and copper ores, employing circa 50 men.

MOCTEZUMA-ARIZPE DEVELOPMENT CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Arizpe Development Co.

MOCTEZUMA COPPER CO. **MEXICO.**

Office: 20-99 John St., New York, N. Y. Mine office: Nacozari, Moctezuma, Sonora, Mex. Jas. Douglas, president; A. C. James, vice-president; Geo. Notman, secretary and treasurer; Jas. S. Douglas, superintendent; T. A. Stanton, assistant superintendent; Geo. Kingdon and Geo. Reed, mine superintendents; Al. Berner, mill superintendent; Dr. A. Sandberg, metallurgist; D. S. Giddings, engineer; Geo. M. Douglas, superintendent of motive power.

Organized under laws of West Virginia, with capitalization $3,000,000. As a close corporation, owned and managed by members of the firm of Phelps, Dodge & Co.

Lands, circa 2,000 acres, in the Moctezuma and Arizpe districts of Sonora, including the Pilares de Nacozari mine, 6 miles east of Nacozari, also the Juárez and Nicolás ranches, area circa 35,000 acres.

The Pilares mine lies in a hilly country, near the divide of the Yaqui and

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Oposura rivers. The lands have been probed extensively, by diamond drill borings. Ore occurs in a broad friction zone, in which the original rock has been broken into pieces, ranging in size from gravel up to masses many tons in weight, the porphyritic rock in this crushed zone, which is the matrix of the ore, carrying mainly auriferous chalcopyrite, with occasional bornite, associated with pyrite. The deposit has no clearly defined footwall, and the hanging dips at an angle of about 80°. There is a small outcrop of rich carbonate ore, but croppings are mainly red-stained porphyry, carrying considerable low grade hematite. The leached zone is about 20′ in depth only, with pay-ore coming in at depth of circa 60′. The ore body apparently is about 800′ wide by 1,500′ long, at surface, with increased area at depth. The matrix is a fine-grained silicious rhyolite, and ore averages about 2.7% in copper tenor, as mined, before concentration, though some high grade ore is found.

Development is mainly by tunnel, though there are two vertical shafts, with a 687′ incline shaft on the San Pedro, deepest workings being only 700′. Extraction is mainly through the Porvenir tunnel, about one mile long, with a vertical shaft at the end, the tunnel, which is on the 700′ level, being equipped with railroad tracks of 20″ gauge. The Porvenir tunnel has extensive driftings at either side, with storage bins in a 25x100′ chamber, to which ore is milled down from the upper workings. The mine shows some enormous stopes, No. 4 stope, on the third level, being 85′ high, 125′ wide and 150′ long. The mine has about 50 miles of workings, and is very dry and well ventilated.

Ore is extracted in stopes 100′ square, and, after removal of ore, the depleted stopes are caved in from surface, after which another 100′ section is opened. This is repeated for the entire length of the ore body, after which another 100′ section is started, at a distance of 100′ from the previously mined section, leaving a 100′ strip of unmined ore between the length of the property, after which the unmined section, 100′ wide, is stoped, ground being held by the broken rock on either side. The Pilares has one of the largest copper ore bodies in the world, and it is comparable, in many respects, with the Rio Tinto. The mine has several million tons of ore blocked out for stoping, with reserves of known ore of enormous tonnage.

The new 1,200-h. p. power plant, completed 1908, has a battery of Stirling boilers, with a 196′ reinforced concrete smokestack, and is equipped with steam turbines and electric generators, distributing electric power to the new concentrator and the mine. The old power plant has both steam and gas power, mainly the latter, with Loomis-Pettibone generators making both producer and water gases, which are stored in separate gasometers, of 15,000 and 5,000 cubic feet capacity respectively, gases being mixed in due proportions, before use. The consumption of fuel in the producer gas plant is under 3 lbs. of very inferior wood, per horsepower hour. The old power plant has eight 100-h. p. Crossley single-cylinder 4-cycle gas engines, with 18½″ cylinders and 24″ stroke, making 200 revolutions per minute, each direct-connected to a 65-kw. direct current generator, and one 200-h. p. Crossley engine, driving a 150-kw. generator. Current is sent from the central station, at 250 volts, to some 40 different motors, installations ranging from 5 to 175 h. p. each. Electric power for the mine is transmitted 6 miles, at 6,600 volts, and at the mine is stepped down to 230 volts, for the pumps, while the hoists and the electric locomotives use a 250-volt direct current.

Buildings, mainly of steel, include a brick machine-shop. Lighting at the mine and mills is by arc and incandescent electric lights.

The mine, mill and smelter are connected by a 6-mile narrow-gauge railway, known as the High Line, which was extended, improved and relaid with 80-lb. steel rails, in 1908. Rolling stock includes 60-ton locomotives and 25-ton steel ore-cars.

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There are two mills, the old concentrator, of 600 tons daily capacity, being in 2 sections, equipped with 2 Blake crushers, 4 sets of 54x3" roughing rolls, 2 sets of finishing rolls, 24 revolving screens, ten 5' Huntington mills, 48 Hartz jigs, 56 six-foot Frue vanners, 20 Bartlett tables, 7 settling tanks and hydraulic classifiers. Slimes from the settlers are worked by vanners exclusively, and rolls are used in crushing, as far as possible, to obviate sliming. Tailings are reground and treated on Frue vanners. Equipment of the old mill includes five 50-h. p. motors, eight 30-h. p. motors and one 20-h. p. motor. The old mill, designed by Dr. L. D. Ricketts, is said to save upwards of 90% of assay values, although the ore is not readily amenable to satisfactory treatment.

The new mill, of 2,000 tons nominal daily capacity, 6 miles from the mine, is in 2 sections, the first half having gone into commission circa July 1, 1908. Equipment includes 15 Allis-Chalmers 3-phase, 60-cycle, 220-volt induction motors, of 10 to 75 h. p. each, and the mill has 70 Risdon-Johnston concentrating tables. The new mill makes concentrates of about 12% copper tenor, with a saving of about 82% of assay values. Equipment includes 20 thirty-ton Ingoldsby side-dumping cars.

The mills are supplied with water by one Triplex and 3 Worthington pumps, forked from a well in the river to a reservoir at the millsite, and wash-water from the concentrators is settled and re-used.

The smelter, near the mill and 5 miles from the mine, has two 42x130" elliptical water-jacket blast-furnaces, of the Copper Queen type, flanked by tilting wells that can be tilted both front and rear. The converter department has 2 stands, with 96x114" shells of the Copper Queen type. Fumes from furnaces and converters pass into an 8' horizontal steel flue, connecting with a 750' brick flue that discharges into a 70' brick stack. Blast is furnished by a blower, direct-connected to a 75-h. p. dynamo. This smelter was closed, September, 1904, upon completion of the railroad line from Cos to Nacozari, since which time all concentrates have been shipped to the Douglas smelter of the Copper Queen, 77 miles distant.

The company maintains both English and Spanish schools, for children of employes, also a hospital, public library and well-stocked general store.

The mine workers are mainly Mexicans, as are many of the employes at the mill, and the bulk of the forces employed on surface. Native labor is paid 2 to 3 pesos per 10-hour shift. Forces are about 800 men.

Production has been as follows: 9,632,000 lbs. fine copper in 1904; 10,160,016 lbs. fine copper in 1905; 12,714,726 lbs. in 1906; 9,640,390 lbs. in 1907. Production for latter half of 1908 was considerably increased, as a result of starting the first section of the new mill, and should be raised, ultimately, to 25,000,000 to 30,000,000 lbs. fine copper yearly. The management is excellent, and the property, while low in average grade, has an enormous tonnage of ore, and is certain to become a much heavier producer in the future than it has been in the past.

MOCTEZUMA DEVELOPMENT CO. **MEXICO.**

Office: Douglas, Ariz. Mine office: Moctezuma, Sonora, Mex. Jas. E. Suits, T. S. Lamberson, Geo. W. Cass, J. J. Brown and Gid Graham, directors. Organized Aug. 6, 1906, under laws of Arizona, with capitalization $200,000, shares $1 par. Mine, having 4 tunnels, with about 2 miles of workings, greatest depth being 700', is claimed to have produced, under former ownership, about $2,000,000 worth of copper, lead, gold and silver ores.

MOCTIGAN MINING CO. **MONTANA.**

Office: care of J. H. Vivian, president, Butte, Silver Bow Co., Mont. Mine office: Corbin, Jefferson Co., Mont. Jas. Higgins, vice-president; J. K. Rowe, secretary and treasurer; preceding officers and Jas. B. White, directors. Organized February, 1907, under laws of Montana, with capitalization

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$1,000,000, shares $1 par. Lands, 8 patented lode claims and 2 patented placer claims, area circa 150 acres, also a millsite and right of way to railroad, including properties formerly held by the Minah Consolidated. Presumably idle.

MODEL GOLD MINING CO. **ARIZONA.**

Dead. Was a bad egg. Formerly at McCabe, Yavapai Co., Ariz.

MODERN COPPER MINING CO. **ARIZONA.**

Office: Utica, N. Y Mine office: Bisbee, Cochise Co., Ariz. W. J. Thistlethwaite, president, R. Harlan, general manager; J. C. Green, secretary. Lands, 28 claims, unpatented, area circa 500 acres, at the northwestern end of Tombstone Cañon, in the Warren district, showing 5 fissure veins, carrying carbonate and sulphide ores, of which one vein, slightly developed, is said to give average assays of 7% copper, 10% lead, 14 oz. silver and 1 oz. gold per ton. Has shafts of 25′, 40′, 50′ and 100′, and has started a tunnel, to strike a vein claimed to show a gossan outcrop. Claims considered poorly located.

MODOC MINING CO. **NEW MEXICO.**

Dead. Lands passed to American Metals Co. Formerly at Organ, Donna Ana Co., N. M. Described Vol. VI.

MOGOLLON GOLD & COPPER CO. **NEW MEXICO**

Office: 516-290 Broadway, New York, N. Y. Mine office: Cooney, Socorro Co., N. M. Thos. J. Curran, president and general manager; Walter D Buchanan, vice-president; Geo. H. Masten, secretary and treasurer; preceding officers, Geo. W. Stubbs and William J. Weatherby, directors; James P. Batchen, superintendent; J. D. Murphy, mine superintendent; Robert G. Reilley, mill superintendent. Organized Sept. 12, 1901, under laws of New Mexico, with capitalization $1,250,000, shares $1 par; issued, $950,000. Bonds, $350,000 authorized, $105,000 issued. Paid dividends of $22,500 to March 12, 1906.

Lands, 29 claims, area 500 acres, partly patented, also a 40-acre millsite, in the Cooney district of the Mogollon Mountains, circa 85 miles northeast of Silver City, the nearest railroad point, including 5 groups, known as the Cooney, Peacock, Little Charley, Independence and Fluoride.

The Peacock mine has a 400′ shaft, about 1,500′ distant from the Cooney shaft, and connected therewith by drifts on several levels. The Cooney group, 9 claims, is developed by a 550′ two-compartment main shaft. The mine is opened on a fissure vein, in porphyry and andesite, that averages 5′ to 10′ width, with occasional greater width, carrying a paystreak of 3′ to 30′ width, with numerous narrow feeders, some of which have high values in gold. Ores are principally slightly auriferous and highly argentiferous chalcocite, bornite and chalcopyrite, with silver values increasing at depth. The Cooney has 6 levels opened, and the Cooney and Peacock have been producers of ores to the estimated value of $1,250,000, in the past.

Equipment includes a machine shop, electric light plant and a small concentrator. A receivership was asked, May, 1907, on the alleged ground of insolvency and bad management, but apparently was not granted by the courts, and the property was working, with a small force, at last accounts.

MOGOLLON MINING CO. **NEW MEXICO.**

Office: Deming, N. M. Mine office: Cooney, Socorro Co., N. M. W. L. Nixon, president and general manager; T. B. Dillon, vice-president and mill superintendent; W. B. Westgate, secretary; E. S. Milford, treasurer. Company has a 5-year lease of the Deep Down mill.

MOHAWK MINING CO. **MICHIGAN.**

Office: 615 William St., New York, N. Y. Mine office: Mohawk, Keweenaw Co., Mich. Mill office: Gay, Keweenaw Co., Mich. Employs circa 1,000 men. Jos. E. Gay, president and treasurer; J. Wheeler Hardley, secretary; John R. Stanton, vice-president; Fred Smith, agent; preceding officers and

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Wm. A. Paine, directors; Willard J. Smith, superintendent; Frank Getchell, clerk; John Trevorrow, mining captain; F. Wm. Hartmann, engineer.

Organized November, 1898, under laws of Michigan, with capitalization $2,500,000, shares $25 par; paid in, $21. Dividends have been as follows: $500,000 in 1906; $900,000 in 1907; $200,000 in 1908. Boston Safe Deposit & Trust Co., registrar; American Trust Co., Boston, transfer agent. Annual meeting, last Tuesday in March.

Lands, 800 acres, forming an irregular tract having its axis on the strike of the lode, in Sections 27, 28, 33 and 34, T. 57 N., R. 32 W. The Mohawk is about 4 miles northeast of Calumet, having the Ahmeek and Seneca on the north, and Ahmeek on the west. The Mohawk, formerly known as the Fulton, was supposed to lie too far east to carry the outcrop of the Kearsarge bed, until it was found, accidentally, circa 1896, by the cutting of a wood-road. The Kearsarge amygdaloidal bed, on which the mine is opened, outcrops for about one mile on the Mohawk tract, and the deepest shaft can be sunk, on the dip of the bed, for nearly 1½ miles, before reaching the boundary.

Crossing the Kearsarge lode at approximately right angles, with nearly vertical dip, are 3 fissure veins, carrying sundry arsenides of copper, including mohawkite, keweenawite, mohawk-whitneyite and stibio-domeykite, the two former being peculiar to this mine. Mohawkite occurs in considerable quantities in the upper north drifts of No. 1 shaft, in a vein ranging 3" to 3' in width, which was found mineralized at the crossing of the amygdaloidal bed, and for an indefinite but unusually short distance on either side, the mohawkite and allied arsenides of copper occasionally occurring massive, though usually disseminated in an arenaceous gangue. On the deeper levels the mineral contents of the principal fissure veins are small, and apparently the production of mohawkite for the future will be trifling. Sales of mohawkite and allied arsenides, to end of 1907, returned $116,407.79.

In addition to the Kearsarge amygdaloid and the arsenical fissure veins, the Mohawk property carries sundry other copper-bearing amygdaloidal beds, which may be given attention later, but work, very wisely, has been confined, to date, to the development of a profitable mine on the Kearsarge bed.

The mine has 5 shafts, numbered from north to south. New openings have been as follows: 10,812' in 1905; 13,314' in 1906; 11,043' in 1907. The mine is equipped with Richmond electric signals, and operates 65 power drills. The shafts are connected by drifts down to and including the 5th level, these drifts running from the northern boundary to circa 600' south of No. 5 shaft. Shafts 1 to 4, inclusive, are connected down to and including the 8th level, and shafts 1 and 2 are connected to the 14th level. The use of concrete stringers was begun in 1905, in shafts 1, 2, 3 and 4, below the timbering formerly installed, and No. 5 has concrete stringers from surface The wooden sleepers in the four older and deeper shafts will be replaced by concrete, from time to time, as the wooden sleepers decay.

Shafts are of uniform size, 8x18' inside of timbers, with solid cribbing through the overburden, and are to have identical equipments. The lode runs 15' to 18' wide, or about the same as in the Wolverine, and carries about the same percentage of copper as the Wolverine at similar depth, but is not nearly so rich as the bottom workings of the Wolverine.

No. 1 shaft, circa 1,500' south of the northern boundary, on the strike of the lode, is 1,700' deep. This shaft gave a good showing near surface, which became poor at depth, but is improving again in the lower levels. The hoist for No. 1, located in the central power plant of No. 2 shaft, operates two 4-ton skips in counterbalance. No. 1 has a combination shaft-rockhouse, equipped with a 12x24" Nordberg engine and rock-crushers.

No. 2 shaft, 1,100' southwest of No 1, is 1,575' deep. Like No. 1, the

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showing was good near surface, but poor at depth, though improving below the 12th level. The power plant at No. 2 shaft, serving both of the northern shafts, includes an engine-house and boiler-house of mine rock with redstone trimmings. Hoists are Nordberg double-conical-drum duplex-cylinder engines, good for 6,000′ depth, each handling two 4-ton skips in counterbalance. The boiler-house has 2 locomotive firebox boilers, with foundations for 3 additional, and the engine-house has an auxiliary compressor plant, with 2 Ingersoll-Sergeant air-compressors, of 40 drills combined capacity. No. 2 has a combination shaft-rockhouse, similar to No. 1 in design and equipment.

No. 3 shaft, 1,100′ southwest of No. 2, is 1,225′ deep, and will reach the western boundary at a depth of circa 2,000′. Equipment includes a shaft-rockhouse similar to the northern shafts, and a Fraser & Chalmers geared hoist, good for 3,000′ depth, operating 2-ton skips in balance.

No. 4 shaft, 1,300′ southwest of No. 3, is 1,175′ deep, developing good average ground from surface. Equipment includes a steel shaft-rockhouse with 3 crushers and a steam-hammer. The engine-house, of redstone, has a Nordberg double-conical-drum hoist, good for 6,000′ depth. The central compressor plant, at No. 4, has a 60-drill Nordberg air-compressor and a 60-drill Ingersoll-Sergeant cross-compound 2-stage air-compressor, with steam cylinders of 22″ and 46″ diameter, and air cylinders of 27¼″ and 42¼″ diameter, with stroke of 48″, having a piston efficiency of 5,260 cubic feet of free air per minute, compressed to a pressure of 70 lbs. per square inch. The boiler-house at No. 4, of redstone, has 5 locomotive firebox boilers and a 160′ self-supporting brick-lined steel smokestack.

No. 5 shaft, 1,800′ south of No. 4, is 575′ deep, with an excellent showing of copper from surface. The temporary rockhouse, with one crusher, is to be replaced by a shaft-rockhouse similar to those at the other shafts. Equipment includes a frame power-house, with a Fraser & Chalmers straight-face drum hoist good for 2,000′, brought from No. 1. A Bullock hoist, good for 4,000′ depth, formerly at No. 4 shaft of the Wolverine, is on the ground, and to be installed, during 1909.

There are large coal-trestles at No. 4 shaft and between shafts 2 and 3. The mine has a complete telephone system, on surface and underground. Buildings include two miners' changing houses, a machine shop, smithy, combination carpenter shop and warehouse, 30x40′ office, a well equipped hospital, numerous minor buildings and dwellings for employes. A considerable village, with business houses, a bank, newspaper, etc., has grown up around the mine.

The mill, near the mouth of the Tobacco river, on Traverse Bay, Lake Superior, opposite the mill of the Wolverine, is 178x206′ in size, of steel frame, sheathed with iron, on foundations of sandstone quarried from the company's own land. A steel trestle, 350′ long and 50′ high, leads into the mill, loaded cars being pulled up the incline by a winding engine. The mill has 4 stamps, all compounded, giving a daily capacity of about 3,000 tons. The mill has a Chilean mill and 3 sets of auxiliary crushing rolls, with fixed bearings, to reduce oversize material from the mortar-boxes of the heads, this averaging 20 to 25% of rock stamped. Mineral from the wash discharges automatically, and is sluiced into the basement, where shoveled into 1½-ton mineral cars, having 14-mesh perforated steel bottoms that allow the draining out of water, after which the cars are weighed, then lifted by a cage-elevator and dumped into bins. The bin-house has 4 compartments, each with a cement floor and steam pipes underneath for drying the remaining moisture from the wash. The mineral is taken from the bin-house, in self-dumping steel mineral cars, to the Michigan smelter at Houghton, for reduction.

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The boiler-house, of steel, adjoining the mill, has four 250-h. p. Stirling water-tube boilers.

Water for both the Mohawk and Wolverine mills is furnished from a joint pumphouse, standing near the Tobacco River, from which water is taken. The pumphouse has a 20,000,000-gallon triple expansion Snow pump, supplemented by a new 9,000,000-gallon Nordberg pump, giving an ample water supply for both mills.

A 30x300′ wharf, on Traverse Bay, a short distance from the mill, with 14′ of clear water alongside, is fitted with coal-hoists and storage sheds, ample for the needs of both mills.

The townsite at the Mohawk and Wolverine mills, named in deserved honor of Jos. E. Gay, long identified with honest and successful copper mining in the Lake Superior district, is well laid out, with wide streets, water-mains and hydrants, and has a number of substantial dwellings for employes.

Production has been as follows: 6,284,327 lbs. fine copper in 1903; 8,149,515 lbs. in 1904; 9,387,614 lbs. in 1905; 9,352,252 lbs. in 1906; 10,107,266 lbs. in 1907. In October, 1908, the fourth stamp was being worked part time, and production for 1909 should be circa 13,000,000 lbs. fine copper. Yield of fine copper per ton of rock stamped was 21.79 lbs. in 1903; 17.76 lbs. in 1904; 16.01 lbs. in 1905; 15.12 lbs. in 1906, and 15.77 lbs. in 1907. Costs per ton of rock stamped, less construction, were $1.92 in 1903; $1.63 in 1904; $1.56 in 1905, $1.59 in 1906 and $1.54 in 1907. The cost of copper per pound, exclusive of construction, was 8.78 cents in 1903; 9.19 cents in 1904; 9.77 cents in 1905; 10.5 cents in 1906, and 10.725 cents in 1907, with total costs, for 1907, including construction, of 11.75 cents per pound. Costs for 1908 should be circa 10 cents per pound. The Mohawk, while it has not proven as rich a mine as was generally anticipated, is a magnificent property, with an assured future, and has a strong, honest and thoroughly competent management.

MOHAWK MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. F. S. Bascom, president; E. B. Critchlow, vice-president; Edward W. Duncan, secretary and treasurer. Organized Nov. 28, 1902, under laws of Utah, with capitalization $150,000. Lands, 7 claims. Idle and apparently moribund.

MOIRA COPPER CO. **ALASKA.**

Office: Milwaukee, Wis. Letter returned unclaimed from former mine office, Ketchikan, Alaska. Lands, 7 claims, adjoining the Niblack Copper Co., on Prince of Wales Island. Idle.

MOJAVE COPPER CO. **CALIFORNIA.**

Dead. Operated circa 1902. Formerly at Mojave, Kern Co., Cal.

MOLLIE STARK COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

MOLOLOA MINING CO. **MEXICO.**

Office: Toronto, Ont. Mine office: Hostotipaquillo, Ahualulco, Jalisco, Mex. Dr. Willet G. Miller, president; Frank G. Stevens, managing director. Organized 1908, under laws of Ontario, with capitalization $250,000. Property, bought of Carlos Romero, is said to show good ore.

MONA & PARYS MINES, LTD. **WALES.**

Office: Amlwch, Anglesey, Wales. Mine office: Mona, Amlwch, Anglesey, Wales. R. Bridson, secretary. Organized Jan. 13, 1899, with capitalization £75,000, shares £1 par; issued, £55,000. Debentures, £20,000 first mortgage, at 6%, and £10,000 second mortgage, at 7%. Lands, 1,067 acres, with improved water-frontage, warehouses, ochre works, tramways, etc. Also has a color-works plant at Amlwch. Makes a little copper, by cementation, from mine-waters. Mines in this district were worked by the Romans. The Parys mine

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was opened 1768, and made 3,000 tons of copper in 1784. Present production is 25 to 50 tons fine copper yearly.

MONARCH CONSOLIDATED GOLD & COPPER MINING & SMELTING CO. **COLORADO.**

Office: 1932 Thirteenth St., Boulder, Colo. Mine office: Sunshine, Boulder Co., Colo. Thos. S. Waltenmeyer, president and treasurer; Chas. Wolcott, vice-president; F. H. Wolcott, secretary. Organized September, 1903, under laws of Colorado, with capitalization $1,000,000, shares $1 par. Bonds, $300,000, at 6%, running 3 years; $200,000 outstanding.

Lands include the Buena and Pilot mines, at Sunshine, Colorado, which are gold properties, and the Copper King group, on the south fork of the Grand River, in Middle Park, Grant county, Colorado, latter, area 1,740 acres, carrying 3 miles of the strike of a copper vein said to be 15′ to 50′ wide. The Copper King group has a 25-h. p. hydro-electric power installation, and developments thereon have been suspended for several years. The company claims to have 50,000 tons of ore blocked out in its gold mines, and the mill was remodeled, 1907. Early 1908 company planned production on a considerable scale, but at last accounts, circa September, 1908, a reorganization was under consideration.

MONARCH COPPER MINING CO. **CALIFORNIA.**

Dead. Was a swindle, promoted by "Baron" W. E. von Johannsen. Formerly at Callahan, Siskiyou Co., Cal. Fully described Vol. VII.

MONARCH GOLD & COPPER MINES, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Nelson, Trail district, B. C.

MONARCH GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Was promoted by G. P. Morrill. Formerly at Big Bug, Yavapai Co., Ariz.

MONARCH MINES & SMELTERS CORPORATION. **UTAH.**

Dead. Name changed, Nov. 26, 1904, to Nevada-Utah Mines & Smelters Corporation. Formerly at Milford, Beaver Co., Utah.

MONARCH MINING, MILLING & SMELTING CO. **ARIZONA.**

Mine office: Macon, Ga. Mine office: Wickenburg, Maricopa Co., Ariz. Has about 7,000′ of workings, including various tunnels, shafts, pits and trenches. Equipment includes an air-compressor and experimental mill.

MONARCH MINING & SMELTING CO. **ARIZONA.**

Mine office: Wickenburg, Maricopa Co., Ariz. J. T. Ross, president; J. K. Harris, vice-president; J. F. Minton, secretary and treasurer. Organized August, 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, known as the Three Black Buttes, in the Black Rock district, 9 miles southeast of Wickenburg, opened by tunnel, with circa 4,000′ of workings. Ores are low in average tenor, giving assays of 3 to 20% copper and $3 to $15 gold per ton. Old 50-ton mill, burned April, 1907, was replaced, 1908, by a 50-ton mill on same site.

MONARCH-SMUGGLER MINING & REDUCTION CO. **COLORADO.**

Office: 521 Commonwealth Bldg., Denver, Colo. Mine office: Eldora, Boulder Co., Colo. Earl W. Kelly, president and general manager; Fred S. Sweet, vice-president; J. Horace Shepard, treasurer; preceding officers, Eda D. Kelly and Oscar Sorsonsen, directors; Charles E. Dawson, secretary. Organized Jan. 2, 1906, under laws of Colorado, with capitalization $3,000,000, shares $1 par.

Lands, 14 claims, area 137 acres, in the Harmon district of Grant county, Colorado, circa 50 miles northwest of Denver, said to show surface ores assaying $6 to $98 per ton. Company planned a 1,500′ tunnel, designed to cut the main vein at 800′ depth. Idle.

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AGUIRRE MONCADA I HERMANOS. **CHILE.**

Mine office: Higuera, La Serena, Coquimbo, Chile. Property is the Carmelita mine, at Yerbas Buenas, circa 13 leagues from Higuera, the nearest railroad point, with 10 pesos per ton transportation charges on ore and supplies. Mine, opened to depth of 115 meters, produced 200 metric tons of 12% ore, after discarding about 2,000 tons of 5% ore, from a vein of 6′ to 7′ width, in 1903.

MOND NICKEL CO., LTD. **ONTARIO.**

Office: 39 Victoria St., London, S. W., Eng. Mine office: Victoria Mines, Algoma, Ont. Works office: Clydach, Wales. Dr. Ludwig Mond, F. R. S., chairman; Robt. Mathias, secretary; Dr. Bernard Mohr, general manager; C. V. Corliss, mine superintendent. Organized Sept. 20, 1900, under laws of Great Britain, with capitalization £600,000, in £250,000 cumulative 7% shares of £5 par, £300,000 ordinary shares of £1 par, and £50,000 deferred shares of £1 par, all issued and fully paid. Paid dividends on ordinary shares of 6% in 1905, 10% in 1906, and 12½% in 1907. Paid dividends on deferred shares of 18% in 1906 and 33% in 1907.

Lands, 3,350 acres freehold and 1,550 acres leasehold, held under 3-year option, in the townships of Blezard, Denison, Snider and Garson, in the Sudbury district of Ontario, carrying nickeliferous and cupriferous pyrrhotite.

The Victoria mine, which is the principal property, has a 3-compartment vertical shaft, 4x12′ inside of timbers, sunk to depth of circa 720′, with 9 levels opened, the bottom level showing ore bodies maintaining their size and quality of ore. The Victoria carries 2 lenses of nickeliferous pyrrhotite and chalcopyrite about 160′ apart, with east and west strike, and uniform dip of about 75° to the east, connected by stringers, in schistose diorite near a granite contact. No. 1 shaft has a rockhouse and shafthouse. Equipment includes 5-drill and 10-drill Rand straight-line air-compressors, and hoists.

The Garson mine has a 225′ shaft, and apparently has been idle for some years.

The mine and works are operated by electric power, transmitted 10 miles from the Wahnapitae River, by the Wahnapitae Power Co.

A 11,000′ Bleichert aërial gravity tram connects the Victoria mine with the roast-heaps and smelters. Ore is dumped from the buckets of the aërial tram at the roast-yard, and, after burning, is carried by bucket to the smelter.

The smelter, of steel, sheathed with corrugated iron, has 2 water-jacket blast-furnaces, and 2 converter stands with a traveling crane. The smelter power plant has five 100-h. p. return tubular boilers, a Riedler air-compressor for converter blast, 2 Connersville blowers with direct connected engines, and a 125-kw. dynamo. The works have direct connection with the Canadian Pacific railway.

About 200 men are employed at the mine and smelter.

At the refining works, in the Swansea Valley, the bessemerized copper-nickel matte from the smelter is dead-roasted and treated with dilute sulphuric acid, which permits the extraction of about two-thirds of the copper and 2% of the contained nickel. The residue, after drying, assaying 45 to 60% nickel, is treated, in charges of 500 kgs., with water-gas, in a reduction tower, at a temperature of about 300° Centigrade. This tower has shelves, and the ore is moved from shelf to shelf by automatic rakes, the lower shelves being cooled. After treatment in the reduction tower, the charge is transferred to a volatizing tower, and treated with carbon monoxide, at a temperature of about 100° C. The residue therefrom is returned to the reducing tower, and the charge goes forward and back between the two towers, for 10 to 15 days, and when 60% of the nickel has been volatized, as nickel carbonyl, the residue of the charge is returned to the roasting furnace. The nickel carbonyl

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is treated in a decomposing apparatus, wherein the metal is recovered in granules, assaying 99.4% to 99.8% nickel. The copper is turned out as bluestone.

Production for 1906 was 54,079 short tons of ore, yielding 3,365 short tons of nickel-copper matte that returned 2,588,000 lbs. fine copper and 2,798,000 lbs. refined nickel.

MONETT GOLD & COPPER MINING & MILLING CO. **UTAH.**

Office: care of J. J. Davis, secretary, Monett, Mo. Mine office: Ibapah, Tooele Co., Utah. O. P. Shaffer, president; H. L. Eckert, vice-president; F. E. Shaffer, treasurer. Organized under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, 37 claims, area 740 acres, showing argentiferous copper and lead ores.

MONEY METALS MINING CO. **ARIZONA.**

Office: Prescott, Arizona. Mine office: Jerome, Yavapai Co., Ariz. H. L. Sweeney, vice-president; W. H. Reiterman, secretary, treasurer and general manager. Organized 1905, with capitalization $1,200,000, shares $1 par. Lands, 7 claims, unpatented, also sundry timber lands, giving total holdings of 120 acres, in the Big Bug and Black Hills districts, circa 3 miles south of the Yaeger Cañon mine, and 6 miles from a railroad. Mine has 275′ of workings, including the Bordeaux shaft of 165′, showing a 3′ vein of argentiferous lead and copper sulphides.

MONFARLAND COPPER EXPLORATION, LTD. **TRANSVAAL.**

Office: 52 New Stock Exchange, Johannesburg, Transvaal. H. Martyn Burgess, manager. Organized April, 1908, under laws of Transvaal, with capitalization £2,350. Lands show 2 practically parallel veins, one of circa 6′ average width, carrying considerable chalcocite, and one of about 8′ width showing chalcopyrite and what the manager terms carbonate of copper glance. Some trenching was done, and a shaft was started, in the 6′ vein, July, 1908.

MONIDA GOLD & COPPER MINING CO. **IDAHO.**

Letter returned unclaimed from former office and mine, Mullan, Shoshone Co., Idaho. Organized under laws of Idaho, with capitalization $1,000,000, shares $1 par, by L. T. Nystrom, et al. Lands, 6 claims, in the Hunter district.

MONITOR CONSOLIDATED COPPER MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Hon. Herman J. Rossi and Dr. Harold J. Reed, managers; Thos. Jay, superintendent. Paid a dividend, 1907, of $9,500.

Lands, 12 claims, near the Richmond, 6 miles west of Saltese, just over the line in Shoshone county, Idaho, carrying a fissure vein up to 14′ in width, with northeast and southwest strike, standing nearly vertical. Mine has a 410′ shaft and management plans a tunnel to carry a back of about 1,000′. Shipments, 1907, of selected ore, returned 17 to 22% copper, circa 7 oz. silver and $1.50 to $2 gold per ton, ore being mainly chalcopyrite, carrying an excess of iron with very little silica, and occasional native copper. Has steam power and a 3-drill air-compressor. Surveyed line for extension of Chicago, Milwaukee & St. Paul Railway passes within 3 miles of the mine. Production, 1906, was 320,000 lbs. fine copper.

MONITOR COPPER MINING & SMELTING CO.

Office: Wallace, Idaho.

MONITOR MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Alberni, Vancouver Island, B. C. Described Vol. III.

MONITOR TUNNEL & PARK CANYON MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Capitalization, $3,750,000, shares $1 par. Lands are in Park Cañon, about 2 miles east of Butte, near the

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Homestake claim of the Butte Coalition, having a 1,500′ crosscut tunnel showing a wide ledge.

MONO-BALTIC MINING & SMELTING CO. **COLORADO.**

Office: 50 Congress St., Boston, Mass. Mine office: Red Mountain, Ouray Co., Colo. E. W. Averill, president and treasurer; Frank Woodbury, vice-president; E. J. Wescott, secretary; Joseph Irving, general manager; preceding officers, M. T. Chestnut and S. J. Ryan, directors. Organized 1907, under laws of Colorado, with capitalization $500,000, shares $10 par; issued, $300,000.

Lands, circa 180 acres, in the Red Mountain district, showing fissure veins and contact deposits having large bodies of oxidized silicious ores of low tenor, but carrying high silver values, with some gold, also bornite and chalcopyrite associated with pyrite, all auriferous and argentiferous, a complete sampling of the mine, with 500 assays, giving an average of 3.5% copper and 12 oz. silver per ton, with small gold values.

Development is by 4 shafts, deepest 140′, and by tunnels of 120′, 700′, 1,000′, and 1,100′, with circa 8,000′ of workings, estimated by company to show 122,000 tons of ore.

Equipment includes a smithy and shops. The property carries limestone for fluxing, and a smelter site has been graded and the company contemplates building a steel smelter building, with bins, aerial tram, and a 42x120″ water-jacket blast-furnace, planned to be blown in circa July, 1909.

MONROE CONSOLIDATED MINES CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz.

MONSTER MINING CO. **UTAH.**

Dead. Was merged, circa 1907, in Garrison-Monster Mining Co. Formerly at Ibapah, Tooele Co., Utah.

MONTAGNAT MINE. **NEW CALEDONIA.**

Mine office: Diahot, New Caledonia. Property, slightly prospected, shows ore for upwards of 500 meters length. Idle some years.

MONTANA APEX COPPER CO. **MONTANA.**

Office and mine: Dillon, Beaverhead Co., Mont. Organized circa February, 1907, under laws of Arizona, with capitalization $800,000. Lands, 3 claims, known as the Snowball, Whale and Los Angeles, in the Utopia district, near the Indian Queen mine, showing indications of copper.

MONTANA & ARIZONA CONSOLIDATED COPPER CO. **MONTANA.**

Dead. Disincorporated circa 1902. Formerly had an office at 68 State St., Boston, Mass.

MONTANA-ARIZONA COPPER CO. **ARIZONA.**

Office: Spokane, Wash. Mine office: Planet, Yuma Co., Ariz. J. W. Greenough, manager. Lands, 26 claims, area 520 acres, circa 30 miles north of Wendendale, the nearest railroad station. Property is said to show 5 veins, of 3′ to 100′ width, traceable circa 7,000′, including a 3′ vein carrying good gold values. Development is by a 2-compartment 300′ shaft and a considerable number of trenches. Equipment includes a 60-h. p. gasoline hoist. Management considered good.

MONTANA BELLE COPPER CO. **ARIZONA.**

Office: 52 Jacobson Bldg., Denver, Colo. Mine office: Wendendale, Yuma Co., Ariz. Chas. P. Pierce, president; Luther Bain, vice-president; A. L. Emberson, secretary and treasurer; preceding officers and A. T. Cronin, directors. Organized Feb. 7, 1906, under laws of Arizona, with capitalization $800,000, shares $1 par.

Lands, 6 claims, area 120 acres, one mile west of Cunningham Pass and 6 miles north of Wellton, in the Ellsworth district of the Harcuvar Mountains, said to show a vein of 8′ to 25′ width, with a good gossan carrying

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oxidized ores to a depth of 100′ to 150′, succeeded by sulphides. Shaft is said to show ore assaying 5 to 17% copper, and the property is said also to have considerable free milling gold ore. Company's advertising is much disliked, because misleading on many points.

MONTANA-BOSTON MINING & MILLING CO. **MONTANA.**

Office and mine: De Borgia, Missoula Co., Mont. Emil Anderson, superintendent. Organized July, 1907, under laws of Montana, with capitalization $100,000, shares 10 cents par.

MONTANA CONSOLIDATED COPPER CO. **MONTANA.**

Office: 46 Wall St., New York, N. Y. Mine office: Basin, Jefferson Co., Mont. Samuel L. Fuller, president; Marcus L. Hewett, vice-president; Otto Julius Merkel, secretary; preceding officers, G. Herman Kinnicut, Ellis Postlethwaite and D. Crawford Clark, directors; Capt. John L. Armit, general manager; M. E. Barr, engineer.

Organized June 13, 1906, under laws of Maine, as International Copper Co., with capitalization $10,000,000, and name changed to present title July 19, 1906.

Lands, 699 acres, in 4 groups, lying northeast of the New Boston, including several old properties, idle, except for operations of leasers, for 9 to 13 years before purchase by present company. The Hope group, 192 acres, includes the Hope and Comet mines, formerly considerable producers, popularly credited with a gross output of $10,000,000, which probably is a considerable overestimate. The Gray Eagle group, 139 acres, includes the Gray Eagle and Minneapolis mines. There also are placer claims and millsites aggregating 101 acres. The Comet mine, 820′ deep, and the Hope mine, 220′ deep, are the principal properties, these showing fissure veins in granite, carrying mainly argentiferous and auriferous copper and zinc sulphides, ore reserves in the old mines being mainly refractory zinc and lead sulphides, associated with cupriferous pyrite, unprofitable for direct shipment and requiring concentration. Management expects an increase of copper and silver values with depth. Equipment includes an electric plant.

Company refuses to furnish a statement, declaring that there is nothing of interest, and that property is in the hands of a few friends only. Development apparently is along business-like and well considered lines, and property is considered promising.

MONTANA CONSOLIDATED COPPER CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. H. C. Wilmot, superintendent. Organized circa June, 1907, under laws of Maine, with capitalization $2,500,000, shares $1 par. Is controlled by the General Development Co.

Lands include the Granite Mountain claim, near the Jessie mine of the North Butte, but do not include the Flatiron mine, near the Butte-Ballaklava. The Altoona mine, in the northern part of Butte, held, 1906, under bond and lease, has been abandoned.

MONTANA CONSOLIDATED MINING CO. **MONTANA.**

Dead. A swindle, put out, circa 1903, by M. P. Hillyer & Co. Formerly at Saltese, Missoula Co., Mont.

MONTANA COPPER CO. **MONTANA.**

Office: care of John F. Davies, Butte, Mont. Letter returned unclaimed from former mine office, Helena, Lewis & Clark Co., Mont. Lands, known as the Spokane Hill group, 7 miles northeast of East Helena, have a 115′ shaft, showing ore said to give average assays of 10% copper. Has steam power and several mine buildings.

MONTANA COPPER & GOLD MINING CO. **MONTANA.**

Office: 1122-135 Adams St., Chicago, Ills. Letter returned unclaimed

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from former mine office, Dillon, Beaverhead Co., Mont. Was controlled, through stock ownership, by International Copper & Gold Co., supposedly succeeded by Sonora Central Mines Co. Lands were 6 claims, in the Stone Creek district of Madison county, Montana, claimed to show carbonate ores. Is regarded with suspicion.

MONTANA COPPER MINING CO. **MONTANA.**

Dead. Formerly at Helmville, Powell Co., Mont. Described Vol. II.

MONTANA COPPER & SILVER MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Clancey, Jefferson Co., Mont. C. H. Lane, superintendent. Capitalization $2,000,000, shares $10 par. Lands, 4 claims, in Lump Gulch, 2 miles from Clancey, opened by the 275′ Clara Bell shaft, lower drift of which shows tetradedrite assaying 60 to 400 oz. silver per ton. Has steam power.

MONTANA ELECTROLYTIC CO. **MONTANA.**

Works office: Wickes, Jefferson Co., Mont. J. L. Malm, superintendent.

MONTANA FURNACE CREEK COPPER CO. **CALIFORNIA.**

Office: care of Hon. John MacGinnis, Butte, Mont. Mine office: Greenwater, Inyo Co., Cal. Organized Dec. 6, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 8 claims. Idle at last accounts.

MONTANA-HECLA MINING CO. **MONTANA.**

Office: 1004 Broadway, Oakland, Cal. Mine office: Norris, Madison Co., Mont. J. K. Riordan, president, treasurer and general manager; M. F. Webster, vice-president; Mark E. Davis, secretary; Daniel O'Shea, superintendent. Organized Jan. 20, 1906, under laws of Washington, with capitalization $375,000, shares $2 par; issued, $225,000.

Lands, 28 claims, area 560 acres, on Old Colony Hill, a few miles from Norris, in the Lower Warm Springs unorganized district. Property shows 5 fissure veins, in granite, of which one, under development, of about 6′ average width, traceable 2 miles, shows, below circa 200′ depth, sulphide ores with silicious gangue, giving assays of 0.5 to 1% copper, 3% lead, 50 to 75 oz. silver and $2 gold per ton, with ledge matter giving assays up to $4.12 gold per ton. Development is by numerous pits of 10′ to 50′ depth, shafts of 95′, 100′ and 210′, and tunnels of 250′ and 700′, with a total of 2,340′ of workings.

Company plans installing a 200-h. p. water plant, having circa 1,000 h. p. available, also a new mining plant with a 3-drill air-compressor and 50-h. p. Westinghouse electric motor. There are 7 mine buildings, and a good wagon road to the Northern Pacific, 3 miles distant.

Property is not yet deep enough for copper in considerable quantities, but indications are decidedly favorable, and company plans steady development and extending No. 1 tunnel 1,500′ on the ledge. Property considered promising.

MONTANA-ILLINOIS COPPER MINING CO. **MONTANA.**

Office: 218 LaSalle St., Chicago, Ills. Mine office: Mammoth, Madison Co., Mont. W. G. Bennett, president. Organized circa 1907, under laws of Montana, with capitalization $2,000,000, shares $1 par. Lands, 11 lode claims, 2 placer claims, 1 millsite, 1 water right and 320 acres timber lands, giving total holdings of circa 550 acres, including part of lands formerly held by Bismarck-Nugget Gulch, in the Ruby Mountains. Mine, said to have circa 1,100′ of workings, shows bornite and chalcopyrite said to average about 5% copper, 1.25 oz. silver and 40 cents gold per ton. The Bismarck-Nugget Gulch had a 30-ton smelter, presumably held by present company. According to company's advertising, its shares offer a better investment than North Butte, which nobody but fools will believe. Is not regarded favorably.

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MONTANA MINE. **AUSTRALIA.**

Mine office: Sunny Corner, N. S. W., Australia. M. Welch, superintendent. Has a shaft about 150′ deep and has secured ore up to 16% in copper tenor.

MONTANA MINERAL LAND DEVELOPMENT CO. **MONTANA.**

Office: Findlay, Ohio. Mine office: Basin, Jefferson Co., Mont. John G. Mizer, president and treasurer; Antoine Lutz, vice-president; Alfred Graber, secretary; Thos. C. Kelly, superintendent. Organized 1902, under laws of Montana, with capitalization $3,500,000, shares $1 par.

Lands, 19 claims, area circa 300 acres, known as the Eva May and Red Bird group, on Cataract Creek. Property shows fissure veins in granite carrying sulphide ores, mainly chalcopyrite. Development is by a 1,200′ vertical shaft and tunnels of 525′, 1,400′ and 800′, developing a vein of 100′ claimed width, giving assays of 6% copper, 6 to 12% lead, 15 to 30 oz. silver and 20 cents to $3 gold per ton. The property shows a considerable body of low to medium grade ore, and the company estimates 50,000 tons blocked out for stoping.

Equipment includes a 200-h. p. steam hoist having two 75-h. p. hoists, one being a 14x16″ Vulcan hoist raising single-deck cages, and a 4-drill Ingersoll-Sergeant air-compressor. Buildings include a 20x40′ log machine shop, 20x30′ smithy, 24x34′ carpenter-shop, and a 30x80′ powerhouse. The concentrator, of logs, is 35x120′, with a 7x10″ Blake crusher, one set of rolls, 8 three-compartment jigs and 2 Wilfley tables. The property, which has been developed steadily, and has produced circa 7,000 tons of ore, sold for $166,238, is considered promising.

MONTANA MINING & DEVELOPMENT CO. **MONTANA.**

Dead. Stock was "guaranteed" by "gold bonds." Formerly at Carter, Missoula Co., Mont. Fully described Vol. V.

MONTANA-MORNING MINING CO. **MONTANA.**

Mine office: Libby, Flathead Co., Mont. Lands, on Callihan Creek, show a vein of about 8′ width, carrying a 5′ paystreak of mixed galena and sphalerite, apparently of smelting grade, with about 3′ of copper sulphides of concentrating grade.

MONTANA-NEVADA COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization $5,000,000, shares $1 par. Lands are said to be fairly located, but in limestone.

MONTANA ORE PURCHASING CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. F. August Heinze, president and general manager; John MacGinnis, vice-president; Arthur P. Heinze, secretary; Stanley Gifford, treasurer. Organized 1883, under laws of Montana, with capitalization $2,500,000; debentures, $1,000,000, first-mortgage 6% bonds. Is controlled by United Copper Co., which holds 76,791 shares out of 80,000 shares issued, and which formerly owned the entire bond issue. The mining property of the company was sold, 1906, to Butte Coalition Mining Co.

MONTANA REDUCTION CO. **MONTANA.**

Mine office: Cooke, Park Co., Mont. C. R. Tuttle, president; Robt. I. McKay, secretary. Organized under laws of Arizona, with alleged capitalization $101,000,000, shares $1 par. Idle and apparently moribund.

MONTANA SCOTCH BONNET COPPER & GOLD MINING CO. **MONTANA.**

Office: Spokane, Wash. Mine office: Cooke, Park Co., Mont. W. M. Anderson, general manager. Capitalization $3,000,000. Lands include the Cora, Maggie and Jennie V. groups, carrying ores of gold, silver and copper, in the New World district, 70 miles from a railroad. A radical change in

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management, made September, 1907, is hoped to prove a betterment, and scarcely can prove otherwise.

MONTANA STANDARD MINING CO. **MONTANA.**

Office: Columbus, Ohio. Mine office: Thompson, Sanders Co., Mont. M. J. Lisle, president; M. J. Maher, vice-president; Otto A. Schenk, secretary and treasurer; preceding officers, B. B. Baker, John Chester and H. Eddy, directors; Fremont S. Rowe, manager. Capitalization 1,000,000 shares, presumably $1 par. Lands, 10 miles east of the Bitter Root Mountains and 11 miles from Thompson, show 3 veins, 2 of which have been prospected, one being said to show 6′ to 8′ of concentrating ore.

MONTANA VERDE COPPER CO. **MONTANA.**

Dead. Formerly at Corbin, Jefferson Co., Mont.

MONTANA ZINC CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. A. L. Strasberger, president. Practically succeeded by Butte Copper & Zinc Co., only assets, 1907, being 7,500 shares of Alice stock. Fully described Vol. VI.

HILARIO MONTAÑO. **MEXICO.**

Office and mine: Guachinango, Mascota, Jalisco, Mex. Lands, 8 pertenencias, showing strong veins, carrying auriferous and argentiferous copper ore, with antigua workings and recent workings.

SOCIÉTÉ DES MINES DE CUIVRE DE MONT CHALMERS. **AUSTRALIA.**

Dead. Voluntarily wound up, May 1, 1901. Formerly at Mt. Chalmers, Queensland, Australia.

MONTE CARLO CONSOLIDATED COPPER CO. **NEW MEXICO.**

Office: 1013 Union Bank Bldg., Pittsburg, Pa. Mine office: Orogrande, Otero Co., N. M. Chas. H. Spriggs, president; H. H. Schneider, secretary; G. B. Wharey, treasurer. Organized 1907, under laws of New Mexico, with capitalization $1,000,000, shares $25 par. Lands, 170 acres, 5 miles north of Orogrande, in the northern end of the Jarilla Mountains, having two 70′ shafts and a 100′ three-compartment shaft, showing ore that has assayed up to 35% copper, 800 oz. silver and $4 gold per ton. Was developing steadily at last accounts.

SOCIETÀ ANONIMA DELLE MINIÈRE DI MONTECATINI. **ITALY.**

Office: 49 Piazza Santa Apostoli, Rome, Italy. Mine offices: Boccheggiano, Grosseto, Tuscany, Italy, and Massa Marittima, Grosseto, Tuscany, Italy. I. Castelbolognesi, president; Alfred Deschars, vice-president; Alfredo Santori, secretary; Paolo Marengo, general manager; Paolo Cerrina, superintendent; Guglielmo Vallada, engineer. Organized 1888, under laws of Italy, with capitalization 5,000,000 lire, increased, circa 1906, to 6,500,000 lire, shares 100 lire par. Paid dividends, 1899-1902, of 82 lire per share.

Lands include the Montecatini, Boccheggiano, Capanne Vecchie, Fenice Massetana and Val di Nievole mines, all very ancient properties, worked successively by the Etruscans, Romans, Goths and Italians. The principal properties are 20 miles from Massa Marittima, the nearest station on the Mediterranean railroad. The Montecatini mines have a brecciated red porphyry, carrying occasional native copper, massive disseminated chalcocite, bornite and chalcopyrite, ores averaging about 3.5% in copper tenor, as mined. Development is by a 125-metre shaft and 5 tunnels, with nearly 10,000 metres of workings, putting about 500,000 tons of ore in sight. The property is equipped with steam power, and has a concentrator with 5 crushers. Production of the Montecatini mine, 1905, was 1,197 metric tons fine copper.

The Boccheggiano mine, which is the principal property, has a quartzite vein with ore in the southern end mainly zinciferous, carrying small quantities of copper and lead, the veins ranging from 13′ to 16′ in width, with a dip of

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about 50° East, carrying paystreaks along the hanging wall. The vein occupies a fault between micaceous Permian shales and Eocene limestone, carrying chalcopyrite disseminated in pyrite and occasional hematite, with a quartz gangue. There also are occasional veinlets of highly argentiferous tetrahedrite. The Boccheggiano carries about 0.05% tin. Development has been difficult, on account of the heavy inflow of thermal waters, at a temperature of 105° Fahrenheit. For 1905 the Boccheggiano yielded 3,138 metric tons of high grade ore averaging 8.88% copper, and 13,158 metric tons of second grade ore averaging 3.09% copper, and the mine also produced 441 metric tons of copper precipitate of 69.25% tenor.

The Capanne Vecchie and Poggio Bindo mines are ancient properties, reopened 1846, since which time they have been small but steady producers. These mines were taken over by the company, circa 1904. The principal vein is 6″ to 50′ in width, ore being mainly chalcopyrite, which is assorted into first grade smelting ore of about 10% copper tenor, and second grade ore, carrying about 3% copper only, which is heap-roasted and leached. Production, 1905, was 572 metric tons fine copper, all obtained as precipitate.

The Fenice Massetana mine, also at Massa Marittima, shows ore bodies of 6″ to 65′ width, apparently lenticular, carrying chalcopyrite associated with pyrite, in a quartz gangue, with occasional sulphides of higher grade. The high grade ore, averaging 10% in tenor, is heap-roasted at the mine, and smelted at Leghorn, and second grade ore, averaging about 3% copper, is heap-roasted and leached at the mine. Production, 1905, was 693 metric tons fine copper, in precipitate, and 94 metric tons fine copper secured by smelting first grade ore.

The Val di Nievole mine carries low grade ores that can be worked profitably only when copper prices are high, and this property is idle.

The smelter, at Leghorn, has 4 reverberatory furnaces and a converter plant. In connection with the smelter is a sulphuric acid plant, for the utilization of the sulphur fumes, the low grade ores of 3.5% copper tenor averaging about 40% sulphur contents.

Production, 1903, was 3,086,440 lbs. fine copper, and 1905 was 5,892,895 lbs. The property is well managed, with a magnificent market at its command, and is likely to prove an increasingly important producer in years to come.

MONTE CRISTO CONSERVATIVE MINING CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. Lands, sundry claims, circa 2 miles north of Paradise. Idle several years and apparently moribund.

MONTE CRISTO GOLD & COPPER CO. **UTAH.**

Dead. Formerly at Milford, Beaver Co., Utah. Described Vol. V.

MONTE CRISTO MINING CO. **ARIZONA.**

Office and mine: Metcalf, Graham Co., Ariz. Henry Brigham, president; Refugio Murillo, secretary and general manager. Lands, 5 claims, on Chase Creek, about 2 miles above Metcalf, carrying a fissure vein in porphyry, showing 3′ to 4′ of oxidized ores, assaying up to 45% copper, opened by a shallow shaft and tunnels of 100′ and 200′. Made small ore shipments, 1904. Idle several years.

MONTEREY GOLD & COPPER MINING CO.

Dead. Formerly had an office at 11 Broadway, New York.

MONTEREY GOLD MINING CO. **WASHINGTON.**

Dead. Formerly at Bolster, Okanogan Co., Wash.

MONTEREY SMELTING & REFINING CO. **MEXICO.**

Works office: Monterey, Nuevo León, Mex. Is controlled by American Smelting & Refining Co. and described under Mexican title of Compañía Minera Fundidora y Afinadora de Monterrey, S. A.

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COMPAÑIA MINERA FUNDIDORA y AFINADORA DE MONTERREY, S. A. — **MEXICO.**

Office and works: Monterey, Nuevo León, Mex. Mine offices: Mineral de la Mula, Monclova, Coahuila, Mex., and Pánuco de Coronado, San Juan del Rio, Durango, Mex. Arthur K. Brewster, manager; Juan Chiado, superintendent; José M. Padilla, superintendent Pánuco mines. Organized under laws of Mexico, with capitalization increased, 1903, to 8,000,000 pesos. Is controlled by American Smelting & Refining Co.

Lands include the Ocampo and Santa Elena mines, at Mineral de la Mula, carrying auriferous copper and lead ores, and La Cruz y Anexas mines, at Pánuco de Coronado, carrying argentiferous lead and copper ores.

The smelter, at Monterey, of circa 1,200 tons daily capacity, does an extensive custom business, in addition to treating the ores of the company's own mines. About 1,500 men are employed, and latest reported production, 1903, was 215,568 lbs. fine copper.

MONTEZUMA COPPER CO. — **NEW MEXICO.**

Dead. Formerly at Albuquerque, Bernalillo Co., N. M.

MONTEZUMA COPPER MINING CO. — **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Lyman C. Woods, president and manager; Mrs. Lyman C. Woods, secretary; Louis Berndt, treasurer; Chas. Maybush, superintendent. Lands, 17 claims, shortly west of the Live Oak and Inspiration mines, and about one mile west of the Miami, with somewhat similar geological conditions. Lands show porphyry and quartz, with a mineralized zone of 23′ estimated average width, opened by a 150′ shaft, showing carbonate ore assaying about 1% copper and $2 gold per ton. Property is held by A. G. Smith, of Globe, Arizona, under an 18-month bond and lease, running from Aug. 1, 1908, for $150,000.

MONTEZUMA MINING CO. — **MEXICO.**

Office: San Antonio, Tex. Mine office: Charcas, Moctezuma, San Luis Potosí, Mex. C. H. Hoffman, superintendent. Property carries copper ores, and company was said, 1907, to be employing 75 men.

MONTEZUMA MINING & SMELTING CO. — **CALIFORNIA.**

Office: care of Southwestern Securities Co., Los Angeles, Cal. Capitalization $1,000,000, shares $1 par. Lands, supposed to be somewhere in Inyo county, California, are claimed to carry gold, silver, lead and copper ores. Company was claimed, July, 1906, to be paying dividends at rate of 15% per annum, on price at which stock was sold. Is regarded with much suspicion.

MONTEZUMA & THE WHIZZERS MINE. — **SOUTH DAKOTA.**

Office and mine: Deadwood, Lawrence Co., S. D. J. T. Gilmore, manager. Lands, 13 claims, patented, area 135 acres, on the divide between Deadwood and Whitewood Cañons, showing Algonkian schists, slates and quartzites, and carrying about 3,000′ of a strong gossan of 45′ estimated average width. Principal development is on the Whizzers mine, by 2 tunnels, the Montezuma having superficial development on a parallel quartzite reef. The Whizzers was worked for gold, producing circa 30,000 tons of low grade fluxing ore, sent to the Golden Reward smelter, at Deadwood. Ore is slightly auriferous chalcopyrite, with gangue of hornblende schist, carrying 0.5 to 1.5% copper, up to 1 oz. silver and 50 cents to $2.50 gold per ton. Though low in grade, property is considered decidedly promising, because of immense tonnage assured. Idle.

MONTGOMERY GOLD LEAF MINING CO. — **NEW JERSEY.**

Dead. Apparently succeeded by Pahaquarry Copper Mining Co. Formerly in Warren county, New Jersey.

MONTOSA COPPER CO. — **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. H. Thompson, general

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manager. Lands, in the Tyndall district, at the western end of the Santa Rita Mountains, were held formerly by the Calabasas Copper Co., Ltd., a Douglas-Lacey swindle. Mine has a 110′ two-compartment shaft, and an antiquated smelter with a 50-ton water-jacket blast-furnace. Presumably idle.

MONTPELIER COPPER MINING & SMELTING CO. **IDAHO.**

Dead. Merged November, 1905, in Bonanza Mining Co. Formerly at Montpelier, Bear Lake Co., Idaho.

MONTREAL & BOSTON CONSOLIDATED MINING & SMELTING CO., LTD. **BRITISH COLUMBIA.**

Dead. Absorbed by Dominion Copper Co., Ltd. Formerly at Greenwood, Boundary district, B. C. Fully described Vol. V.

MONTREAL SMELTING & REDUCTION CO. **ONTARIO.**

Works office: North Bay, Nipissing, Ont. E. E. Leonard, president; J. H. Brown, vice-president and managing director; Benj. Burlan, treasurer; L. J. Cartier, secretary; P. W. Brown, manager. Works, sometimes known as the North Bay or Trout Lake smelter, said to have cost $700,000, were designed primarily to reduce the argentiferous ores of the Cobalt district, but are planned also to smelt copper ores. Blown in Jan. 7, 1908.

SUCESIÓN MONTT. **CHILE.**

Office and mine: San Juan, Freirina, Atacama, Chile. Principal properties are the Quebradita, 300 meters deep, opened 1834; Rosario, 290 meters deep, opened 1864; Manto, 160 meters deep, opend 1846, and San José, 180 meters deep, opened 1851. Properties have been considerable producers in the past, but at last accounts output was practically nil.

MONUMENT COPPER MINING CO. **MONTANA.**

Mine office: Dillon, Beaverhead Co., Mont. Organized August, 1902, under laws of Montana, with capitalization $75,000. Lands, on Bloody Dick creek, are developed by a 165′ shaft, bottomed in auriferous copper ore, and a 270′ tunnel, planned to be driven 500′, at which length it should strike a vein of high-grade auriferous copper ore.

MOOIPLAATS (NO. 83) COPPER DEVELOPING SYNDICATE, LTD. **NATAL.**

Office: care of E. J. Edmonds, Newcastle, Natal. Mine office: Entonjaneni, Zululand, Natal. Chas. Earl, chairman. Organized, 1907, under laws of Natal, with capitalization £5,000, shares £1 par. Property is a lease, with right of purchase for £8,000, of the Farm Mooiplaats No. 83, area 6,156 acres.

MOON-ANCHOR COPPER MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. L. W. Tennant, president and general manager; W. J. Wernli, secretary and treasurer. Organized 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 3 claims, area 60 acres, on Green Mountain, in the Upper Platte district, said to show a 50′ fissure vein of sulphide ore, giving assays up to 10% copper, developed by a 200′ shaft. Has steam power. Idle.

MOON GOLD MINING CO. **CALIFORNIA.**

Office: Valley Springs, Cal. Mine office: Richey, Amador Co., Cal. J. B. Lucas, vice-president and general manager. Has shafts of 100′ and 140′. Vein-stuff is a sulphide mineralization of diabase and talcose schist, carrying gold and copper values. Idle.

MOONLIGHT MINE. **MONTANA.**

Owned by Washoe Copper Co.

MOONMERA COPPER MINING CO., LTD. **AUSTRALIA.**

Office: 69 Queen St., Brisbane, Australia. Mine office: Moonmera, Rockhampton, Queensland, Australia. T. G. Dewar, secretary; Samuel Phillips, general manager.

Lands, 4 leases, area 200 acres, showing 4 ore bodies, of which 2 are partly

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developed. Country rocks are sandstone and granite, veins having an arenaceous gangue. Gold is found in the oxidized zone, but values turn to copper at a little depth, ores being mainly sulphide, with a little oxidized ore and some native copper, latter sometimes occurring as flakes and small sheets, but commonly disseminated in small particles. The property also shows large bodies of low-grade carbonate ores. The ores average 1.75 to 2% copper only, but by rejecting about 70% of the ground broken, can furnish 5% ore to the mill, making concentrates carrying circa 17.5% copper and 9 dwts. gold per long ton. The mine is opened by shafts of 50′ and 93′, and by 5 tunnels, of 90′ to 280′ length. Idle.

MOONTA CENTRAL COPPER CO., LTD. **AUSTRALIA.**

Offices: 30 Moorgate St., London, E. C., Eng., and Adelaide, South Australia. Mine office: Wallaroo, Daly Co., South Australia. A. Lesser, chairman; John Alex. Russell, secretary; John S. Scott, manager. Organized Oct. 29, 1901, as a reconstruction of the Mid-Moonta Copper Mines, Ltd., with capitalization £110,000, shares £1 par, in 50,000 cumulative preference 6% shares and 60,000 ordinary shares. Debentures, £1,400 issued, at 10%.

Lands, 152 acres, held under 99-year lease, expiring 1991. Has 4 shafts, deepest 432′, said to show considerable medium grade ore, with steam power and a small concentrator. Idle since circa 1904, and apparently moribund.

MOONTA SYNDICATE, LTD. **AUSTRALIA.**

Dead. Wound up March 5, 1907. Formerly at Moonta, Daly Co., South Australia.

MOORE COPPER CO. **ALASKA.**

Office and mine: care of J. R. Heckman & Co., Ketchikan, Alaska. Property is on the southern arm of Moira Sound. Presumably idle.

MOQUI COPPER CO. **VIRGINIA.**

Office: 42 Broadway, New York, N. Y. Mine office: Reager, Rappahannock Co., Va. Is successor of Mannassas-Gap Copper Mines, Inc.

Lands, 700 acres, freehold, including circa 400 acres of timber land, in Fauquier county, Virginia, 3 and 6 miles from 2 railroads, carrying 2 contact veins between Cambrian sandstone and Silurian slates, claimed to range 3′ to 11′ in width, and claimed to give average assays of 5% copper, 10 oz. silver and $4 gold per ton, which figures are considered unduly high, from malachite, bornite and chalcopyrite, associated with a little native copper. Mine has about 600′ of workings.

SOCIEDAD ESPLOTADORA DEL MORADO. **CHILE.**

Office: Santiago de Chile. Mine office: Freirina, Atacama, Chile. Organized Dec. 22, 1906, under laws of Chile, with capitalization 500,000 pesos, shares 20 pesos par. Property is the Arenillas mine, opened 1860, and a small matting furnace, idle for several years until taken over by present company.

SOCIEDAD MINERA DEL MORADO. **CHILE.**

Dead. Succeeded, Dec. 22, 1906, by Sociedad Esplotadora del Morado. Formerly at Freirina, Atacama, Chile.

MOREDYKE MINING CO. **ARIZONA.**

Office: 404 Jackson Bldg., Denver, Colo. Mine office: Casa Grande, Pinal Co., Ariz. J. R. Smith, president; J. F. Kramer, vice-president; W. H. Haven, secretary and treasurer; A. R. Benzie, general manager; preceding officers and W. B. LeFave, directors. Organized Sept. 10, 1907, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 8 claims, area 160 acres, 28 miles from a railroad, showing a 2′ vein of silver-lead ore, with occasional gold values, opened by several pits and a 60′ shaft.

COMPAÑÍA COBRE DE MORELOS, S. A. **MEXICO.**

Is the Mexican incorporation of the Royal Morelos Copper Co.

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MORENCI COPPER CO. **ARIZONA.**

Dead. Formerly at Morenci, Graham Co., Ariz. Described Vol. V.

MORENCI COPPER MINES, LTD. **ARIZONA.**

Dead. Merged, 1903, in Clifton Consolidated Copper Mines of Arizona, Ltd. Formerly at Morenci, Graham Co., Ariz.

MORGAN-ARGENTINE MINING CO. **UTAH.**

Office: 54 West Second South St., Salt Lake City, Utah. Mine office: Peterson, Morgan Co., Utah. Herbert Pembroke, president and general manager; W. H. Croft, vice-president; A. B. Pembroke, secretary and treasurer; Earle R. Pembroke, engineer; preceding officers, John Croft and S. J. Pembroke, directors. Organized 1900, under laws of Utah, with capitalization $50,000, shares 1 cent par. Annual meeting, third Tuesday in May.

Lands, 10 claims, area circa 175 acres, partly patented, 11 miles from Union Pacific railway, in the Argentine district, showing fissure veins in Carboniferous limestone, and contact deposits between limestone and quartzite. Main vein, of 2′ to 10′ width, with northwesterly strike, carries mainly silver-lead ore, with copper and gold values, opened by a 175′ shaft, with circa 2,000′ of workings. Property supposedly is in the same limestone belt as Park City, about 30 miles to the south.

KUPFERBERGWERK MORGENSTERN. **GERMANY.**

Mine office: Kupferberg, Schlesien, Germany. Employs circa 200 men.

MORMON GIRL MINING CO. **ARIZONA.**

Dead. Was a bad egg. Formerly at Cave Creek, Maricopa Co., Ariz. Described Vols. V and VI.

MORNING BELL COPPER MINING & SMELTING CO. **BRITISH COLUMBIA.**

Office: Spokane, Wash. Registered 1907, under laws of British Columbia, as a foreign corporation, with capitalization $250,000, shares 25 cents par.

MORNING GLORY MINE. **ARIZONA.**

Office and mine: care of Chas. Wilson, owner, Patagonia, Santa Cruz Co., Ariz. Mine has a 5′ vein of medium grade sulphide ore, and shipped, 1907, about 1,000 tons.

MORNING STAR MINE. **CALIFORNIA.**

Mine office: Markleeville, Alpine Co., Cal. An old mine, in the Mogul district, north of Markleeville, showing ores assaying up to 17% copper, 49 oz. silver and $32 gold per ton. Long idle.

MORNING STAR MINING CO. **ARIZONA.**

Dead. Formerly at Dewey, Yavapai Co., Ariz.

MORRIS MINING CO. **WYOMING.**

Office: Morris, Ills. Letter returned unclaimed from former mine office, Battle, Carbon Co., Wyo. F. H. Mattison, president; J. R. Collins, vice-president; G. A. Leach, secretary; A. Hollenbeck, treasurer; J. T. Brown, general manager.

Lands, sundry claims, on Nellie Creek, one mile below Battle, adjoining the Continental Copper Mining Co., opened by a 500′ tunnel, said to cut a 15′ vein of copper ore. Also has a 50′ shaft showing a 7′ vein assaying 5% copper. Presumably idle.

MORRISON MINES, LTD. **BRITISH COLUMBIA.**

Dead. Absorbed, 1904, by Montreal & Boston Consolidated Mining & Smelting Co., also dead. Formerly at Greenwood, Boundary district, B. C. Fully described Vol. IV.

MORRISON MINING CO. **NEVADA.**

Dead. Name changed, 1907, to Imlay Copper Mining Co. Formerly at Humboldt House, Humboldt Co., Nev.

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MORROW COPPER CO. **ARIZONA.**

Dead. Was merged, August, 1908, in Clara Consolidated Gold & Copper Mining Co. Formerly at Planet, Yuma Co., Ariz.

MOSCOW MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Mathew Cullen, manager; Daniel Ferguson, superintendent. Mine, 15 miles west of Milford, opened to depth of circa 400′, is a small producer of medium and high grade silver-lead and gold-copper ores, averaging about $1,000 per carload in gross values. Shipment of 45 tons, circa May, 1908, returned 12.6% copper and 6% lead, with small silver and gold values.

MOTHER LODE COPPER CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Organized 1907. Lands, 7 claims, area 140 acres, in the Copper Basin, 10 miles west of Prescott, showing an ore body between limestone and porphyry, said to give average assays of circa 12% copper and $6 gold per ton.

MOTHER LODE COPPER MINES OF ALASKA. **ALASKA.**

Office: 902 Lowman Bldg., Seattle, Wash. Mine office: McCarthy Creek, Alaska. Clarence L. Warner, president; Joshua Menach, vice-president; Jas. A. Godfrey, secretary and treasurer; preceding officers, Chas. G. Hubbard and John Miller, trustees. Organized under laws of Washington, with capitalization $5,000,000, shares $1 par. Lands include 120 acres of placer claims, said to be well timbered, presumably in the interior of Alaska; claims on Dryer Bay, known as the Valdez group, and the Copper River group, 19 claims, adjoining the Bonanza group, on McCarthy's Creek, in the Copper River district, Alaska, claimed by company to have a better showing than the Bonanza, which statement is not believed. The Copper River group, having a 105′ tunnel, is said to show a mineralized zone of 50′ to 60′ width, carrying a 6′ to 8′ paystreak of massive chalcocite assaying 18 oz. silver per ton, with small gold values. Company's prospectus is very loosely written, and filled with a vast amount of misinformation regarding general copper conditions, but property is considered of more than usual promise.

MOTHERLODE COPPER MINING CO. **VIRGINIA.**

Office: 623-18 Broadway, New York, N. Y. Mine office: Virgilina, Halifax Co., Va. Joseph H. Morong, president and general manager. Organized September, 1902, under laws of New York, with capitalization $1,500,000. Idle.

MOTHER LODE MINES. **BRITISH COLUMBIA.**

Owned by British Columbia Copper Co., Ltd.

MOUNTAIN COPPER CO., LTD. **CALIFORNIA.**

Office: 22 Abchurch Lane, London, E. C., Eng. American agency office: 811-56 Beaver St., New York, N. Y. Mine office: Keswick, Shasta Co., Cal. Works office: Martinez, Contra Costa Co., Cal. Wm. Keswick, M. P., chairman; preceding officer, Sir Andrew Noble, Bart., K. C. B., Henry J. Wenham, Sir Walter Scott, J. P., and Chas. W. Fielding, directors; Alfred N. Frewer, secretary; Lewis T. Wright, resident manager; W. F. Kett, assistant general manager; T. J. Jones, mine superintendent; J. A. Black, smelter superintendent; J. J. Murray, assistant smelter superintendent; W. Cole, railway superintendent.

Organized Dec. 1, 1896, under laws of Great Britain, and reorganized May 10, 1902, with capitalization £250,000, shares £1 par. In 1899 the company changed its capitalization of £1,250,000 into £250,000 in shares and £1,000,000 in 6% debenture stock, shares £4 par, on which a first repayment of £1 per share was made Jan. 16, 1905, leaving £750,000 of stock now outstanding. The change in 1899 was practically a complete amortization. Dividends before reconstruction, 1897-1901, aggregated 58½%. Profits for 1907 were £150,254.

Lands are extensive, including the Iron Mountain and Hornet mines, 10

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miles northwest of Redding. The Iron Mountain mine was worked originally, in a small way, for gold and silver values carried in the gossan. The main ore body of the Iron Mountain mine is a solid pyritic mass, approximately 100′ to 400′ wide, 800′ long and 500′ deep, with a gossan of 100′ to 300′ width. Ore is mainly chalcopyrite, associated with pyrite and pyrrhotite, occurring in a shear zone of meta-rhyolite, the ore averaging circa 5% copper, 2 oz. silver and slightly under $1 gold per ton. The mine was worked pillar-and-stall, and depleted stopes filled with rock, quarried just west of the mine. Considerable ore has been left in the pillars, which undoubtedly will be robbed, eventually, by open-cast work. Ore reserves are estimated at less than 500,000 tons, and diamond drill borings show comparatively little ore outside of the fire zone. The ore being strongly pyritic, there has been considerable trouble from mine fires, caused by spontaneous combustion. In 1902 C. Colcock Jones was engaged as engineer, for the special object of controlling fire conditions, and, as a result of the combined efforts of Messrs. Wright and Jones, the plenum system of ventilation was applied, overcoming heat troubles in the masses of pyritic ore, and restoring normal conditions sufficiently to save a large tonnage of ore. J. J. Shaw, then in charge of underground work, later applied the same ideas, under even more drastic conditions, in the United Verde mine, with like success. Considerable copper is secured by precipitation from the charged mine water coming from the fire zone.

The Hornet mine, lying to the north of the Iron Mountain, has developed about 5,000,000 tons of ore, apparently averaging about 1% only in tenor, though some of the ore carries up to 2.5% copper, all ore being strongly pyritic, ranging 47 to 50% in sulphur tenor.

The mine is connected with the Keswick smelter by an 11-mile narrow-gauge electric railway, traversing a rugged country, with an average grade of nearly 2%, the elevation gained being 2,000′.

Ore is heap-roasted in open air, 8 to 10 weeks being required for burning, raw ore carrying about 45% sulphur and roasted ore only 7%. The roasted ore is loaded by steam-shovel.

The Keswick smelter, in the cañon of Spring Creek, less than a mile from the Sacramento river, does considerable custom smelting. The plant has 5 water-jacket blast-furnaces, of 300 tons daily capacity each, with 11 Wright circular calcining furnaces having settlers with slag overflow to ladle cars, and a slag railway, the matte pouring into iron casting-moulds on a slow-moving belt-conveyor, and passing under jets of water to chill the pigs, which are dumped into barrows and hoisted to the charging floor. The first-fusion matte, of 25 to 30% copper tenor, is resmelted, and the second-fusion matte is roasted and blown up to white metal, running into settlers, and being taken thence, in ladles, by traveling crane, to the converters. Stands are controlled hydraulically, from a single pulpit, and linings are tamped by power. Fumes from roasters, furnaces and converters are carried through dust-chambers, and flue-dust is briquetted and resmelted. Fines and ores from the roast-heaps are calcined in Wright turret roasters, and briquetted by 3 machines, which also handle flue-dust and calcined granulated matte, using lime for a binder.

The power plant of the Keswick smelter includes rotary blowers, driven by 3 engines, including an Allis-Chalmers cross-compound, Risdon cross-compound and a small auxiliary straight-line engine, steam being furnished by 3 Babcock & Wilcox boilers and a Heine water-tube boiled, all fired with petroleum. Blast is heated by stoves fired with oil, before entering the tuyeres. The converter plant has an air-compressor driven by a 500-h. p. Allis-Chalmers engine. Electric power, generated 80 miles distant, is used, at a cost of ¾ cent per h. p.-hour. In connection with the smelter are a large machine shop, foundry and smithy.

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The operation of the Keswick smelter has been greatly hampered by suits of neighboring ranchers, and the plant was idle for some time, on account of this trouble. The company has withdrawn its appeal from an adverse decision in the case of a suit for damages brought by the United States government, for injury done to federal lands, and the company has promised to pay damages to the government.

The Keswick smelter is not modern, and doubtless would be rebuilt were there sufficient ore in sight to justify such an expenditure. The results secured, however, are unusually good, and this plant stands second only to the works of the Mount Lyell as a successful pioneer in the field of pyritic smelting. After idleness for a long period, the roasters were started, circa March, 1908, to treat fines from the mines, before shipment to the Martinez smelter.

The Martinez smelter, on San Francisco Bay, includes the old works of the San Francisco Chemical Co., taken over as the nucleus of the new plant. The Martinez works have one of the most extensive and best planned acid works in existence, built at a cost of approximately $1,000,000. The Hornet ores, which are low in copper, but rich in sulphur, are burned, and the sulphur fumes collected in lead-lined chambers and transformed into sulphuric acid by the contact process, and the cinder remaining after the roasting is leached for its copper contents. The acid is sold crude, and also is used as the basis of commercial fertilizers, for which there is an enormous demand in the rich fruit and agricultural districts of California and the other Pacific coast states. The Martinez works have a smelting capacity of 350 tons daily, and also do a general custom business.

Production of the Iron Mountain mine has greatly decreased, figures of output in fine copper being as follows: 29,727,040 lbs. in 1901; 19,116,160 lbs. in 1903; 5,708,000 lbs. in 1906; 6,814,000 lbs. in 1907. In October, 1908, the Iron Mountain mine was shipping 100 tons daily, with a considerable production of cupriferous pyrites from the Hornet mine. Notwithstanding the depletion of the company's reserves of medium and high grade ore, the finances have been managed with great prudence and marked success, and the company, while facing a partially exhausted mine, has been able to make a successful change of base, by which low grade pyritic ores are utilized for acid making, and the company is in excellent condition financially.

MOUNTAIN GEM MINING CO. **MONTANA.**

Office: care of W. D. Greenough, Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Organized late in 1907.

MOUNTAIN HOME COPPER CO. **AUSTRALIA.**

Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. A considerable share interest is said to be owned by Queensland Copper Freeholds, Ltd. Lands are circa 600 acres.

MOUNTAIN KEY MINE. **NEW MEXICO.**

Office: Pinos Altos, Grant Co., N. M. W. C. Chandler, owner and manager. Property is one of the oldest mines in Grant county, having a 700′ shaft, and producing auriferous and argentiferous copper sulphides. Has steam power. Presumably idle.

MOUNTAIN LAKE CONSOLIDATED MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Brighton, Salt Lake Co., Utah. Jesse Knight, president. Organized circa 1906, under laws of Utah, as successor of Mountain Lake Mining Co.

Lands include the Original group, 24 claims, area circa 400 acres, and the Mountain Lake Extension, an adjoining property, bought circa April, 1908. The Original group, at the head of Big Cottonwood Cañon, adjoining the Big Cottonwood Gold & Copper Co., shows 2 contact deposits, between diorite and limestone, of 100′ claimed average width, traceable circa 2,000′, carrying

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bornite and chalcopyrite, giving average assays of 2.5% copper, 2 oz. silver and $1 gold per ton. Development is by a 100′ shaft and 5 tunnels, longest, known as the Steamboat tunnel, circa 2,500′.

MOUNTAIN LAKE MINING CO. **UTAH.**

Dead. Succeeded, circa 1906, by Mountain Lake Consolidated Mining Co. Formerly at Brighton, Salt Lake Co., Utah. Fully described Vol. VI.

MOUNTAIN LION GOLD & COPPER CO. **MEXICO.**

Letter returned unclaimed from former office, La Cananea, Sonora, Mex. Organized 1905, with capitalization $50,000. Lands were circa 400 pertenencias, in the Magdalena district of Sonora. Moribund.

MOUNTAIN MEADOWS COPPER CO. **CALIFORNIA.**

Mine office: Quincy, Plumas Co., Cal. Property, in Lights Cañon, has a 200′ tunnel, said to show native copper.

MOUNTAIN MONARCH GOLD MINING CO. **CALIFORNIA.**

Office: 319 Yuba St., Redding, Cal. Mine office: Shasta, Shasta Co., Cal. W. F. Aram, president and general manager; J. H. Hunter, secretary; C. E. Armstrong, treasurer. Organized Nov. 25, 1905, under laws of California, with capitalization $75,000, shares $1 par, in $25,000 preferred and $50,000 common stock; issued, $68,500.

Lands, 11 claims, unpatented, area 220 acres, in the Whiskeytown district, north of Redding, 10 miles from Southern Pacific railway, showing 3 fissure veins in rhyolite, main vein, of 140′ estimated width, traceable circa 2,500′, carrying malachite, bornite and chalcopyrite associated with pyrite, giving average assays of 7% copper, 1.5 oz. silver and $3.40 gold per ton. Development is by tunnels of 200′ and 750′, with 1,200′ of workings. Equipment includes a 6,000′ sawmill and 5 mine buildings. Company plans extension of main tunnel.

MOUNTAIN RUN MINE. **AUSTRALIA.**

Mine office: Rockley, N. S. W., Australia. Has shafts of 120′ and 180′, and at last accounts was erecting a smelter with a small water-jacket blast-furnace.

MOUNTAIN VIEW COPPER CO. **OREGON.**

Dead. Lands sold, 1903, to Vulcan Copper Co. Formerly at Kerby, Josephine Co., Ore.

MOUNTAIN VIEW DEVELOPMENT CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. Geo. Bennett, president; H. M. Woods, vice-president; W. D. Kinsey, secretary; Chas. Trotman, treasurer. Organized 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 9 claims, 4 miles northwest of Bisbee, opened by 2 shallow shafts and a tunnel. Ores carry occasional lead values, and a small test shipment gave returns of 16.74% copper and 100 oz. silver per ton. Idle and apparently moribund.

MOUNTAIN VIEW MINING CO. **UTAH.**

Dead. Property sold, 1908, to Yankee Consolidated Mining Co. Formerly at Eureka, Juab Co., Utah.

MOUNT ANDREW MINING CO. **ALASKA.**

Office: 1500-52 William St., New York, N. Y. Mine office: Ketchikan, Alaska. Property, leased to Britannia Smelting Co., Ltd., is described under title of that company.

MOUNT BAKER & SHUKSAN MINING CO. **WASHINGTON.**

Office: 18 Post-Intelligencer Bldg., Seattle, Wash. Mine office: Maple Falls, Whatcom Co., Wash. J. Conaway, president; C. M. Welsh, secretary; Geo. B. Conaway, superintendent. Lands, 320 acres, having an available water power and said to carry 7,000,000′ of good standing timber. Has 4 tunnels, longest 320′, with about a quarter-mile of workings, showing ore said to

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average circa 3.5% copper and $5 to $8 gold per ton. Has an air-compressor and plans a mill and smelter.

MOUNT BOPPY BLOCKS, LTD. **AUSTRALIA.**

Dead. Was being liquidated 1908, and property is for sale. Formerly at Cobar, Robinson Co., N. S. W., Australia.

MOUNT BOPPY COPPER MINING CO., N. L. **AUSTRALIA.**

Office: Cobar, N. S. W., Australia. Mine office: Canbelego, Canbelego Co., N. S. W., Australia. J. P. Conley, chairman; G. Marshe, secretary; C. J. Elliott, general manager; E. H. Harris, superintendent; John Butler, mine superintendent; G. Elliott, mill superintendent; H. Bailey, engineer. Organized 1906, under laws of New South Wales, with capitalization £25,000, shares 12s. par, fully issued. Shares are listed on the Sydney stock exchange.

Lands, 3 claims, area 120 acres, held under mineral lease, also a 4-acre millsite and 100,000 acres of timber lands, in the Geweroo mining district, 7 miles from the government railway. Mine, formerly known as the Burra Burra, shows 2 ore bodies, occurring as contact deposits between slate and porphyry, of about 6′ average width, carrying malachite, bornite, chalcopyrite, tetrahedrite and sphalerite said to average 8% copper, 20 oz. silver and 2 dwts. gold per long ton. Development is by shafts of 300′ and 200′, and by tunnels of 100′ and 300′, showing circa 20,000 tons of ore, with 15,000 long tons blocked out for stoping.

Equipment includes 100-h. p. steam plant, with a 16-h. p. hoist, and there are 4 buildings, including a general office and assay office.

The mill, of 50 long tons daily capacity, has 15 gravity stamps, 3 Alley tables, 1 Wilfley table and 3 slime tables.

The company plans deepening one shaft, developing the mine more extensively, constructing several new buildings and erecting a smelter, to have a 100-ton furnace.

MOUNT BOPPY SOUTH COPPER MINING CO., N. L. **AUSTRALIA.**

Office: Cobar, N. S. W., Australia. Mine office: Canbelego, Canbelego Co., N. S. W., Australia. Organized early 1907, under laws of New South Wales, with capitalization £2,250, shares £15 par.

MOUNT BOWEN COPPER DEVELOPMENT CO. **AUSTRALIA.**

Mine office: Bonang, East Gippsland, Victoria, Australia. Is said to have proven a vein for 50′ carrying ore averaging about 10% copper. Is chiefly interesting as the only Victorian copper mine listed in this work.

MOUNT BROWN MINE. **AUSTRALIA.**

Mine office: Grafton, N. S. W., Australia. Has a 10′ vein with a 2′ pay-streak carrying copper carbonates and tetrahedrite, averaging about 30% copper. Has a 64′ main shaft and, early 1908, was driving a tunnel.

MOUNT BULGA COPPER CO. **AUSTRALIA.**

Mine office: Springfield, Bathurst Co., N. S. W., Australia. In 1906 was shipping circa 25 tons of ore weekly, to the Lithgow smelter. Presumably idle.

MOUNT CANNINDAH COPPER CO. **AUSTRALIA.**

Dead. Reorganized, 1906, as Mount Cannindah Copper Mines, Ltd. Formerly at Mt. Cannindah, Queensland, Australia.

MOUNT CANNINDAH COPPER MINES, LTD. **AUSTRALIA.**

Office: Commercial Union Chambers, Eagle St., Brisbane, Queensland, Australia. Mine office: Mount Cannindah, via Miriam Vale, Queensland, Australia. Hon. Robt. Philp, chairman; Thos. Welsby, secretary; Allan Gibb, general manager; Wm. Shaffrey, mine manager; N. Farquhar, mill manager; R. Chas. Philp, metallurgist. Organized 1906, under laws of Queensland, with capitalization £30,000, shares 2s. par, as a reconstruction of Mt. Cannindah Copper Co.

Lands, 97 acres, well watered and timbered, carrying ore in brecciated

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dykes running through slates, in Gympie beds of upper Devonian age. The Mount Cannindah dyke, running north and south, has an extreme width of 110′, carrying oxidized ores, mainly azurite, and secondary sulphides, largely chalcocite and bornite, with gangue of impure kaolinized slate, richer portions running 35 to 40% copper, and, excluding rich patches, which are of fairly frequent occurrence, estimated average tenor of ore is 3.5 to 4% copper.

The reduction plant includes a mill and smelter, mill, completed October, 1906, being rated at 50 tons daily capacity, but actually treating an average of 25 tons daily. Equipment includes a rock-crusher, Krupp ball mill, classifier, jigs, Wilfley tables and Wilfley slimer, turning out concentrates of 20 to 35% copper tenor. Tailings carry about 1% copper, and it is planned to leach them, eventually. Smelter, of about 25 tons daily capacity, has a 19x13′ 6″ reverberatory furnace, fuel being ironbark wood, costing about 12s. per cord, delivered. The McMurtry pot process for desulphurization of concentrates before smelting is employed, apparently with very satisfactory results.

Production, 1906, was 1,879 long tons of ore, making 139,776 lbs. fine copper and 784 oz. silver, giving an average extraction of 3.3% copper from ore treated. Employed circa 50 men, 1907, until suspension of operations. Heavy rains, March and April, 1908, washed away company's dams. Idle.

MOUNT CATTLIN COPPER MINING CO., LTD. **AUSTRALIA.**

Office: Salisbury House, London Wall, London, E. C., Eng. Mine office: Ravensthorpe, Phillips River goldfield, Western Australia. J. Tyhurst, chairman; Selwyn Goldstein, general manager; E. Protheroe Jones, secretary; Geo. Chas. Klug, consulting engineer. Organized Oct. 23, 1906, under laws of Great Britain, with capitalization £200,000, shares £1 par, fully issued.

Lands, 50 acres, circa 30 miles from Port Hopetoun, showing a vein of about 7′ width, opened to depth of nearly 400′, carrying, at depth of circa 300′, ore giving average assays of 3% copper and 2 dwts. gold per long ton, improving, for depth of 30′, to tenor of 5% copper and 3 dwts. gold per ton. Mine is proving very wet. The Western Australian government is said to plan building a railway from Ravensthorpe to the mine. Ore treated, 1907, returned 6% copper and 6 dwts., 10 grains gold per long ton, copper produced costing £81 per ton, but company estimates that copper can be made, eventually, for £51 per ton. Production, 1907, was 1,147,020 lbs. fine copper, and upwards of 2,500 oz. of gold, with a little silver.

MOUNT CHALMERS COPPER MINES, LTD. **AUSTRALIA.**

Dead. Voluntarily wound up, May 1, 1901. Formerly at Mt. Chalmers, Rockhampton, Queensland, Australia.

MOUNT CHALMERS MINE. **AUSTRALIA.**

Owned by Great Fitzroy Gold & Copper Mines, Ltd.

MOUNT CUTHBERT, N. L. **AUSTRALIA.**

Offices: 395 Collins St., Melbourne, Australia, and Palmerston House, London, E. C., Eng. Mine office: Coolullah, Beaconsfield Co., Queensland, Australia. Hon. R. Philp, chairman; F. G. Hughes, secretary; E. Habben, London secretary. Organized January, 1907, under laws of Victoria, with capitalization £240,000, shares £1 par; issued, £160,000.

Lands, 21 claims, area 230 acres, on the Leichhardt river, in the Mount Cuthbert district, opened by several trenches and a shallow shaft, showing copper carbonates and a little chalcopyrite, in chloritic schists.

MOUNT DIAMOND COPPER CORPORATION, LTD. **AUSTRALIA.**

Dead. Formerly at Wandie, Northern Territories, South Australia. Described Vol. VI.

MOUNT DONALDSON COPPER CO., LTD. **TASMANIA.**

Dead. Formerly at Corinna, Russell Co., Tasmania. Described Vol. VI.

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MOUNT EDDY MINING & DEVELOPMENT CO. **CALIFORNIA.**

Dead. Formerly at Sisson, Siskiyou Co., Cal.

MOUNT ELLIOTT, LTD. **AUSTRALIA.**

Offices: Palmerston House, Old Broad St., London, E. C., Eng., and 375 Collins St., Melbourne, Australia. Mine office: Selwyn, Cloncurry, Beaconsfield Co., Queensland, Australia. E. Habben, London secretary; E. H. Schackell, Melbourne secretary; G. A. Walker, general manager. Organized June 14, 1907, under laws of Great Britain, with capitalization £750,000, shares £1 par; issued, £600,000, as reconstruction of a corporation of same name organized 1906, under laws of Victoria.

Lands, 260 acres, 58 miles south of Cloncurry, on the 2 upper branches of Maggie's Creek, a tributary of the Cloncurry River. Has a townsite called Selwyn, one-half mile north of the mine. Lands show a big outcrop of rich ore, in an area of pre-Devonian upturned slates and schists, there being the usual oxidized ores, with considerable chrysocolla and a fine showing of chalcocite. Main shaft is 231', sunk at an angle of 65°. Ore reserves estimated, August, 1907, at 71,000 long tons, first estimated to average 25% copper, but, after resampling, estimated to carry 16.4% copper and 2 dwts. gold per ton, which figures still seem high, though ore shipped, 1907, assayed 37% copper, 1 oz. silver and 9 dwts. gold per ton. A railway is projected to reach the mines, and it is planned working the property open-cast to depth of 135'.

Smelter, built 1907-1908, has a water-jacket blast-furnace. Production, 1906, was 182 long tons of high grade copper ore, yielding circa 140,000 lbs. fine copper. Property considered decidedly promising.

MOUNT FISHER PROPRIETARY CO. **AUSTRALIA.**

Office: 114 Pitt St., Sydney, N. S. W., Australia. H. Ernest A. Miller, secretary. Idle and apparently moribund.

MOUNT FLORA COPPER CO. **AUSTRALIA.**

Mine office: Mackay, Queensland, Australia. Lands, 300 acres, in three 100-acre tracts, known as the Mount Flora, Wallaroo and Eastern Selections, opened by a 140' shaft on the Wallaroo vein, said to be 18' in width, surface ores being melaconite, azurite and malachite, with some native copper, bottom of shaft carrying chalcopyrite, ores shipped ranging 15.5 to 43.5% in copper tenor. Property also has a number of other copper veins. Begun 1908 with indebtedness of £2,250, and it was planned, February, 1908, to form a local company, with capitalization of £12,000, and build a smelter.

MOUNT FRASER COPPER MINES (N. S. W.), LTD. **AUSTRALIA.**

Dead. Voluntarily wound up, June, 1902. Formerly at Springfield, Bathurst Co., N. S. W., Australia.

MOUNT GARNET & CHILLAGOE EXPLORATION CO., N. L. **AUSTRALIA.**

Dead. Formerly at Mt. Garnet, Queensland, Australia.

MOUNT GARNET FREEHOLD COPPER & SILVER MINING CO., LTD. **AUSTRALIA.**

Dead. Company liquidated, and property taken over by bondholders. Formerly at Mt. Garnet, Queensland, Australia.

MOUNT GARNET RAILWAY & FREEHOLD MINES. **AUSTRALIA.**

Dead. Voluntarily wound up, 1903. Formerly at Mt. Garnet, Queensland, Australia.

MOUNT GLASSFORD COPPER CO. **AUSTRALIA.**

Mine office: Glassford Creek, via Miriam Vale, Queensland, Australia. Has expended circa £1,250 in exploratory work on claims adjoining the Glassford Creek mine, finding a little copper ore of fair grade. Out of funds and idle at last accounts.

MOUNT GLINES GOLD & SILVER MINING CO. **MAINE**

Mine office: Bryant Pond, Oxford Co., Me. W. N. McGrillis, superin-

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tendent. Property shows auriferous and argentiferous copper and lead ores. Has steam power and a small mill. Presumably idle.

MOUNT GODDARD COPPER MINING CO. **CALIFORNIA.**

Office: Fresno, Cal. Property is located in San Bernardino Co., California. Long idle and apparently moribund.

MOUNT GUNSON MINING CO. **AUSTRALIA.**

Mine office: Pernatty Lagoon, South Australia. Works office: Port Augusta, South Australia. Lands, 460 acres, one mile west of Pernatty Lagoon, 5 miles southeast of Mount Gunson, and circa 90 miles northwest of Port Augusta. Property, discovered 1875, and worked in an exceedingly small way before present ownership, shows 2 practically parallel ore bodies, of 6′ to 14′ width, with a northeasterly strike, carrying malachite, azurite and tetrahedrite, giving average assays of about 26% copper. The old mine shows carbonate impregnations in practically horizontal beds of quartzose sandstone, with adjoining seams and cracks carrying copper carbonates and chalcocite. Company was said, 1905, to have built a small reverberatory smelter. Property considered promising.

MOUNT HECTOR COPPER MINES, LTD. **AUSTRALIA.**

Office: William St., Rockhampton, Queensland, Australia. Mine office: Glassford Creek, Queensland, Australia. Thos. Gibb, managing director; A. A. Slack, secretary; Matthew Caldwell, mine manager; Clifton G. Rutledge, smelter superintendent. Capitalization £25,000, shares £1 par, divided equally into full-paid and half-paid stock. Lands, 346 acres, 7 miles north of Glassford Creek, and 29 miles from a railroad, in the Monal Goldfield, showing rocks of Devonian age. Mine has a tunnel and a 270′ shaft, and also is worked opencast, producing auriferous and slightly argentiferous copper ores. Smelter, blown in, 1907, has one 20-ton reverberatory furnace, producing matte of about 55% copper tenor. Production, 1907, from circa 3,000 tons of ore treated, was 262 tons of 55% matte, carrying circa 325,000 lbs. fine copper. Employs about 40 men.

MOUNT HOPE COPPER PROPRIETARY. **AUSTRALIA.**

Office: 114 Pitt St., Sydney, Australia. Mine office: Mount Hope, Blaxland Co., N. S. W., Australia. H. Ernest A. Miller, agent. Organized 1904, under laws of New South Wales, as successor of New Mount Hope Copper Mining Co., N. L.

Lands, circa 600 acres, freehold, well watered, about 90 miles south of Cobar and 80 miles west of Condobolin. District is subject to drought, but good provision is made for the conservation of water, there being 2 dams, of 22,000 cubic yards aggregate storage capacity.

The property has had a somewhat checkered career, since opened in 1880, and has been closed down and reopened fully a half dozen times. The mine produced upwards of $500,000 worth of copper, to the end of 1901.

The property shows altered sandstone, carrying 3 parallel outcrops of close-grained ferruginous slates, and quartz seams with silicious sulphide ore ranging 4.5 to 7% in copper tenor, as broken in the stopes. Above 250′ the ores are oxidized, being mainly earthy carbonates, and a considerable amount of oxidized ore remains available in the upper workings. The ore shades into the walls, which are impregnated for some distance, the main ore body having an extreme width of 80′. The property resembles the Great Cobar in many respects.

Development is by a 400′ main shaft, showing on the bottom level a 30′ vein, with some stopes of 30′ to 50′ width, ore occurring in chutes of 200′ to 500′ length.

Equipment includes a fair machinery plant, with reduction works having Hancock jigs making concentrates of 15 to 25% copper tenor. The smelter has

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4 reverberatory furnaces, formerly making rough copper of about 96% tenor, but planned, at last accounts, to turn out high-grade blister copper. Flux is iron ore, secured from a quarry 12 miles from the mine. Forces are about 85 men. Production, 1878-1898, inclusive, was 5,070 long tons fine copper, and for 1906 was 485,280 lbs. fine copper, valued at £14,672.

MOUNT HOPE COPPER MINES CO. **AUSTRALIA.**

Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. Organized circa 1906, under laws of Queensland, with capitalization £30,000. Lands include the Mount Hope, Mount Hope North, Regina and Aurum mines, all leasehold, showing 2 veins, of which No. 1 vein is said not to be payable, while No. 2, in schist, carries chalcopyrite. Property was idle, late 1908, with 6 months exemption from labor conditions.

MOUNT JUKES PROPRIETARY MINING CO., N. L. **TASMANIA.**

Office: care of T. L. Hood, agent, Hobart, Tasmania. Lands are in the Mt. Jukes field, Tasmania. Idle and apparently moribund.

MOUNT LYELL ANACONDA MINING CO., N. L. **TASMANIA.**

Office: 60 Queen St., Melbourne, Australia. Mine office: Mt. Lyell, Montagu Co., Tasmania. N. Madden, manager. Organized under laws of Victoria, with capitalization £50,000, shares 10s. par; fully issued. Lands, 38 acres, leasehold. Idle some years.

MOUNT LYELL BLOCKS COPPER CORPORATION, LTD. **TASMANIA.**

Dead. Reorganized, 1903, as Mt. Lyell Blocks Mining Co., N. L. Formerly at Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL BLOCKS MINING CO., N. L. **TASMANIA.**

Offices: 47 Queen St., Melbourne, Australia, and Palmerston House, London, E. C., Eng. Mine office: North Mount Lyell, Montagu Co., Tasmania. Employs, normally, about 250 men. Colin Templeton, chairman; preceding officer, Alfred Tolhurst, Thos. Harvey and Alex. Campbell, directors; Thos. Rollason, secretary; Edwin Habben, London secretary; Robert Ferguson, general manager. Organized March 20, 1908, under laws of Victoria, as a reconstruction of Mount Lyell Blocks Copper Corporation, Ltd., with capitalization £300,000, shares £1 par; paid in, 19s. 9d. First half of 1907 made a profit of £3,247. Half yearly meetings, February and August.

Lands, 317 acres, including 17 acres held under mineral lease, 60 acres timber lands, 150 acres miscellaneous lands and a millsite. In addition the company has the right to mine on adjoining lands of the Mount Lyell Consols for 7 years, on a royalty of 40% of net profits.

The property shows two ore bodies, carrying native copper, in minute particles, disseminated quite evenly through argillaceous schists, locally termed clays, as the schists are very soft and weather readily. These ore bodies were estimated to carry 3% copper, but revised figures, 1906, gave average estimates of 2.15% copper, and, as a matter of fact, the average probably is about 1% copper. Development is by the 240′ Balance shaft and 250′ Main shaft, and by the Consols tunnel of 1,638′ and the Office tunnel of 680′, mine being estimated to show 100,000 long tons of ore. The ground is very soft, turning to clay when weathered, and is exceedingly treacherous, requiring heavy timbering and constant watchfulness.

In addition to the two schistose ore bodies, the property shows sulphide ores giving assays up to 6% copper, in a 30′ bed of conglomerate, but this has not been worked for some time.

The company also holds options on lands in the Mount Darwin district, Tasmania, on which some prospecting work was done, 1907.

Miscellaneous improvements at the mine include a small sawmill, and a framing mill for mine timbers. The Mount Lyell & North Mount Lyell Railway is 5 miles distant. Fuel is wood, costing 10s. per cord.

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The 350-ton concentrator begun work August, 1904, and gave very unsatisfactory results at first, but has done better latterly, after some minor changes. The mill, of steel frame, has 10 gravity stamps, 20 Wilfley and Phoenix-Weir tables, canvas tables and 12 Frue vanners. The ore is concentrated quite easily.

During the first half of 1905 the mine showed a working profit of £551 11s. 11d., and at the end of 1905 was treating circa 1,000 tons of ore weekly, making 15 to 20 tons of fine copper therefrom. At last accounts the mine was practically closed, on account of the low price of copper. Mr. Ferguson seems to be handling a hard proposition with skill and technical ability.

MOUNT LYELL COMSTOCK COPPER CO., LTD. TASMANIA.

Offices: Alderman's House, Bishopsgate, London, E. C., Eng., and Broken Hill Chambers, 31 Queen St., Melbourne, Australia. Mine office: Mount Lyell, Montagu Co., Tasmania. Works office: Pillinger, Macquarie Harbour, Tasmania. T. J. Ive, chairman; Chas. Alfred Sack, secretary; Geo. A. Moore, manager. Organized June 1, 1907, under laws of Great Britain, with capitalization £150,000, shares 4s. par; issued, £105,066 8s., with 2s. 6d. per share paid in. Was organized as a reconstruction of the Lyell Comstock Consolidated Copper Co., Ltd., which was a reconstruction of the Mount Lyell-Comstock Copper Co., Ltd., thus changing back to the original title.

Lands, 300 acres, on Mount Lyell, considered fairly located, showing a considerable amount of ore of low to medium tenor. Some boring was done, 1908, by a petrol drill.

Development is by the Central tunnel, showing ore assaying 3.7% copper, and by a 450′ main shaft, with levels opened at depths of 50′, 137′, 163′, 250′, 325′ and 425′, which is poor mining practice. The main shaft shows a fissure carrying ore said to give average assays of 6.8% copper, 5.7% tin and 25 oz. silver, which figures seem large. The property, as a whole, shows considerable ore of low to medium grade, best ore averaging circa 4.5% copper. A tramway is built to within 2 miles of the mine. Company employs circa 15 men.

MOUNT LYELL COMSTOCK MINING ASSOCIATION, N. L. TASMANIA.

Dead. Was succeeded by Mount Lyell-Comstock Copper Co., Ltd. Formerly at Mount Lyell, Montagu Co., Tasmania.

MOUNT LYELL CONSOLS, N. L. TASMANIA.

Dead. Was succeeded, July, 1906, by Mount Lyell Consols Mining Corporation, N. L. Formerly at North Mount Lyell, Montagu Co., Tasmania. Described Vol. VI.

MOUNT LYELL CONSOLS EXTENDED MINING CO., N. L. TASMANIA.

Dead. Formerly at North Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL CONSOLS MINING CORPORATION, N. L. TASMANIA.

Offices: 47 Queen St., Melbourne, Australia, and Palmerston House, London, E. C., Eng. Mine office: North Mount Lyell, Montagu Co., Tasmania. Arthur J. Price, chairman; preceding officer, Wm. P. Jarvie and Wm. Colman, directors; Thos. Rollason, secretary; Edwin Habben, London secretary; Henry Hoyle, mine manager. Organized July, 1906, under laws of Victoria, with capitalization £93,750, shares 7s. 6d. par, fully issued and fully paid. Authorized, June, 1908, a £15,000 debenture issue.

Lands, 78 acres, leasehold, on Mount Lyell, south of the Mount Lyell Blocks, and 40 acres at Mount Darwin, Tasmania, though lease on latter possibly forfeited.

The Mount Lyell property has a 90′ shaft, near the mouth of No. 2 tunnel, showing a gossan said to carry native copper. Principal development is by 2 tunnels, driven in hope of striking a continuation of the sulphide ore body worked in the adjoining North Mount Lyell mine. Circa 600′ south of the shaft is a body of cupriferous clay, similar to that of the Mount Lyell Blocks,

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outcropping for 900', with an average overburden of 6', estimated to carry approximately 700,000 tons of ore, and management estimated Jan. 31, 1907, that there was in sight 94,117 long tons of cupriferous clays, of about 2.5% average copper tenor.

The mill, completed October, 1907, of circa 200 tons daily capacity, has 5 stamps, puddling machines and Wilfley tables, water being secured from a pumping plant at Linda Creek. The property employed 12 men, previous to May, 1908, when all hands were discharged, on account of financial stringency.

MOUNT LYELL CONSOLS REGISTERED, N. L. **TASMANIA.**

Dead. Formerly at North Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL COPPER ESTATES, LTD. **TASMANIA.**

Office: 85 Gracechurch St., London, E. C., Eng. Mylius Cohen, chairman; F. W. Eccardt, secretary. Organized July 19, 1899, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £103,435. Lands, 4 leases, on Mt. Lyell, were abandoned. Dead, for all practical purposes, and should be buried.

MOUNT LYELL EXTENDED CO., N. L. **TASMANIA.**

Offices: 138 Leadenhall St., London, E. C., Eng., and Equitable Bldgs., Collins St, Melbourne, Australia. Mine office: Mt. Lyell, Montagu Co., Tasmania. M. Gilmore, mine manager; J. P. Madden, secretary in Melbourne; H. M. Taylor, secretary in London. Capitalization £150,000, shares £1 par. Lands, 30 acres on Mt. Lyell and 80 acres on Mt. Darwin. Lands, forfeited, circa 1906, and bid in by company's local agent, for £505.

MOUNT LYELL EXTENDED MINING ASSOCIATION, N. L. **TASMANIA.**

Dead. Was succeeded by Mount Lyell Extended Co., N. L. Formerly at Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL MINING & RAILWAY CO., LTD. **TASMANIA.**

Offices: 39 Queen St., Melbourne, Australia, and Palmerston House, Old Broad St., London, E. C., Eng. Operating office: Queenstown, Tasmania. Mine office: Gormanston, Montagu Co., Tasmania. Employs circa 2,000 men. Bowes Kelly, chairman; Hon. Wm. Knox, M. P., vice chairman; preceding officers, Wm. Jamieson, Jos. Cowen Syme and Lindsey Tullock, directors; A. Williamson, J. Dowling, Sir John A. Cockburn, K. C. M. G., and John Ball Ball, directors London Board; Robt. C. Sticht, general manager; Alfred Mellor, secretary; Edwin Habben, London secretary; R. M. Murray, engineer in charge of mine; A. Lewis Dean, metallurgist; W. H. Wesley, assistant metallurgist; G. W. Wright, mechanical engineer; P. A. Mackay, manager chemical works; E. Carus Driffield, railway superintendent; Dr. F. J. Howell, superintendent; Hon. B. Stafford Bird, Tasmanian agent; A. G. S. Williams and Thos. Woodward, auditors.

Organized Aug. 11, 1903, under laws of Victoria, as a merger of an old company of same name with North Mount Lyell Copper Co., Ltd., with capitalization £1,300,000, shares £1 par; issued, £1,200,000. Debentures of £140,000, at 5%, were retired, 1908, leaving the company without bonded debt. Dividends were £150,000 in 1904; £205,000 in 1905; £285,000 in 1906, and £330,000 in 1907. Company and its predecessors paid dividends, to end of 1907, of £1,966,574. Balance of liquid assets, March 31, 1908, was £455,500. Half yearly meeting, May; annual meeting, November.

Lands, 4,108 acres, including 3 consolidated leases and a large number of ordinary leases from the crown, for 20-year and 30-year periods, also 565 acres of mill and smelter sites, 17 miles southeast of Zeehan, in the West Coast mining district of Tasmania. The company also holds an option on the Tasman & Crown Lyell property, and is prospecting in other mineral fields, and holds, outright and under option, 1,368 acres of tin-bearing leases, in addition to damsites and water rights of circa 900 acres area. The mines are

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several miles from the smelter, and are connected therewith by surface and aerial trams.

The Mt. Lyell mine was discovered 1883, and the gossan was worked, in a small way, as a gold mine, until taken over by the predecessor of the present company, in 1892. The North Lyell mine was developed in 1897.

Country rocks are schist, conglomerate, quartzite and sandstone, ore bodies occurring as massive lenses in the schist, near conglomerate contacts, the lenses having a generally NW. and SE. trend. There are 15 known lenses, of which 6 are under development, these having average dimensions, at the Mt. Lyell mine, of 270′ width, 660′ length, and a proven depth of 730′, and at the North Mt. Lyell mine, 100′ width, 180′ length and 600′ proven depth. Ores are of two varieties, the Mt. Lyell ores consisting of massive pyrite carrying disseminated bornite and chalcopyrite, with average values of 2.18% copper, 1.85 oz. silver and 0.055 oz. gold per long ton, while the North Mt. Lyell mine carries silicious sulphide ores, including chalcocite, bornite and chalcopyrite, with quartzose schist gangue. There are occasional occurrences of native copper and tetrahedrite, but the ores of commercial importance are almost exclusively sulphide. In addition to the ores previously enumerated, the Mt. Lyell has large bodies of very low-grade sulphide ores, averaging circa 0.65% copper, 2 oz. silver and 0.0725 oz. gold per ton, which doubtless will become valuable in time. The North Mt. Lyell ores are higher in copper tenor than those of the main mines, but are decidedly refractory, unless heavily fluxed, carrying 15 to 20% alumina and 60 to 75% silica. An average analysis of ores, made circa 1903, gave, in addition to copper, silver and gold contents, 40.3% iron, 46.5% sulphur, 4.4% silica, 2.5% barium sulphate and 2% alumina.

The Mount Lyell mine proper is developed by tunnels of 320′ and 1,450′, with a 260′ blind shaft, and has circa 15 miles of workings, with estimated ore reserves of upwards of 1,000,000 long tons available for open-cast extraction, and upwards of 2,100,000 long tons available for underground extraction. Mining is done open-cast, in terraces, at the Mount Lyell and its principal subsidiary mines, underground extraction at these properties being confined largely to the removal of the richer patches of ground encountered during exploitation. A traveling crane is used in open-cast mining. The overburden of the Mount Lyell main ore body is estimated at 1,500,000 cubic yards, all of which must be stripped, eventually. The mine is lighted by electricity, and 2 diamond drills are employed, steadily, in exploratory work. A little cement copper is secured by leaching the charged mine waters.

The North Mount Lyell mine is a comparatively small property, though with ore of excellent average grade, showing considerable bornite of better than 12% average copper tenor. Development is by 2 shafts, known as the Main and Auxiliary, former 1,122′ and the latter 1,000′ in depth, both being blind shafts, with tunnels of 850′ and 1,080′ length. Stoping is mainly on the 700′ and 850′ levels, with promising developments under way on the 1,000′ level, levels being driven at 150′ intervals. The ore body is variable in size, pinching out at the fourth level, but showing a 60′ stope below. The North Lyell ore is the richest produced in Tasmania, but is refractory in smelting, unless blended with the basic ores of the Mount Lyell.

Owing to extraction of ore largely by tunnel and from quarries, the power plant at the mine is of only 300 indicated horsepower, taking energy transmitted electrically from the main power plant at the smelter. There are 4 hoists, including an Ilgner electric engine, and 2 Corliss cross-compound air-compressors of 40 drills aggregate capacity.

Buildings include 13 smithies, of various sizes, a 40x50′ machine shop, 17x30′ carpenter shop, boiler and compressor-house, engine-house, warehouse,

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office, locomotive roundhouse and numerous dwellings for employes. The company also owns and operates three sawmills, at various points, for the preparation of mine timber, and lumber for general building purposes. In addition to the ore mines there are extensive silica and limestone quarries, with a crushing plant, near the reduction works.

The mines are connected with the Queenstown smelting plant by an aerial tramway and counterbalanced inclines, surmounting the intervening hills, the tramway being of 1,500 long tons daily capacity.

The company has two private railroad systems, of 31 and 38 miles, respectively, also a 24" gauge line, with 6 locomotives, connecting the mines, flux quarries, smelters, warehouses and yards. The 31-mile line, of 42" gauge, runs from the smelter at Queenstown to the seaport of Strahan, with extensive wharves on Macquarie Harbor, connecting at the latter point with the Strahan-Zeehan government line, giving rail connections with all parts of the colony. The Queenstown-Strahan line traverses an exceedingly difficult country, 4½ miles of this line having gradients of 1 in 20 and 1 in 16, employing 4 special Abt type locomotives and centre-rack railway, in addition to ordinary adhesion engines. The company's private lines have 238 cars, and do a good general business, in addition to handling the company's traffic.

The 250-ton North Lyell smelter, 28 miles from the mine, is 75x210' in size, with four 16x32' reverberatory furnaces, 4 blast furnaces and a converter plant. The North Lyell works also have a 69x72' sampling mill, 41x66' boiler-house with three 250-h. p. Stirling water-tube boilers, and a 60x100' power-house with 200-kw. generators and cross-compound blowers. This plant is idle, and likely to remain out of commission permanently.

The Queenstown smelter, on the Queen river, 1¼ miles from the mines, receives ore by aerial tram and counterbalance inclines. This plant, which also treats custom ores, is in 2 sections, known as Nos. 1 and 2, latter being the principal plant. No. 1 smelter has 5 water-jacket blast-furnaces, 40x168" at the tuyeres, and No. 2 has 6 water-jacket blast-furnaces, 32x127" at the tuyeres and 20' in height over all, all furnaces having cast-iron water-jackets, while a twelfth furnace, of greater capacity, was added to No. 2 plant, in 1908. The capacity of the 6 furnaces in No. 2 smelter is circa 2,000 tons daily. No. 2 smelter has mechanical feeders, and the two grades of ore from the two principal mines afford an excellent furnace mixture. A 48-oz. blast formerly was supplied by 9 No. 8 Root blowers, and 3 No. 7 Root blowers, each driven by a 12x22x28" direct-connected compound condensing vertical engine, but these were replaced, circa 1908, by 2 large steam turbo blowers, of 36,000 cubic feet capacity each, with a pressure of 4 lbs., and a similar smaller turbo blower of 18,000 cubic feet capacity per minute, at the same pressure. Blast is heated by 8 hot-blast stoves, of the hanging U-pipe type.

Pyritic smelting is employed for the first fusion, which gives a 15% matte, showing a concentration of 6 into 1, with slags averaging 46% iron, 38% silica and only 0.3% copper. The low-grade first-fusion matte is blown up, to a tenor of 40 to 50%, without previous calcining, in a small hot-blast furnace, using only a 5% coke charge, the consumption of coke amounting, 1906, to about 120 lbs. per long ton, or practically 5%.

In front of the furnaces are 4 rectangular forehearths, slag and matte flowing into the first and slag skimming from the fourth into a stream of running water, granulating the slag, which is carried to a pit, whence 2 centrifugal pumps raise it to a launder running to the slag-dump. Matte is tapped from the first forehearth three times hourly, and from the others about every two hours.

The 75-ton converter plant has 2 remelting furnaces, 6 stands and 17 Stahlmann shells, each 60x96". Converter blast is furnished by two 16x24x30"

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compound condensing air-compressors. The final product is blister copper averaging 98.83% copper, 100 oz. silver and 3.21 oz. gold per long ton, sent to the United States for electrolytic refining.

The power plant at the smelter has twelve 125-h. p. Babcock & Wilcox boilers, and 16 multitubular boilers, with aggregate steaming capacity of 2,700 h. p. There is a Green fuel economizer with induced draft, and superheaters, the joint use of the various steam economies effecting a saving of 31% in fuel costs. The electric plant, of 1,200 h. p., includes 2 Brown-Boveri-Parsons steam turbines, direct-connected to generators, and a complete electric light plant.

Fuel is mainly cordwood costing 8 to 11s. per long ton, with a little soft coal costing circa 27s. per ton, and coke costing 30s. per long ton. Yearly consumption of fuel is 67,500 tons of firewood, 42,200 cords of cordwood, 2,500 tons of bituminous coal and 10,000 tons of coke.

The company owns and operates coke works at Port Kembla, N. S. W., Australia, these having 62 funnel-shaped ovens. The coking plant does a general custom business, in addition to meeting the company's requirements.

Miscellaneous enterprises include a machine shop, iron foundry, brass foundry, brickyard and 3 sawmills.

The company built, 1905, at Yarraville, a suburb of Melbourne, Australia, an acid and fertilizer plant that makes sulphuric acid from the low grade cupriferous pyrites of the Mount Lyell mine.

A second acid and fertilizer plant at New Birkenhead, Port Adelaide, South Australia, was put in commission Apr. 1, 1908. The basis of the Port Adelaide plant is the old Junction smelter, which has been remodeled and greatly enlarged. These works are built of timber and roofed with rubberoid, in order to withstand the strongly acid fumes. The plant has 6 Herreshoff furnaces, each discharging into hoppers at the bottom, fumes going by flue to lead-lined acid-chambers, where, by the agency of nitrous gases and steam, the fumes are condensed and made into dilute sulphuric acid, which is run into storage tanks, and forced, by pneumatic power, to the tower of the superphosphate building. The plant has 2 Westinghouse engines, with Babcock & Wilcox boilers, and electric power is used throughout. Guano rock is secured from Ocean Island, in the Pacific, and the product of the works is superphosphates of high grade, for which there is a large demand in the Australian commonwealth. The acid and fertilizer plants have proven highly successful.

Although the company's ore averages under 2½% in copper tenor, the cost-sheet makes an excellent showing, ore secured by quarrying costing approximately one-third as much as that taken by underground extraction from the North Mount Lyell mine, the latter furnishing one-fourth to one-third the total ore supply. The average cost of mining and treatment, for the fiscal year 1907, was only $3.58 per long ton, reflecting great credit upon the manager and staff.

To the end of 1907 the mine had produced about 100,000 tons of copper, and large quantities of gold and silver. Production, for fiscal year 1904, was circa 406,000 long tons of ore, and remained practically unchanged until the latter half of 1907, when there was a considerable falling off, owing to depression in the metal industry. For the half-year ending March 31, 1908, production was circa 202,000 long tons of ore, yielding 4,247 long tons fine copper, 344,608 oz. silver and 10,489 oz. gold, and ore production for quarter ending June 30, 1908, was 108,181 long tons. For half year ending Sept. 30, 1907, the ore treated returned an average of 2.32% copper, 1.72 oz. silver and 0.045 oz. gold per ton. Production of fine copper has been as follows: 8,513,600 lbs. in 1904; 18,592,000 lbs. in 1905; 19,293,120 lbs. in 1906; 17,664,640 lbs. fine copper, 7,087 oz. silver and 19,849 oz. gold in 1907.

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The Mount Lyell has been a hard property to handle, presenting a series of financial, mining and metallurgical problems, all of which have been solved with great skill. The management is most excellent, in all departments, and the company obviously is endeavoring to extend its operations and production, which is the part of wisdom.

MOUNT LYELL NORTH CO. **TASMANIA.**

Dead. Formerly at North Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL PEAKS MINING CO., N. L. **TASMANIA.**

Office: 90 Queen St., Melbourne, Australia. Mine office: North Mount Lyell, Montagu Co., Tasmania. W. D. McWhae, manager. Capitalization £40,000, shares 10s. par. Lands, 80 acres, leasehold. Idle some years and apparently moribund.

MOUNT LYELL PROPRIETARY MINES, LTD. **TASMANIA.**

Dead. Voluntarily wound up, June, 1901. Formerly at Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL SOUTH CO. **TASMANIA.**

Dead. Formerly at Mt. Lyell, Montagu Co., Tasmania.

MOUNT LYELL TASMAN COMSTOCK GOLD, SILVER, LEAD & COPPER MINING CO., LTD. **TASMANIA.**

Office: Launceston, Tasmania. Mine office: Mt. Lyell, Montagu Co., Tasmania. Bernard Bradley, manager. C. H. F. Shern, agent. Lands, 113 acres, leasehold. Idle and apparently moribund.

MOUNT LYELL WEST CO. **TASMANIA.**

Dead. Formerly at Mt. Lyell, Montagu Co., Tasmania.

MOUNT MERLIN COPPER CO., LTD. **AUSTRALIA.**

Office: Eagle St., Brisbane, Queensland, Australia. Thos. Welsby, secretary. Property is the Horse Creek mine, having a 114′ shaft, showing a practically vertical ore body.

MOUNT MOLLOY, LTD. **AUSTRALIA.**

Office: Irvinebank, Queensland, Australia. Mine office: Molloy, Cardwell Co., Queensland, Australia. G. C. Young, secretary; J. Horsburgh, general manager; R. Refle, superintendent Mount Molloy mine; T. Gurrin, superintendent Mount Cardwell mine. Organized 1906, under laws of Queensland, with capitalization £100,000, shares £1 par. Planned, circa June, 1908, increasing capitalization by £50,000. Profits, for half year ending Dec. 31, 1906, were £41,257. Company paid dividends, to June 30, 1907, of 10s. 6d. per share, amounting to £52,500.

Lands include a timber reservation, shortly north of the mine, and a quarry of ironstone, said to carry 1.5 to 2% copper, which is used for fluxing. There also is a limestone quarry, near Nine-Mile Siding, about midway between Molloy and Bihoohra. The Mount Cardwell mine, at Nymbool, Cardwell County, employed 13 men only at last accounts, and is but slightly developed. The Mount Molloy mine has 5 shafts, No. 5, the main shaft, being 475′ deep. The 370′ level does not show an ore body as big or as rich as anticipated, though of fair size and grade. The 190′ level proved disappointing also, showing a wide vein, low in copper contents, the 270′ level being the best in the mine. Ore occurs in rich chutes, mainly as chalcopyrite, much of which is massive, said to assay as high as 50% in copper tenor, which evidently cannot be, as if ores do assay up to 50% copper, the so-called chalcopyrite must be mainly chalcocite, associated with some chalcopyrite and pyrite. On the 270′ level the vein is 17′ wide, carrying a 5′ paystreak of high grade sulphides, balance of 12′ consisting of low grade cupriferous pyrite. The mine is estimated to show ore reserves of circa 20,000 long tons.

Equipment, at No. 5 shaft, includes a good engine-house, with first-motion hoist, boiler-house, air-compressor, etc. There is a 20,000-gallon underground

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tank, holding water for boilers and water-jackets of the 16-drill Thompson air-compressor. The company plans building a sawmill.

The smelter had a very troublesome water-jacket blast-furnace, which was replaced by a larger furnace, blown in early 1907, and plans a second new blast-furnace. Matte is taken from a storage forehearth to the converter department, which has one stand with 6x7′ shells, of barrel type, turning out converter bars of 99% average copper tenor.

A 20-mile railway line, from Bihoohra to Mt. Molloy, was completed Dec. 1, 1908. This line, of 42″ gauge, laid with 45-lb. rails, is of great advantage to the company.

Production, 1906, was 10,359 tons of ore, of slightly better than 10% average copper tenor, which yielded 2,441,846 lbs. fine copper and 9,118 oz. silver. Property is valuable, being one of the best copper mines in Queensland, and management is considered good.

MOUNT MORGAN COPPER CO. **AUSTRALIA.**

Dead. Reorganized as Moonmera Copper Mining Co., Ltd. Formerly at Mt. Morgan, Queensland, Australia.

MOUNT MORGAN GOLD MINING CO., LTD. **AUSTRALIA.**

Office: 118 Pitt St., Sydney, Australia. English office: 9 Gracechurch St., London, E. C., Eng. Mine office: Rockhampton, Palmerston Co., Queensland, Australia. Robt. Stubbs Archer, chairman; Walter Russell Hall, chairman Sydney board; Wm. Knox D'Arcy, chairman London board; preceding officers, Hon. Albert James Callan, Kelso King, Richard Gardiner Casey and Kenneth De Lacy Cudmore, directors; George Anderson Richard, general manager; H. P. Seale, assistant manager; Holyoake Wood, secretary; John Jenkins, London secretary; J. B. Wilson, mine manager; N. F. White, engineer.

Organized Oct. 1, 1886, under laws of Queensland, with capitalization £1,000,000, shares £1 par; 17s. 6d. paid in. From organization to and including May 31, 1908, company paid dividends of £7,079,166, 13s. 4d. Dividends, 1907, were £237,500, and largest dividends were £1,100,000, in 1889. Declared, circa February, 1908, a 1s. dividend. Company is second only to the Broken Hill Proprietary as a dividend payer among Australian mines, and is one of the most profitable mines of any metal in existence.

Lands, circa 640 acres, freehold, also 80 acres leasehold and 90 acres perpetual leasehold, about 25 miles southwest of Rockhampton, also miscellaneous landed holdings, including the Many Peaks mine. The Mount Morgan has been, for two decades, one of the greatest gold producers of the world, but has shown declining values and decreasing gold output for several years, due mainly to increased depth, but partially to the mistaken policy formerly followed of extracting the richest ore without due regard for reserves.

The Mount Morgan gold mine apparently is merely the gossan of a mammoth copper deposit. This showing increased copper values at depth, the company wisely begun extensive diamond drill borings, which proved an immense tonnage of copper ore. While the Mount Morgan formerly was a gold mine, and now is a copper mine also, the two mines really are one, the copper ores coming mainly from the 750′ level, or below. The gold ore of the mine carries copper, and the copper ore carries gold, the classing of the ore being largely a matter of selection according to predominant mineral values. The mine, while a single mammoth property, is worked as two connected mines, the upper section being worked open-cast, yielding oxidized gold ores, while the underground workings yield cupriferous gold sulphides and auriferous copper sulphides. The overburden is removed by steam shovels, which are used also in ore extraction, to some extent, and about one-half of the gold ore treated is secured by open-cast workings. The oxidized ores are decreasing in tonnage and values, oxidized ores, for fiscal year ending May

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31, 1908, yielding an average of only 3.4 dwts. gold per ton, a considerable decline from the high values formerly secured. The sulphide gold ore, known locally as mundic, being pyritc, yielded circa 11 dwts. gold per long ton.

The underground workings are developed by the 1,035′ Main shaft and the 650′ Lynda incline shaft, which is the largest in the Commonwealth of Australia. Extraction is mainly from the 750′ level, and the deepest level is at 850′. For fiscal year ending May 31, 1908, the mine made 4,752′ of new underground openings, in addition to extensive open-cast operations. The mine shows reserves of low grade sulphide ores, from the 315′ to 750′ levels inclusive, estimated at 7,000,000 long tons, but it is not certain just what proportion of this tonnage is payable. Estimates of auriferous copper ore, 1906, were 1,212,000 long tons of ore averaging 3.5% copper and 8 dwts. gold per ton, and 1,597,000 tons of ore averaging 3% copper and 2.5 dwts. gold per ton, with considerably larger quantities carrying 2 to 3% copper and 1 to 2 dwts. gold per ton, all of which should be available for extraction later. For 1906 the copper ore treated averaged circa 2.5% copper and 7 dwts. gold per ton.

The Many Peaks mine, some miles distant from Mount Morgan, carries a considerable body of low grade pyritic ore, averaging circa 2.5% copper, which is excellently adapted to fluxing the Mount Morgan copper ores. A railroad connecting the Many Peaks mines with Mount Morgan is planned, and it is expected to use circa 100,000 tons of low grade ore yearly, from the Many Peaks, for fluxing, on the completion of this line.

Ironstone for fluxing is brought by vessel from Iron Island, circa 150 miles north of Keppel Bay, and limestone is secured from a quarry at Marmor, which has electric lights.

The district being arid, extensive dams have been built, these having a total capacity of 380,000,000 gallons. It is planned to transfer water by pipe-line, thus obviating considerable present losses through seepage and evaporation.

The company has an extensive mill for reduction of gold ores, gold being secured from oxidized ores and from sulphide ores by chlorination, while gold also is secured from blister copper by electrolytic refining, and the gold mill furnishes circa 500 tons yearly of copper precipitate, of about 60% copper tenor.

The copper reduction plant, built at a cost of about £250,000, was completed and the first furnace blown in, January, 1906, the third furnace going into commission early 1908. The smelter has 3 blast-furnaces, and a converter department with 2 stands. The product is blister copper averaging 98.6% copper and 14.5 oz. gold per ton, which is shipped to the De Lamar works, in New Jersey, U. S. A., for electrolytic refining, but the company will have in operation, 1909, its own electrolytic refinery, at Port Kembla.

Forces employed are circa 2,500 men, and ore is broken mainly on contract, this system proving very satisfactory to both employer and employe.

The Mount Morgan has yielded over £12,000,000 in gold, and crushes yearly circa 225,000 long tons of gold-bearing quartz, carrying an average of about 8 dwts gold per long ton. Production, for fiscal years ending May 31, has been as follows: 5,760,458 lbs. fine copper and 120,606 oz. fine gold in 1906; 12,456,640 lbs. fine copper and 153,092 oz. fine gold, valued at £911,723, in 1908. Copper ore treated for fiscal year 1908 gave an average extraction of 3.3% copper and 8.75 dwts. gold per long ton. In August, 1908, the works treated 16,780 long tons of ore, yielding 539 long tons blister copper and 6,730 oz. gold, and secured also, from the gold mill, 45 long tons of copper precipitate, carrying 34 long tons fine copper and 13 oz. gold, in addition to the gold production from the gold mill.

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The Mount Morgan is one of the very best gold mines in the world, and in addition is a copper property of altogether exceptional promise.

MOUNT MORGAN PROSPECTING CO., LTD. **AUSTRALIA.**

Office and mine: East St., Rockhampton, Palmerston Co., Queensland, Australia. Organized Nov. 28, 1907, under laws of Queensland, with capitalization £5,000, shares 1s. par. Company contracted, early 1908, for a 1,000′ borehole, by diamond drill, with a view to locating the continuation of the ore body of the Mount Morgan Gold Mining Co., Ltd.

MOUNT ORANGE MINING CO. **AUSTRALIA.**

Mine and works office: Mt. Flora, Queensland, Australia. Has a smelter with 1 small reverberatory furnace, which it was planned, early 1908, to lease for 5 years. In June, 1908, smelter was reported to be treating 60 tons of ore daily, making 60% matte.

MOUNT PERRY COPPER CO., LTD. **AUSTRALIA.**

Dead. Formerly at Mount Perry, Bowen Co., Queensland, Australia.

MOUNT PERRY COPPER & REID'S CREEK GOLD MINES & SMELTING CO., LTD. **AUSTRALIA.**

Dead. Voluntarily wound up, June, 1902. Formerly at Mount Perry, Bowen Co., Queensland, Australia.

MOUNT READ MINING CO., LTD. **TASMANIA.**

Office: Worcester House, Walbrook, London, E. C., Eng. Operating office: Cook's Chambers, Elizabeth St., Hobart, Tasmania. Mine office: Dundas, Montagu Co., Tasmania. Harold G. Campion, chairman; J. Hickson, secretary; Newman M. Ogle, London secretary; Stafford Bird, manager. Organized May 13, 1896, and reorganized Nov. 4, 1901, with capitalization £150,000, shares £1 par; paid in, 18s.

Lands, 80 acres, carrying gold, silver, lead and zinc ores assaying about 0.5% copper, also mill and smelter sites of 121 acres, with water-rights. Development is by tunnel, with considerable ore in sight, but no feasible process of treatment has been devised, the mixed sulphides being very difficult of separation and reduction. Idle some years.

MOUNT ROSE MINING & SMELTING CO. **SOUTH AUSTRALIA.**

Mine office: Wallaroo, Daly Co., South Australia. J. Remfrey, manager. Early 1908 employed circa 20 men.

MOUNT ROYAL MINE. **AUSTRALIA.**

Mine office: Dandaloo, New South Wales, Australia. Mine, circa 20 miles west of Dandaloo, in the Orange Plains field, has 2 shallow shafts, with about 500′ of workings, showing a considerable body of oxidized ores, and chalcocite assaying up to 40% in copper tenor. Has a smelter, with 1 small reverberatory furnace and November, 1907, had 20 tons of 60% matte ready for shipment.

MOUNT ROYAL MINING & REDUCTION CO. **MONTANA.**

Mine office: Philipsburg, Granite Co., Mont. L. N. Loomis, president. Lands, 4 claims, a tunnelsite and water rights, on Royal Mountain, 8 miles from Philipsburg, opened by tunnel, with about a quarter-mile of workings, showing auriferous and argentiferous copper ore.

MOUNT ST. HELENS CONSOLIDATED MINING CO. **WASHINGTON.**

Office: 606 Marquam Bldg., Portland, Ore. Mine office: Spirit Lake, Skamania Co., Wash. Thos. Prince, president; H. P. Christiansen, vice president; Chas. H. March, secretary; L. O'Connor, assistant secretary; Dr. Henry Waldo Coe, treasurer and managing director; Andrew Olson, superintendent; Geo. W. Lilly, engineer. Organized 1902, under laws of Oregon, with capitalization $1,800,000, shares $1 par.

Lands, 101 claims, 65 patented, area 2,000 acres, estimated to carry 100,000,000′ of standing timber, on the north fork of the Toutle river and

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on the shores of Spirit Lake, in the St. Helen's district, circa 50 miles from Portland. Lands include former holdings of the Sweden Copper Co., Calumet Copper Mining Co., Bronze Monarch Mining Co., Chicago Mining Co., Yellow Metal Mining Co., Earl Mining Co. and Cascade Copper Mining Co. The company also owns a three-fourths in the United mines, the holdings being practically a parallelogram of 1½ miles width by 4 miles in length. In addition to copper ores the tract contains sundry gold veins, an ochre bed, granite quarry, and a deposit of pumice stone.

The property shows syenite, diorite and slate, carrying fissure veins and contact deposits between diorite and syenite, with about 20 ore bodies more or less developed, these ranging from 5′ to 100′ in width, carrying mainly sulphide ores, including chalcocite, bornite and chalcopyrite, giving assays of 2 to 25% copper, 2 to 50 oz. silver and $1 to $40 gold per ton, with occasional lead values, the usual oxidized ores being absent.

Development is almost exclusively by tunnels, there being a 50′ shaft and tunnels of 250′, 400′, 600′ and 2,300′, with total workings of circa 5,500′, estimated to show 125,000 tons of ore of medium and high grades, with a greater tonnage of milling ore.

The Sweden-Norway-Denmark group carries a vein of 30′ to 40′ width, between diorite and syenite, mineralization being mainly on the footwall, with frequent chutes of rich ore, running from 3 to 20% copper, 4 oz. silver and $1.50 to $7 gold per ton.

The Earl group shows a strong gossan carrying small gold values, with occasional bunches of high grade copper ore, the gossan apparently overlying a breccia.

The Bronze Monarch group, adjoining the Sweden, opened by a 300′ tunnel, has produced circa 1,000 tons of auriferous and argentiferous copper sulphides.

The Polar Star mine is said to show a 2′ to 5′ vein of ore giving assays of 10 to 30% copper, 8 to 70 oz. silver and $3 to $11 gold per ton.

The Minnie Lee group, 4 miles from the Polar Star, has about 500′ of workings, showing low grade auriferous and argentiferous copper ore.

The Index mine, circa 2½ miles from the main group, shows a vein of 44′ estimated average width, carrying ore said to average 1.5% copper, 8 oz. silver and $4 gold per ton.

Equipment includes an 80-h. p. Pelton water-wheel and a 6-drill Sullivan air-compressor. There is a sawmill, with about 25 shops and cabins at the various camps.

The property has been practically idle for several years, but a small amount of development work is planned for 1909. Lands are owned outright, and the company has no bonds or debts, with a small amount of cash on hand. Property considered promising and management good.

MOUNT SHASTA GOLD MINES CORPORATION. **CALIFORNIA.**

Dead. Was partly "succeeded," 1904, by Phœnix Gold Mining Co. Was an unsavory bit of stock jobbery. Formerly at Shasta, Shasta Co., Cal. Fully described Vol. IV.

MOUNT SICKER & BRITISH COLUMBIA DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Office: 116 St. Vincent St., Glasgow, Scotland. Mine office: Mount Sicker, Vancouver Island, B. C. Kenneth H. M. Connal, chairman; John D. Steel, secretary. Organized Oct. 20, 1898, under laws of Great Britain, with capitalization £125,000, shares £1 par. Lands, sundry claims on Mount Sicker, Vancouver Island and in the East Kootenai district of British Columbia. Idle for some years.

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MOUNTS SICKER & BRENTON MINES, LTD. **BRITISH COLUMBIA.**

Office: 764 Bullitt Bldg., Philadelphia, Pa. Mine office: Mount Sicker, Vancouver Island, B. C. Dr. T. J. Jones, president; John Edmonds, vice president; Jas. A. Cameron, secretary, treasurer and managing director; Jas. Humes, superintendent. Capitalization, $1,000,000.

Lands, 9 claims, area 352 acres, 49 miles north of Victoria, in 2 groups, known as the Copper Cañon group of 5 claims, on Mount Sicker, and a group of 4 claims on Mount Brenton. Property is in the same geological horizon as the Tyee and Lenora mines, and carries a continuation of the schistose ore formation of those mines. Development is by a two-compartment shaft, sunk at an angle of 76°, variously reported as 80′ to 144′ deep, showing a little good ore in the bottom, values apparently improving with depth. Considerable development work, done at different times, on various claims, has given encouragement, but the company has not yet secured a workable ore body. Equipment is said to include necessary mine buildings.

MOUNT STANLEY MINING CO. **ARIZONA.**

Mine office: San Carlos, Gila Co., Ariz. Martin Davis, superintendent, at last accounts. Organized, 1905, with capitalization $1,000,000, shares $1 par.

MOUNT TRITLE COPPER CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. H. R. Ward, consulting engineer. Organized under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 11 claims, on the southern slope of Mount Tritle, near the head of Slate Creek, circa 12 miles south of Prescott. Mine, formerly known as the Dunkirk, is an old property, once worked as a gold mine, having 4 tunnels, of 150′, 160′, 170′ and 270′ length, driven at vertical intervals of 100′, showing argentiferous and auriferous copper and lead ores, apparently carrying values in copper, gold, silver and lead, in order named. Has steam power, air-compressor and electric light plant. Has a 30-ton mill with 4 Nissen stamps, 3 Wilfley tables, 100-ton ore bin and 10,000-gallon water tank. Begun production early 1907, and middle of year was producing about 200 tons of ore monthly. Property considered promising, but creditors applied for a receiver, October, 1908.

MOUNT TURNBULL COPPER MINING & SMELTING CO. **ARIZONA.**

Mine office: Safford, Graham Co., Ariz. P. W. Keller, president; Larkin A. Rockwell, secretary. Idle since circa 1899, and presumably moribund.

MOUNT UNION CONSOLIDATED MINING CO. **ARIZONA.**

Office Germania Bldg., St. Paul, Minn. Mine office: Prescott, Yavapai Co., Ariz. R. H. Green, president; W. H. Fagley, vice president; H. M. Temple, secretary; J. E. Whalen, general manager; Edward M. L'Engle, superintendent. Organized 1904, under laws of Arizona, with capitalization $3,600,000, shares $1 par, as successor of the Mount Union Mining Co. and Arizona-Michigan Mining Co. Lands, 19 claims, in Cook Cañon, on the southwestern slope of the Mount Union, in the Senator Range of the Bradshaw Mountains, Hassayampa district, circa 14 miles south of Prescott. The property has about 2,000′ of workings. The Arizona-Michigan mine, 9 claims, has a 175′ shaft, with circa 1,000′ of workings, showing a vein of 3′ to 6′ width, carrying a 12″ paystreak of argentiferous and auriferous copper ore and galena. The property also is reported to have a 460′ shaft. Equipment includes a 75-ton mill. Idle.

MOUNT UNION MINING CO. **ARIZONA.**

Dead. Merged, 1904, in Mount Union Consolidated Mining Co. Formerly at Prescott, Yavapai Co., Ariz.

MOUNT WARATAH COPPER MINES, LTD. **TASMANIA.**

Office: 6 Moorgate St., London, E. C., Eng. Operating office: Zeehan,

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Tasmania. Mine office: Heazlewood, Tasmania. J. H. Wolf, chairman; J. E. Meadowcroft, secretary; preceding officers and S. F. Ralli, directors; Capt. John Walters, general manager. Organized Feb. 18, 1907, under laws of Great Britain, with capitalization £125,000, shares £1 par; issued, £100,000.

Lands, 202 acres, in 3 leases from the Tasmanian government; showing 5 ore bodies, carrying chalcopyrite, associated with pyrite in a quartz gangue, averaging circa 5% in copper tenor, also a body of galena. Development is by shafts of 60′ and 170′, with tunnels aggregating 1,000′ length. Company plans continuous development.

MOUNT WARMINSTER MINE. **AUSTRALIA.**

Office: 166 Bolsover St., Rockhampton, Queensland, Australia. Mine office: Mt. Chalmers, Palmerston Co., Queensland, Australia. Wm. Thompson, secretary; J. Bruce, mine manager. Lands, 100 acres, 80 acres freehold, 2 miles from Fitzroy and 10 miles northeast of Rockhampton. Mine has 2 shallow shafts and a short tunnel, latter showing a 12′ vein of oxidized and sulphide ores of 2% copper tenor. Shipped, 1907, a parcel of 23 tons of 20% copper ore to Waratah smelter. Employs 10 men.

MOUNT WASHINGTON COPPER CO. **MARYLAND.**

Dead. Property sold under foreclosure, March, 1903. Formerly at Mount Washington, Baltimore Co., Md.

MOUNT WHIPPLE MINING CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. Lands are near Empire Flats, on the Colorado river, near the junction of the Bill Williams Fork river. Presumably idle.

MOUNT ZIRKEL COPPER MINING CO. **COLORADO.**

Office: 240 La Salle St., Chicago, Ills. Mine office: Pearl, Larimer Co., Colo. Wm. A. McGuire, president; E. B. Boisot, secretary and treasurer. Organized 1901, under laws of Washington, with capitalization $1,000,000, shares $1 par. Is controlled by Standard Development Co. Lands, 7 claims, area 60 acres, also a 5-acre millsite, in the Big Horn district, showing a 75′ fissure vein, claimed by company to average 20% copper, 4 oz. silver and $10 gold per ton, which is untrue, opened by a 250′ shaft. Idle some years. Is not regarded favorably.

MOURGOUL RIVER COPPER CO., LTD. **RUSSIA.**

Dead. Formerly at Dzansulski, Kutais, Russia.

SOCIÉTÉ ANONYME DE MOUZAÏA. **ALGERIA.**

Office: 5 Rue St. Vincent-de-Paul, Paris, Xe., France. Mine office: Camp des Chenes, par Blida, Alger, Algeria. E. Raschlé, president; R. Lava, secretary; M. Duvialard, general manager. Organized 1891, with capitalization 350,000 francs.

Lands, 5,362 hectares, showing 6 fissure veins, in schists, carrying chalcopyrite, and 10 contact veins carrying antimonial gray copper, veins ranging from 2cm. to 1m. wide and averaging 4 to 5% copper, and from nothing to 27 oz. silver per ton. Mine is opened by a 17m. shaft and 7 tunnels of 39m. to 63m. length, in chalcopyrite, and by 12 tunnels, four longest 220m., 240m., 255m. and 265m., in gray copper ore. Property is served by the West Algerian railroad, 2km. distant. Copper properties have been idle since 1899, but the company has developed large bodies of hematite and spathic iron, estimated to contain 1,200,000 metric tons of ore of merchantable grade.

MOZUMI MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

M'TAMBA COPPER DEVELOPMENT CO., LTD. **TRANSVAAL.**

Office: Johannesburg, Transvaal. J. H. Rainier, P. J. Dennyssen, F. T. Blane and Geo. Peel, directors. Organized circa February, 1908, under laws of Transvaal, with capitalization £16,000, shares £1 par. Vendors took £9,000

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in shares. Lands, 1,284 claims, in a tract circa one mile wide and three miles long, 107 miles from Pietersburg.

MULATOS MINING CO. **MEXICO.**

Dead. Formerly at Mulatos, Sahuaripa, Sonora, Mex.

MULLAN MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Ida. Lands are on the east fork of Deadman Creek. Resumed operations, October, 1908, after about 3 years idleness.

MULOCK MINE. **MICHIGAN.**

Office: care of R. P. Mulock, owner, Colfax, Ia. Mine office: Matchwood, Ontonagon Co., Mich. John F. Dreiss, superintendent. Lands, 160 acres, being the Northwest ¼ of Section 9, Town 49 North, Range 41 West, near the Norwich. Exploratory work, 1903-1905, has shown 2 amygdaloidal beds, outcropping at a distance of about 400′ apart, with average widths of circa 6′ and 15′, opened by several pits, showing copper.

MULTNOMAH MINING & MILLING CO. **WASHINGTON.**

Office: 1214 Harmon Ave., Minneapolis, Minn. Mine office: Nespelem, Okanogan Co., Wash. J. N. Hudnut, president; M. J. Hills, vice president; David W. Peabody, secretary; Geo. S. Wickman, treasurer; Dr. F. O. Hudnutt, general manager; Thos. B. Early, superintendent. Organized under laws of Washington, with capitalization $2,000,000, shares $1 par.

Lands, 8 claims, opened by a 930′ tunnel, planned to be driven 1,500′, said to cut a 15′ vein, carrying mainly auriferous and argentiferous lead ore.

MUNGANA (CHILLAGOE) MINING CO., LTD. **AUSTRALIA.**

Office: 39 Queen St., Melbourne, Australia. English office: Palmerston House, Old Broad St., London, E. C., Eng. Mine office: Mungana, Lynd Co., Queensland, Australia. Employs 350 men. Harvey Patterson, chairman; V. J. Saddler, vice-chairman; C. L. Hewitt, secretary; Edwin Habben, London secretary; Stanley N. Rodda, manager. Organized March 1, 1901, under laws of Queensland, with capitalization £125,000, shares 5s. par, fully issued. Statement of finances, as of date June 30, 1908, gave assets of £185,672 7s. 3d., and liabilities of £134,088 13s. 8d., with £6,123 13s. 10d. on hand. For fiscal year ending June 30, 1908, net profit was £8,090 17s. 2d. Annual meeting, second Monday in October.

Lands, 5 claims, area 287 acres, in the Walsh and Tinaroo districts, circa 10 miles west of Chillagoe, including a number of mines, of which the principal properties are the Girofla and Lady Jane. The property shows considerable ore, assaying up to 8% in copper tenor, but is primarily a silver-lead mine, with greatest values in silver, followed in turn by lead and copper. The mine is very wet, and considerable trouble has been had in shaft sinking at times, inflow of water being beyond the pumping capacity. Timbering is by square sets.

The Girofla mine gives a good surface showing, and carries a large ore body containing workable values in silver, lead and copper, developed by three shafts, No. 3 being 510′ deep. There also is a large open-cut, stripped to depth of 60′.

The Lady Jane mine lost its old shaft from a crush, and is very wet, having a water flow of circa 200,000 gallons daily. The old main shaft, lost through drawing, has been replaced by the 426′ Saddler shaft, which has 4 compartments and is 4′ 6″x15′ 9″ in size, inside measurement, sunk circa 100′ west of old Lady Jane No. 3 shaft.

There also are minor properties, including the Griffiths, having an 80′ open-cut; Calumet, having an 80′ shaft; Magazine, having an 83′ shaft and an open pit, and the Dorothy, having a 100′ shaft.

The mine has a number of shops and buildings, including a new general

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workshop, built 1908. Waterworks include a service furnished to the town, with fire protection for all mine buildings, with tanks holding 48 hours' supply at each mine. The property is served by the Chillagoe to Mareeba Railway. Fuel is wood.

Production for fiscal year ending June 30, 1906, was 969,280 lbs. fine copper, 652 long tons lead and 128,600 oz. silver, and for fiscal year ending June 30, 1907, was 30,275 tons of ore, yielding 2,719,360 lbs. fine copper, 2,974 long tons lead and 298,505 oz. silver.

SUCESIÓN JUAN MUÑOZ. **CHILE.**

Office and mine: Higuera, La Serena, Coquimbo, Chile. José Muñoz, general manager. The mines are Las Casas and Ají, opened to depth of 220 meters, with horizontal workings 1,350 meters in length, development being partly by tunnel. Country rock is syenite. Equipment includes a Siemens & Halske electric plant. Near the mine is the smelting establishment, known as San Juan, having a modern equipment, including an electric light plant, intercommunicating telephone system, etc. Ores under 5% in copper tenor are not treated. Smelter has 3 reverberatory furnaces. Production, 1903, was 3,770 tons of ore averaging 9.5% in copper tenor, from which were produced 775,680 kilos of ejes, averaging 46.31% copper tenor, giving an output equal to 791,958 lbs. fine copper. The mines offer good working conditions, and the property is managed with vigor and success.

MUNROE-THOMPSON ORE REDUCTION CO. **NOVA SCOTIA.**

Dead. Was a bad egg. Formerly at Wentworth Centre, Cumberland Co., N. S. Fully described Vol. IV.

MURCHISON COPPER MINING SYNDICATE. **AUSTRALIA.**

Mine office: Barraba, N. S. W., Australia. Lands, 30 acres, leasehold, 2 miles north of Gulf Creek, slightly prospected.

MURRAY COPPER MINING CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Henry Harker, president; Matt. Gilby, vice-president; A. R. Condict, secretary. Organized 1907, under laws of Utah, with capitalization $50,000, shares 10 cents par.

MURRIN COPPER MINES, LTD. **AUSTRALIA.**

Dead. Voluntarily wound up, March, 1905. Formerly at Murrin, West Australia.

MURTEGA MINERALS CO., LTD. **PORTUGAL.**

Office: 8 Princes St., London, E. C., Eng. Letter returned unclaimed from former mine office, Barrancos, Alemtejo, Portugal. J. Dunham Massey, chairman; H. G. Jones, secretary. Organized Dec. 8, 1900, under laws of Great Britain, with capitalization £80,000, shares £1 par; issued, £67,567. Lands include 5 old copper mines. Company endeavored to open a mine at the presumable point of intersection of 3 main veins, in the center of a hill, under a promising gossan capping, by shaft and tunnel. Idle several years and apparently moribund.

MUTOOROO COPPER & SILVER MINING CO., LTD. **AUSTRALIA.**

Office: care of J. P. Winch, Hindley St., Adelaide, South Australia. Mine office: Cockburn, South Australia. Lands, 320 acres, leasehold, 14 miles southwest of Cockburn, carrying lenticular ore bodies of considerable size, in contact deposits near intrusive rocks, ores including cuprite, malachite, azurite, chrysocolla and atacamite in the oxidized zone, changing at depth to chalcocite, bornite and chalcopyrite, associated with pyrite. Latest reported production, first half 1905, was 100 long tons of 16% copper ore. Property has paid several small dividends. Idle.

COMPAÑIA MINERA y FUNDIDORA DE LA MUTUA. **MEXICO.**

Mine office: Zimapán, Hidalgo, Mex. León Lemaire, general manager.

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Has argentiferous copper and lead ores, with steam power and 50-ton smelter, employing circa 200 men at last accounts.

MUTUAL COPPER CO.

Office: 100 Boylston St., Boston, Mass. Location of lands, if any, not learned.

MUTUAL GOLD & COPPER MINING CO. **WYOMING.**

Dead. Formerly at Rawlins, Carbon Co., Wyo. Described Vol. VI.

MYERS MINING & MILLING CO. **MEXICO.**

Office: care of Thos. C. Myers, manager, San Luis Potosí, Mex. Mine office: Etzatlán, Jalisco, Mex. A. Larkin, president; C. E. Ratchell, secretary and treasurer; T. L. Myers, comisario. Organized 1906, under laws of Mexico, with capitalization 40,000 pesos, shares 1 peso par. Property is the Culebra, an antigua mine, 1 mile south of Etzatlán, said to have been a large producer in the past. Development is by 2 tunnels, showing ore carrying varying percentages of copper, up to 59 kilograms silver, and 5 to 30 grams gold per metric ton.

MYSTIC SHRINE GOLD & COPPER MINING CO. **UTAH.**

Dead. Lands sold to Intermountain Mining & Industrial Association. Formerly at Bingham Cañon, Salt Lake City, Utah. Fully described Vol. V.

MYSTIC SHRINE MINE. **UTAH.**

Owned by Intermountain Mining & Industrial Association.

NABOB CONSOLIDATED MINING CO. **UTAH.**

Office: care of H. Barnett, secretary and treasurer, Salt Lake City, Utah. Jos. Geoghegan, president. Organized 1907, under laws of Utah, with capitalization $250,000, shares 50 cents par. Lands are in Beaver county, Utah.

COMPAÑIA METALURGICA NACIONAL. **MEXICO.**

Is the Mexican incorporation of the National Metallurgical Co.

COMPAÑIA MINERA LA NACIONAL. **MEXICO.**

Mine office: El Salado, Catorce, San Louis Potosí, Mex. Miguel Ferrara, president; José M. Parga, manager. Company operates El Saltillito mines, producing silver, gold, copper and iron ore. Employs circa 200 men.

NACKARA PROPRIETARY COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Nackara, South Australia.

NACO CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 428-228 West Fourth St., Los Angeles, Cal. Mine office: Turkey, Yavapai Co., Ariz. A. J. Padan, president; Wm. Theising, vice-president; Chas. W. Stewart, secretary and treasurer; preceding officers, J. Ross Campbell and J. W. McBride, directors. Organized Oct. 26, 1906, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 20 claims, area 400 acres, including the Yankee Chief and Comet groups, in the Black Cañon district, circa 3 miles from Turkey. Development is by 2 shafts, with about 700′ of workings, showing sulphide ore.

NACO SMELTING & REFINING CO. **ARIZONA.**

Office: 522 Bradbury Bldg., Los Angeles, Cal. Works office: Naco, Cochise Co., Ariz. Robert Mitchell, president and treasurer; Robert E. Morrison, vice-president; Chas. B. Lewis, secretary; preceding officers, Henry J. Stevens and N. M. Edwards, directors. Organized under laws of Arizona, with capitalization $500,000, shares $10 par.

Lands, 53 acres, just east of the Naco townsite, reached by the El Paso & Southwestern Railway, on which it was planned, 1906, to build a 250-ton custom smelter, costing circa $75,000. Smelter not built and company apparently abortive.

NACOZARA MINING & REDUCTION CO. **MEXICO.**

Dead. Formerly at Moctezuma, Sonora, Mex.

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NACOZARI CONSOLIDATED COPPER CO. **MEXICO.**

Office: care of W. L. Musick, president, Burlington Bldg., St. Louis, Mo. Mine office: Pilares de Teras, Moctezuma, Sonora, Mex. John G. Alexander, superintendent. Organized under laws of Arizona, apparently succeeding the Nacozari Copper Co., and protocolized under laws of Mexico. Lands, 40 pertenencias, area 98 acres, including La Galera, La Puerta and Copper Queen mines, one said to be an antigua, near the Moctezuma Copper Co., and carrying a 10′ to 20′ vein, supposed to be the extension of the Pilares ore body of the Moctezuma.

NACOZARI COPPER CO. **MEXICO.**

Dead. Organized September, 1906, and apparently succeeded, 1907, by Nacozari Consolidated Copper Co. Formerly at Pilares de Teras, Moctezuma, Sonora, Mex.

NADAR COPPER MINES, LTD.

Office: Bassishaw House, London, E. C., Eng. Robt. Biggar, secretary. Organized Apr. 5, 1907, under laws of Great Britain, with capitalization £100,000, shares £1 par. Apparently inoperative.

NAFVERBERGS KOPPARVERK. **SWEDEN.**

Owned by Naversberg Falun Copper Mines & Works, Ltd.

NAGAMATSU MINE. **JAPAN.**

Owned by Furukawa Mining Co.

NAHMINT MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. A. C. Cabel, superintendent. Organized 1898, with capitalization $100,000. Property is the Hayes mine, on the western side of the Alberni Canal, having 3 tunnels, longest 1,200′, with about 1 mile of workings. Has a 1-mile aerial tram, leading to a shipping wharf at tidewater. Ore shipped, 1898-1899, to Tacoma smelter, gave average returns of 13% copper, 1 oz. silver and 65 cents gold per ton. Suspended operations, 1902, when mine was said to be nearly exhausted, and idle since circa 1904.

F. B. NAJARA y CA. **MEXICO.**

Office and mine: Topia, Tamazula, Durango, Mex. Properly has auriferous and argentiferous copper ores. Employed circa 40 men at last accounts.

COMPAÑIA MINERA DE NALTAGUA. **CHILE.**

Dead. Was succeeded, Jan. 26, 1907, by Société des Mines de Cuivre de Naltagua (Chili). Formerly at Naltagua, Milipilla, Santiago, Chile.

SOCIÉTÉ DES MINES DE CUIVRE DE NALTAGUA (CHILI). **CHILE.**

Office: 52 Blvd. Haussmann, Paris, France. Mine office: Naltagua, Milipilla, Santiago, Chile. J. de Bethan, A. Boscher, Chas. Chalput, H. de Lamarre, A. de Bitrick, P. Keller, E. Leolino, M. Lyon and A. de Mun, directors. Organized Jan. 26, 1907, under laws of France with capitalization 10,000,000 francs, shares 100 francs par. Mine, opened 1898, was owned previously by Compañía Minera de Naltagua.

NAMAQUA VENTURE SYNDICATE. **CAPE COLONY.**

Mine office: Wittwater, Little Namaqualand, Cape Colony. Did some development work, circa 1904. Presumably idle.

NANAIMO JUBILEE MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Mine office: Dunsmuir, Vancouver Island, B. C. Lands, known as the Delphi group, on the south fork of the Nanaimo River, circa 18 miles from the Esquimault & Nanaimo railway, show a vein of 10′ to 15′ width, carrying fair copper values. Property considered promising.

NANCOT COPPER CO. **NEW MEXICO.**

Office: care of H. S. Clark, president, Southboro, Mass. Mine office:

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Belen, Valencia Co., N. M. Organized October, 1902, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Bonds, $250,000 authorized, running 5 years, at 6%, company giving a $2 stock bonus with each dollar of bonds sold. Lands, 26 claims, in the Manzana Mountains, near Belen, fairly timbered and watered. Mine has a 2-compartment shaft, and shipped a few carloads of ore running 15 to 20% copper. Presumably idle.

NANTLLE VALE COPPER MINING CO., LTD. **WALES.**

Office: 11 Dale St., Liverpool, Eng. Mile office: Llanllyfin, Carnarvon, Wales. O. A. Harling, chairman; W. H. Hill, secretary. Organized Sept. 9, 1900, with capitalization £5,000, shares £1 par. Issued, £4,007. Debentures, £8,500, "protected" by first, second and fourth mortgages. Idle and apparently moribund.

NAPA COUNTY COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Middletown, Lake Co., Cal., but with lands in Napa county, California. Described Vol. VI.

NAPOLEON & MAGHERA COPPER MINING & REDUCTION CO. UTAH.

Office: Lock Box 537, Cedar Rapids, Ia. Operating office: Ogden, Utah. Mine office: Utah Hot Springs, Box Elder Co., Utah. Employs 10 to 40 men. Don McGuire, president and general manager; John H. Kincaid, vice-president; Dr. Frank Carroll, secretary and treasurer; John E. Dalbey, superintendent; preceding officers, Lee Kincaid, Wm. Zaff and Dr. C. T. Chandler, directors. Organized Feb. 23, 1904, under laws of Utah, with capitalization $1,000,000, shares $1 par. Annual meeting, second Tuesday in June.

Lands, 12 claims, area 240 acres, also a 10-acre millsite, in the Sierra Madre district, showing gneiss carrying 4 fissure veins, of which 2, under development, are practically parallel, estimated by company at 20′ average width and traceable 5,000′. Veins show malachite, bornite and chalcopyrite, with occasional chalcocite and copper silicates, estimated to average 2% copper; 4 oz. silver and $2 gold per ton. Development is by a 120′ shaft and by tunnels of 1,800′, 1,100′, 300′ and 50′, with about 4,000′ of workings, estimated to show 400,000 tons of ore, with 75,000 tons blocked out for stoping. There is a 2,682′ Broderick & Bascom aërial tram.

Equipment includes a 20-h. p. steam plant. There is a 30x36′ machine shop and a 30x36′ carpenter shop, both of frame construction, covered by sheet steel. Company plans a concentrator.

NAPOLEON MINE. **CALIFORNIA.**

Mine office: Copperopolis, Calaveras Co., Cal. Is the oldest copper mine in California, and once was a considerable producer. Vein channel is 100′ wide and ranges from diabase to talcose schist, ore bodies occurring in lenses up to 20′ wide. Ores are principally sulphide, with a fair sprinkling of carbonates and oxides. Old shaft, 325′. A new shaft has been sunk to the westward. Some copper has been produced, during past few years, by leaching the old dumps.

NAPOLEON MINE. **WASHINGTON.**

Mine office: Boyds, Ferry Co., Wash. Is owned by British Columbia Copper Co. Ore is low in grade, carrying small values in copper, silver and gold, with about 20% silica and 40% iron, being valuable mainly for fluxing. Has 3-drill and 7-drill air-compressors, and a 4,100′ tram. Is said to plan a 500-ton cyanide plant to treat low grade auriferous ores. Was shipping, 1907, circa 100 tons of ore daily.

NARLARLA SILVER-LEAD MINING CO., LTD. **AUSTRALIA.**

Mine office: Mount Marmion, Western Australia. Y. H. Grant, mine manager. Lands, 240 acres, 30 miles from Mount Marmion and 90 miles from Derby, on the Barker River, in the Napier Range, carrying a ledge of 30′ to 50′, assaying 2.4 to 16.4% copper, 47 to 68% lead and 3 to 70 oz. silver, esti-

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mated by company to average 8% copper, 50% lead and 10 oz. silver, which, in all likelihood, is an overestimate. Also has property at Moondooma, 30 miles from Narlarla, said to show a 20′ vein traceable 3,000′, showing outcrops of ore that can be hand-sorted to 30% copper tenor.

NASSAU COPPER CO. **CALIFORNIA.**

Mine office: Milton, Calaveras Co., Cal. A. S. Pool, superintendent. Property, known as the Goat Ranch mine, was developing with about 20 men, at last accounts.

NAST MINING & MILLING CO. **UTAH.**

Dead. Was absorbed by New England Gold & Copper Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

NATICK COPPER CO. **MICHIGAN.**

Office: Leopold Bldg., Houghton, Mich. Mine office: Copper Falls, Keweenaw Co., Mich. F. W. Nichols, resident manager. Lands, 200 acres, between the Humboldt and Eagle River properties, being the West ½ of Section 17, Town 58 North, Range 31 West. Idle for many years.

NATIONAL CAPITAL COPPER CO. **MEXICO.**

Office: Dallas, Texas. Mine office: Coapa, Morelia, Michoacán, Mex. Neale Starke, president; W. F. Thatcher, secretary. Organized Apr. 23, 1902, under laws of Virginia, with capitalization $150,000, shares $1 par. Lands, 550 pertenencias, area circa 1,375 acres, in the Tacambaro district, showing 6 contact deposits between granite and limestone, carrying native copper and argentiferous and auriferous oxide, carbonate and sulphide ores. Two veins are being developed by tunnels, the Confianza vein being said to be 70′ wide. Nearest railway is the Mexican National, 45 miles distant. Property is well watered and timbered.

NATIONAL CONSOLIDATED MINING CO. **ARIZONA.**

Office: 420 Milwaukee Ave., Chicago, Ills. Operating office: Nogales, Ariz. Mine office: Patagonia, Santa Cruz Co., Ariz. Employs 8 men. Oscar E. Porter, president; S. F. Johnson, vice-president; A. F. Richardson, secretary; Alfred Thurtell, treasurer and general manager; preceding officers, and E. E. Bethel, directors; Geo. D. Gross, superintendent. Organized Dec. 9, 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, circa $700,000. Annual meeting, first Monday after first Tuesday in January.

Lands, 21 claims, area circa 400 acres, also 40 acres in millsites, property including the Silver Glance group, about 12 miles northwest of Nogales. Lands show granite and diorite, former frequently decomposed, and occasional limestone, carrying a number of fissure veins and contact deposits, of which 6 are partly developed, principal vein of circa 12′ average width carrying chalcocite and galena, estimated to average 3% copper, 10% lead, 12 oz. silver and $9.75 gold per ton. Development is by shafts of 60′, 110′, 80′ and 75′, and by tunnels of 193′ and 120′.

Equipment includes a 12-h. p. Fairbanks & Morse gasoline hoist and there are 5 mine buildings. Company plans continuous and systematic development.

NATIONAL COPPER CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. Lands, in the Whipple Mountain district, in the eastern part of San Bernardino county, have several prospecting shafts, with small mine buildings, and company was said, August, 1908, to plan beginning small ore shipments.

NATIONAL COPPER CO. **NEW JERSEY.**

Office: 250 Water St., New York, N. Y. Works office: Elizabeth, Union Co., N. J. H. Heppenheimer, president and general manager. Organized circa August, 1906, under laws of New Jersey. Property is a small smelting plant, treating custom ores and matte. Became bankrupt Jan. 10, 1908.

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NATIONAL COPPER CO. **NEW MEXICO.**

Office: care of Col. Ed. Butler, president, St. Louis, Mo. Mine office: Silver City, Grant Co., N. M. C. P. Laughlin, superintendent. Capitalization, $1,200,000. Lands, circa 12 claims, 4 miles from Chemung Copper Co., in Whitewater Cañon, Burro Mountains, opened by a tunnel and 200′ main shaft, showing a fissure vein in granite, of 60′ estimated average width, carrying mainly chalcocite, with considerable ore developed. Has steam power and a Norwalk air-compressor, and is said to plan a concentrator.

NATIONAL COPPER CO. **WASHINGTON.**

Mine office: Springdale, Stevens Co., Wash.

NATIONAL COPPER & GOLD MINING CO. **ARIZONA.**

Office: care of Gates M. Fowler, general manager, Phœnix, Ariz. Mine office: Wellton, Yuma Co., Ariz. Organized 1904, under laws of Arizona. Lands are the Rogers Springs group, held on $60,000 bond and lease from W. E. Marlar. Presumably idle.

NATIONAL COPPER MINES CO. **IDAHO.**

Office: 605 Couch Bldg., Portland, Ore. Mine office: Cuprum, Washington Co., Idaho. J. J. Richardson, president; Wm. Trevor, vice-president and superintendent; R. A. Proudfoot, treasurer; L. B. Reeder, secretary; preceding officers, J. F. Boone, F. B. Jones, W. E. Jones, H. A. Mautz and J. W. Shaver, directors. Organized May, 1905, under laws of Oregon, with capitalization $1,000,000, shares $1 par. Lands, 17 claims, area 330 acres, on Horse Mountain, in the Seven Devils district, opened by a shallow shaft and several tunnels, longest circa 750′, with about 1,000′ of workings, showing argentiferous and auriferous chalcocite.

NATIONAL COPPER MINING CO. **IDAHO.**

Office: 115 Howard St., Spokane, Wash. Operating office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. D. E. Keys, president; Andrew McCrea, secretary; Chas. McKinnis, manager; F. Cushing Moore, consulting engineer. Organized Sept. 22, 1906, under laws of Washington, with capitalization $1,250,000, shares $1 par.

Lands, 6 claims, west of the Lucky Calumet, between the east and west forks of Deadman Creek, circa 4 miles northeast of Mullan, near the Imperial and Copper King properties, and west of the Lucky Calumet. Suit has been brought by C. H. Williams and A. H. Featherstone over title to lands.

Development is by a tunnel and a 2-compartment main shaft, showing a vein of 7′ to 10′ width, with a 30″ paystreak giving average assays of about 4 to 5% copper, 25% lead and 10 oz. silver per ton, copper being mainly from malachite and occasional chalcopyrite, while lead values are mainly from carbonate ores and occasional galena. Both the lead and copper ores are considerably argentiferous.

Equipment includes a 15-drill electric air-compressor, energy being taken from the Washington Water Power Co.

NATIONAL COPPER MINING CO. **UTAH.**

Office: 400 D. F. Walker Bldg., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Castleton, Grand Co., Utah. F. E. Smith, president; W. H. Tibbals, vice-president; C. E. Peyton, secretary and treasurer. Capitalization $100,000, shares 10 cents par. Lands, circa 115 acres, in the La Sal Mountains, Sonoma district, showing ore assaying up to 9.5% copper and 17.5 oz. silver per ton, taken from a fissure vein traversing sandstone. Long idle and apparently moribund.

NATIONAL COPPER MINING CO. **WYOMING.**

Office and mine: Douglas, Converse Co., Wyo. Frank Tinkham, president; G. W. Johnson, secretary; H. C. Paul, general manager. Organized July, 1906, with capitalization $250,000. Long idle and apparently moribund.

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NATIONAL COPPER ORE CO. **VIRGINIA.**

Mine office: Garrisonville, Stafford Co., Va. Has cupriferous pyrite. Idle and apparently moribund.

NATIONAL COPPER TEMPERING CO. **COLORADO.**

Office: 808 Continental Bldg., Denver, Colo. David Lamon, president; Henry Stewart, vice-president; Theo. H. Thomas, secretary and treasurer. Organized under laws of Colorado, with capitalization $500,000, shares $1 par. Claims to have a process for tempering copper that increases tensile strength by more than 500%, which is untrue. Careful tests of copper, claimed to have been tempered by this process, show no improvement whatever in the metal, and Mr. Lamon excuses himself therefor by the puerile statement that successful tests can be made only on a considerable quantity of material. Process considered worthless. Promised dividends impossible of realization, and company considered a mere bit of stock-jobbery.

NATIONAL DEVELOPMENT & MINING CO. **ARIZONA.**

Dead. Was succeeded, June 5, 1906, by Sultana-Arizona Copper Mining Co. Formerly at Kolvin, Pinal Co., Ariz.

NATIONAL GOLD & COPPER CO.

Office: care of Lewis Lusk, Spokane, Wash. Organized 1906, under laws of Washington, with capitalization $1,500,000, shares $1 par, to operate in "the United States, Canada and Mexico." Location of lands, if any, unknown.

NATIONAL GOLD & COPPER CO. **ARIZONA.**

Office: care of Ben Blanchard, manager, Prescott, Ariz. Mine office: Bouse, Yuma Co., Ariz. Lands are slightly developed by several shallow shafts. Idle.

NAMAQUA COPPER CO., LTD. **CAPE COLONY.**

Office: 3 Fenchurch St., London, E. C., Eng. Mine office: Concordia, Little Namaqualand, Cape Colony. Frederick J. Mirrielees, manager; Francis Phillips, superintendent; A. W. Outram, secretary. Organized Apr. 23, 1888, under laws of Great Britain, as a reconstruction of Namaqua United Copper Co., Ltd., with capitalization £200,000, shares £1 par; issued, £188,662. Operating profits were £57,819 in 1905; and nearly £100,000 in 1906. Has paid annual dividends of 5 to 40% since organization, except 1891-1894, and 1901-1902. Dividends were 5% in 1903; 7.5% in 1904; 7.5% in 1905; 10% in 1906 and 35% in 1907. A 2s. dividend was announced May, 1908. The company has a surplus fund of more than £40,000, invested in British consols, and has returned in dividends more than its capitalization.

Lands, 680 acres, leasehold, held on royalty of 2s. 6d. per long ton of ore produced. Mines are the Tweetfontein, with 7 shafts; Wheal Julia, with 3 shafts; Flat, with 1 shaft; New East Centre, with 1 shaft; Jubilee, with 2 shafts; Henderson, with 2 shafts, and Prospect, with 2 shafts. Ore is high-grade chalcopyrite, occurring in intrusive greenstone traversing granite, and the property has considerable ore reserves.

There are concentrating plants at the Flat and New East Centre mines, where crude ore is dressed up to circa 25% copper tenor and shipped for smelting to Swansea, via Port Nolloth.

Production was 5,276,712 lbs. fine copper in 1905, and 5,931,521 lbs. in 1906. The property is managed conservatively, and with marked financial success.

NATIONAL GOLD & SILVER MINING CO. **NEW MEXICO.**

Mine office: Steins, Grant Co., N. M. M. H. Sherman, president; B. L. Berkey, superintendent, at last accounts. Has steam power and a 50-ton concentrator. Shipped a little ore and concentrates, 1906. Presumably idle.

NATIONAL METAL CO. **MEXICO.**

Offices: 170 Broadway, New York, N. Y., and Apartado 71b, Mexico, D. F.

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Works office: Guadalajara, Jalisco, Mex. C. B. Lewis, president; H. B. Lewis, vice-president and general manager; D. C. Doney, metallurgist. Apparently is an auxiliary of the American Smelting & Refining Co. Has sampling plants at Chinipas, Chihuahua; Guanacevi, Durango; Ameca and Guadalajara, Jalisco; Toluca and Temascaltepec, Mexico; San Luis Potosí; Hermosillo, Sonora, and Nogales, Arizona. Also has purchasing agencies at various other points in the Mexican Republic. Had a refinery at Nonoalco, and sold same, circa December, 1907, to Société Affinage des Metaux.

NATIONAL METALLURGICAL CO. **MEXICO.**

Office: 1503 Arrott Bldg., Pittsburg, Pa. Mine office: Matehuala, Catorce, San Luis Potosí, Mex. D. C. Noble, president; C. H. Fogg, vice-president; J. H. McConnell, treasurer and chairman board directors; preceding officers, Geo. T. Ladd, Jas. A. Steele, J. H. Douglas and H. N. Nichols, directors; W. A. Griffith, secretary; Samuel James, general manager; A. P. Callender, general agent; H. T. Schmidt, mine superintendent; W. E. Newnam, smelter superintendent; Grattan Foley, cashier.

Organized August, 1901, under laws of Colorado, with capitalization $1,000,000, shares $25 par. Debentures, $500,000 authorized, at 6%; issued, $472,000. Annual meeting, last Tuesday in July. Holds lands through a Mexican corporation, the Compañía Metalurgica Nacional.

Lands are circa 1,300 acres, and a 160-acre millsite, in the Matehuala and El Salado subdivisions of the Catorce district. Property shows limestone metamorphosed by intrusive granite-porphyry, ore bodies occurring as irregular contact deposits in an altered zone of garnetiferous limestone and wollastonite. The company's lands carry 26 known ore bodies, of which 7 are more or less developed, these ranging from 3′ to 130′ in width, and from 200′ to 1,200′ length, 5 ore bodies being under development at present. Ores are mainly malachite, bornite and chalcopyrite, carrying estimated averages of 5% copper, 6 oz. silver and $2 gold per ton.

Lands include mines known as La Cobriza, Santa Ana, Las Agustias, Santo Tomás, Monte Cristo, Alpha and Beta mines.

Principal openings include the 100′ Aurora shaft; 200′ El Carmen shaft; 500′ Santiago shaft; 1,000′ El Carmen tunnel; 900′ No. 3 tunnel; 350′ Russian tunnel, and 600′ Perico tunnel, all tunnels being crosscuts, with about 25 shorter tunnels and cuts, with a total of circa 6,500′ of workings.

La Cobriza y Anexas, opened by shaft and tunnel, have ore carrying 5 to 15% copper, circa 250 grams silver and 3 grams gold per metric ton, and were said, September, 1906, to be shipping 50 tons of ore daily.

Las Agustias mine has a shaft with circa 2,000′ of workings, ore averaging about 10% lead and 20 oz. silver per ton.

Santo Tomás mine, developed by shaft, with about one-half mile of openings, has silver-lead ore averaging circa 10% lead and 20 oz. silver per metric ton.

Santa Ana mine, opened by tunnel, has a silver-lead vein carrying 10% lead and 14 oz. silver per metric ton, and also has undeveloped silver-lead ores.

Mining equipment is slight, including a 25-h. p. gasoline hoist and a 10x10″ belt-driven air-compressor.

There are 8 buildings at the mine, including office, assay office and dwellings.

The principal mines are connected with the smelter by the 7-mile Matehuala narrow-gauge railroad. A spur of the Mexican Central railway runs into the smelter.

The smelter, receiving ore by rail and burro, and doing a general custom business, in addition to treating the company's own ores, is of 350 tons rated

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daily capacity, having 150-ton and 200-ton water-jacket blast-furnaces, one for lead and one for copper, with a 30-ton reverberatory furnace, calcining furnace, briquetting plant and a small sampling mill, the reverberatory being used for treating flue dust. Product is matte averaging circa 45% copper, 50 to 200 oz. silver and 1 oz. gold per metric ton, shipped to the Aguascalientes smelter for refining.

The power plant at the smelter includes three 125-h. p. boilers and a 275-h. p. Corliss tandem-compound engine, direct-connected to a 150-h. p. electric generator, with a number of smaller dynamos and motors.

Miscellaneous enterprises include a brick plant with a capacity of 20,000 finished brick daily, and the company holds various government franchises and concessions, and plans securing a water supply from a distance of 18 miles, and furnishing water to the city of Matehuala.

Production, 1906, is reported by company as 2,295,270 lbs. fine copper, in addition to lead, silver and gold. The mines and smelter employ circa 900 men, mainly at the reduction plant.

The company was promoted from Denver, and estimates of prospective profits made by the promoters, while placing stock, were ridiculously high, but the present management apparently has no connection with the original promoters, and seems operating along sound lines.

NATIONAL MINES CO. **IDAHO.**

Office: Portland, Ore. Mine office: Weiser, Washington Co., Idaho. W. Trevor, vice-president. Lands, 20 claims, in the Seven Devils district, having, on the King group, a 275′ tunnel with 100′ blind shaft at its end, showing ore assaying up to 5% copper, 33% lead, 90 oz. silver and $2.50 to $5 gold per ton.

NATIONAL MINING CO. **BRITISH COLUMBIA & CALIFORNIA.**

Office: Tacoma, Wash. Mine office: Waldo, Josephine Co., Ore. S. J. Pritchard, president; Geo. P. Larsen, secretary; John Sanger, superintendent. Capitalization $10,000,000. Property is the Sanger group, 35 claims, area 700 acres, in Del Norte county, California, shortly south of Waldo, also sundry mining claims in British Columbia, "oil lands" in western Washington and several mining claims in the lower Arrow Lake district, British Columbia. The Sanger ores give good assay values in copper and gold. Capitalization is excessive and claims made for company even more inflated. Idle and presumably moribund.

NATIONAL MINING CO. **MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Rockland, Ontonagon Co., Mich. John C. Watson, president; Alvin R. Bailey, secretary and treasurer; preceding officers, F. H. Raymond, Geo. H. Flint and Capt. Jas. Chynoweth, directors. Organized 1848, and rechartered 1878, with capitalization increased later to $2,500,000, shares $25 par; issued, $1,875,000. In November, 1908, company had a floating debt of circa $25,000. Has paid dividends of $320,000.

Lands lie west of the old Minesota mine, now owned by Michigan Copper Mining Co. The National has produced nearly 6,000 short tons of fine copper, but has been idle since 1893. At last accounts management was making tentative plans for resumption. Fully described Vol. II.

NATIONAL MINING & DEVELOPMENT CO. **WYOMING.**

Office: 1314 Eleventh St., N. W., Washington, D. C. Mine office: Liberty, Frémont Co., Wyo. Chas. Jacobsen, president; H. Clay Browning, Jr., vice-president; Melvin A. Wertz, secretary; preceding officers, J. Frank Hess, Achille E. Burklin, John H. Muirhead, John R. Galloway, Burt H. Brockway and Chas. J. Berner, directors; Col. John T. Wertz, general manager; A. L. LaViers, engineer. Organized May 22, 1903, under laws of Maine, with capitalization $500,000, shares $10 par. Annual meeting, first Monday in June.

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Lands, 43 claims, unpatented, area 875 acres, in the Willow Creek district, showing about a dozen ore bodies, of which 5, mainly fissure veins, are under development, these being estimated by company to average 25′ width and to be traceable 5 miles, carrying an average of 8% copper, up to 100 oz. silver and up to $2 gold per ton, mainly from chalcopyrite with quartz gangue, which figures are excessive. Development is by 5 pits and shafts, deepest 60′, and by 3 tunnels, longest 93′, with 378′ of workings. Property is 30 to 35 miles from nearest railroads.

NATIONAL MINING EXPLORATION CO. **ARIZONA.**

Office: 1012-60 State St., Boston, Mass. Mine offices: Globe, Gila Co., Ariz., Kelvin, Pinal Co., Ariz., and Safford, Graham Co., Ariz. Hon. Chas. M. Bruce, president; Wm. W. Williamson, vice-president; Jas. A. Otis, secretary and treasurer; Frank A. Woodward, general manager. Organized November, 1905, under laws of Maine, with capitalization $1,500,000, shares $1 par; issued, $796,013. Authorized, Sept. 21, 1908, an issue of $250,000 first-mortgage 10-year 6% gold coupon bonds, convertible into stock at par at any time within 2 years, and retirable by company at any time on 60 days' notice, at 5% premium. Bond issue apparently was not put out, though supposed to be placed, and money advanced the company thereon. A note, supposedly for advance on bond issue, is said to have been repaid, November, 1908.

Lands are in 3 groups in Gila, Pinal and Graham counties, Arizona, the principal property being at Globe.

The Iron Cap group of 7 claims, patented, area circa 130 acres, at Globe, is well located between the two properties of the Arizona Commercial, and not far from the Superior & Boston. The upper workings of the Iron Cap show leached ore, with promising ore in the lower workings, the mine having nearly a mile of openings. A crosscut from the 350′ level has cut what is believed to be an extension of either the Black Hawk or Old Dominion fissures, presumably the former, considerably leached, but with indications of good ore at a little greater depth, this being circa 14′ wide, with a paystreak of 20″ to 24″ of commercial ore. The company plans locating a new 3-compartment shaft, early 1909, and shipped, circa August, 1908, to the Old Dominion smelter, some ore returning net values of $8.08 per ton.

The Fumarole group, of 15 claims, circa 10 miles south of Safford, shows an oval ore body, circa 125x160′ in extreme area, with a 700′ two-compartment shaft, near the centre, having levels opened at depths of 200′ and 500′, with about a quarter-mile of workings. Apparently the Fumarole has a pipe vein, carrying gold in a disintegrated quartz gangue, ore assaying $5 to $16 gold per ton. Active development is in progress at the Fumarole.

The Copper Ridge group, 8 claims, area 160 acres, lying on the northern bank of the Gila river, circa 7 miles west of Kelvin, shows 3 veins, in a mineralized zone of circa 500′ width, opened by an old 130′ shaft. The Copper Peak group, on the northern bank of the Gila River, circa 2 miles southwest of the Copper Ridge, has a 100′ tunnel in conglomerate. Apparently both of the Pinal county properties are idle.

NATIONAL MINING & INVESTMENT CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Is said to hold an option on a controlling interest in the stock of the Farrell Copper Co.

NATIONAL MINING & MILLING CO. **COLORADO & WYOMING.**

Dead. Formerly at Pearl, Larimer Co., Colo. Fully described Vol. VI.

NATIONAL MINING & SMELTING CO. **MONTANA.**

Dead. Changed title, 1906, to New York & Saltese Copper Mining Co. Formerly at Saltese, Missoula Co., Mont.

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NATIONAL RADIUM & COPPER CO. **COLORADO.**

Dead. Formerly at Denver, Denver Co., Colo. Described Vol. VI.

NATIONAL SMELTING CO. **MEXICO.**

Office: 2030 Land Title Bldg., Philadelphia, Pa. Mine office: Chalchihuites, Sombrerete, Zacatecas, Mex. L. H. Taylor, Jr., president; Richard G. Park, vice-president; Paul W. Meyers, secretary; John J. Little, treasurer; preceding officers, John P. Logan, Clarkson Clothier and John P. Whitney, directors; Theo. Montgomery, general manager; John M. Bell, mine superintendent; Albert R. Wores, smelter superintendent; Henry Carnaghan, mill superintendent. Organized March 27, 1906, under laws of Maine, with capitalization $1,000,000, shares $5 par; issued, $389,375. Formerly had a $150,000 bond issue, at 6%, which has been converted into stock, at par. Dividends, 1907, were $14,000. The company reports that it has no debts or liabilities, other than outstanding capital stock, and that properties are free from any incumbrances. Annual meeting, first Monday in June.

Lands, 194 pertenencias, held through a Mexican incorporation, known as the Compañía Minera y Benificiadora de Minerales de Chalchihuites, S. A. There also are 38 acres of mill and smelter sites and sundry water rights, mining lands being in 10 groups, in the Sombrerete district.

The property shows limestone, with frequent intrusions of eruptive rocks, carrying fissure veins in the eruptives, and contact deposits between igneous rocks and limestone, and in limestone near the point of contact. Ore values are mainly in silver-lead.

The company's mines consist of the Colorado silver-lead mine, San Juan silver mine, Anaconda mine of iron ore flux, Esplendida gold mine, El Manto and El Tigre silver-gold mines, Estufa silver-lead mine, Constancia silver-lead mine, Santa Rita de Las Boas mine, and stock control of the Nüngano silver-lead-copper mine. The company has state concessions exempting it from taxation and granting various privileges.

The Anaconda mine shows a 36′ vein, mined open-cast, carrying some ore averaging 2.5 to 3% copper. The Nüngano has an ore body of 6′ to 15′ width, developed for 120′ in length and 160′ in depth, giving ore of 2.5 to 3% copper tenor, opened by shafts of 30′, 60′ and 160′, and by tunnels of 250′ and 300′, being estimated to show 100,000 tons of ore, which seems high. The other mines carry silver-lead ores, mainly auriferous, ranging in tenor from 20 to 45% lead, 10 to 50 oz. silver and $2 to $5 gold per ton. The mines have extensive openings, but were not developed in a systematic manner, by the former owners, having been opened in the Seventeenth Century, and, until taken over by present company, July, 1906, had been worked, from circa 1850, in a small way, by local owners, the mines being operated exclusively by hand-power, with malacates, and the ores reduced in adobe smelters.

Equipment includes a 30-h. p. producer gas engine, with malacates used at different mines for hoisting, and stoping is entirely by hand. Buildings, about 20 in number, mainly of timber and adobe, include a 20x20′ carpenter-shop, 50x60′ machine-shop and 20x25′ smithy.

The concentrator, of wood and iron, of 60 tons daily capacity, has a 14x17″ Dodge crusher, 2 pairs of rolls, 3 New Century jigs, 2 Standard concentrating tables and settling tanks.

The smelter, at Chalchihuites, is 2 to 12 miles from the various mines, receiving ores by burros and wagons. Equipment of the smelter includes 7 brick stall calciners, a 10-ton reverberatory furnace and 40-ton and 50-ton water-jacket blast-furnaces, latter working interchangeably on lead and copper ores. The smelter has circa 125 tons daily capacity, product being mainly lead-silver bars, with some copper matte averaging about 45% copper, 180

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oz. silver and 2 oz. gold per ton, sent to the Aguascalientes smelter for refining. The works do a general custom smelting business.

The company, in its short career, has met with a variety of misfortunes, becoming involved in legal difficulties upon the completion of its smelter. These were adjusted, temporarily, in September, 1906, but in June, 1907, new troubles arose, and were adjusted February, 1908, leaving the company free from debt, and in full legal possession of its properties, but without working capital for resumption.

NATIONAL SMELTING & REFINING CO. **NEW MEXICO.**

Dead. Formerly at Lordsburg, Grant Co., N. M. Described Vol. V.

NATIVE COPPER CO. **MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. Mine office: Delaware Mine, Keweenaw Co., Mich. M. Augustus O'Neil, president; F. W. Morandi, secretary and treasurer. Lands, 480 acres, being the South ½ of Section 3 and Northeast ¼ of Section 10, Town 58 North, Range 30 West. A little work was done on a fissure vein crossing the ashbed, 1852-1855, company levying assessments of about $39,000. Since idle.

NATIVE COPPER MINING CO. **NEVADA.**

Office: Reno, Nev. Mine office: Yerington, Lyon Co., Nev. Benj. Curler, president; H. Pennington, vice-president; Sophia Knox, secretary and treasurer; preceding officers, John Pothoff, Theresa Pennington and F. B. King, directors. Organized under laws of Nevada, with capitalization $500,000, shares $1 par. Lands 3 miles west of Yerington, said to be near the Bluestone, are claimed to have an 8′ vein, carrying auriferous and argentiferous copper ore, with free gold, opened by 3 short tunnels, longest, 185′.

NATIVE COPPER MINING CO. **NEW MEXICO.**

Dead. Succeeded, 1907, by Native Copper Mining & Smelting Co. Formerly at Hanover, Grant Co., N. M.

NATIVE COPPER MINING & SMELTING CO. **NEW MEXICO.**

Office and mine: Hanover, Grant Co., N. M. Organized 1907, under laws of New Mexico, with capitalization $5,000,000, as successor of Native Copper Mining Co.

SOCIEDAD MINERA NATIVIDAD. **PERÚ.**

Mine office: Morococha, Junín, Perú. Nicholás Azalia, manager; Manuel Quintana, superintendent. Employs 114 men. Organized 1895, under laws of Perú. Lands, 4 pertenencias, showing a vein with northeast and southwest strike, opened by a 360-meter tunnel, with upper workings practically barren, succeeded below the barren zone by very evenly mineralized ore that is mainly chalcopyrite and tennantite, associated with pyrite. For first 9 years of operation, average smelter returns were 21.65% copper and 530 grams silver per metric ton, with a total production of 2,988,300 kilograms fine copper, and 7,304 kilograms fine silver. Production, 1904, was circa 2,400 metric tons of 20% ore, yielding 1,058,108 lbs. fine copper.

NAUMKEAG MINING CO. **MICHIGAN.**

Office and mine: Houghton, Houghton Co., Mich. Thos L. Chadbourne, manager. To Dec. 31, 1871, old company of this name had levied assessments of $20,000. Lands, 400 acres, being the N. ½ of Section 3, and the N. ½ of SE. ¼ of Section 3, Town 54 North, Range 34 West. Has a 112′ shaft, sunk circa 1870, since idle, until 1907, when diamond drilling was begun. Property is so located that it should carry the southern extension of the Pewabic lode of the Quincy.

NAVERSBERG FALUN COPPER MINES & WORKS, LTD. **SWEDEN.**

Office: 25-35 New Broad St., London, E. C., Eng. Mine office: Falun, Dalarne, Kopparbergslän, Sweden. J. Lee, chairman; R. W. Blackburn,

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secretary. Organized July 5, 1907, under laws of Great Britain, with capitalization £100,000, shares £1 par, in 20,000 A shares and 80,000 B shares; issued, £5,200, in A shares. Production, 1902, under old ownership, was 361,800 kilograms of low grade copper matte.

NAVY GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Orient, Ferry Co., Wash.

NEEDLES EYE COPPER MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Needles, San Bernardino Co., Cal. Organized May, 1907. Lands, 11 claims, circa 7 miles from Needles, having a 100′ shaft, said to show a little good ore. Company apparently had claims also in Dulzura, Rawhide and other mining camps in the southwest. Apparently organized mainly to sell stock:

NEEDLES SMELTER. **CALIFORNIA.**

Owned by Arizona-Mexican Mining & Smelting Co.

NELSON COPPER FIELDS, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Nelson, Kootenay district, B. C. Described Vol. VII.

NELSON COPPER MINING CO. **NEVADA.**

Dead. Formerly at Amos, Humboldt Co., Nev.

NELSON COPPER SYNDICATE, LTD. **BRITISH COLUMBIA.**

Mine office: Nelson, Kootenay district, B. C. Organized January, 1905, under laws of British Columbia, with capitalization $10,000, shares $100 par. Idle and apparently moribund.

MINAS DE COBRE DE NERVA, S. A. **SPAIN.**

Office: Madrid, Spain. Mine office: Valverde del Camino, Huelva, Spain. Sr. Don Andres Mellerdo, president; Marquess de Portago, vice-president; R. Sanchez Ocaño, secretary; J. J. C. Fernan, general manager; Chas. Hansen, smelter superintendent. Organized April, 1907, under laws of Spain, with capitalization 20,000,000 pesetas, in 250,000 shares of 50 pesetas par, fully paid, and 15,000 shares of 500 pesetas par in deferred stock. Dividend rate is 4% for 3 years on the preferred shares. Company reports three dividends, of 2 pesetas each, for three half-years ending Dec. 31, 1907, amounting to 750,000 pesetas.

Lands, formerly held by Arenillas Copper Mines, Ltd., which was liquidated May, 1904, include the Chaparrita group, in the commune of Nerva, and the Ratera group, 8 kilometers from a railroad station. Company reports that its ores are cupriferous pyrites, averaging 3.5% copper, which estimate is considered excessive. Company reports steam plants of 250 h. p. at the mines and 400 h. p. at the smelter.

The company reports a 300-ton smelter, 2 miles from the mine, receiving ore by rail, having 2 water-jacket blast-furnaces, with a converter department having one stand, turning out blister copper of 98% tenor, carrying small quantities of silver, the works doing custom smelting also.

The company reports that its mine is served by its own 5-mile branch railroad, to Buitron. The company reports that production for 1906 was nil, but says nothing about production for later years.

The prospectus issued by this company, or by some other person interested in pushing its shares, was most misleading. The compiler of the prospectus in question secured, presumably by accident, a photograph of the village at the mines of the Compañía del Castillo de las Guardas, showing a hospital, etc., and printed a reproduction of this photograph in the prospectus, but the Castillo de las Guardas mines are 150 kilometers from La Ratera. The same careless compiler of prospectii also secured a photograph showing the shipping facilities of the Sotiel Coronada mine, instead of the Nerva, and this also appeared in the prospectus. Under these circumstances, and because

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of excessive capitalization, the company is viewed with suspicion, notwithstanding the fact that its president is a senator of the Spanish Cortes, and its vice-president a member of the Spanish grandezza.

NEST EGG GOLD & COPPER MINING CO. **NEVADA.**

Office: 402 Majestic Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. David J. Reed, president; E. B. Henderson, vice-president; Albert L. Hiller, secretary and treasurer; preceding officers, Dr. C. S. Roberts and Geo. A. Huestiss, directors. Organized under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands include the Portland group, 6 claims, area 440 acres, in the Ely district, and 2 claims in the Bullfrog district, and company is said also to have claims near Searchlight. Cannot be learned that any work is in progress, and company apparently was promoted mainly to sell shares.

O. NEUMANN & CO. **CAPE COLONY.**

Mine office: O'okiep, Little Namaqualand, Cape Colony. Did some development work on copper lands, circa 1903. Presumably idle.

NEVADA BELL COPPER MINING & REDUCTION CO. **NEVADA.**

Dead. Formerly at Lovelock, Humboldt Co., Nev. Fully described Vol. VI.

NEVADA BLACKHORSE MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Black Horse, White Pine Co., Nev. Organized circa April, 1907. Idle and apparently moribund.

NEVADA-BONANZA COPPER CO. **NEVADA.**

Office: care of Freeman Morningstar, president and general manager, Salt Lake City, Utah. Mine office: Aurora, Esmeralda Co., Nev. Lands, 15 claims, shortly west of the Ludwig mine, showing ore assaying 5 to 15% copper and $4.15 gold per ton.

NEVADA-BRITON MINING CO. **NEVADA.**

Office: care of Alfred Fletcher, president, Leeds, Eng. Letter returned unclaimed from former mine office, Golconda, Humboldt Co., Nev. J. W. Walker, general manager; Wm. F. Fletcher, secretary. Capitalization $1,000,000, shares $1 par. Lands, sundry claims, known as the Chief of the Hills group, in the Cherry Creek district, west of the Adelaide Star Mines, Ltd. Idle.

NEVADA BUNKER HILL MINING CO. **NEVADA.**

Office: Elko, Nev. Mine office: Bullion, Elko Co., Nev. Employs 8 men. L. H. Johnson, president; W. W. Booker, vice-president; Frederick Davis, secretary and general manager; John Henderson, treasurer; preceding officers, John Zelch and Chas. E. Van Barneveld, directors. Organized Apr. 28, 1905, under laws of Navada, with capitalization $2,000,000, shares $1 par.

Lands, 20 claims, area circa 320 acres, 10 miles from a railway and about 28 miles south of Elko, showing argentiferous and auriferous copper, lead, zinc and iron sulphides. Has a 15-h. p. gasoline air-compressor. In 1907 shipped 372 tons of ore to Salt Lake smelter, securing therefrom average returns of circa 6% copper, 12% lead, 6% zinc and 20 oz. silver per ton. Company plans continuous development and production.

NEVADA-CALIFORNIA PROSPECTING CO. **CALIFORNIA & NEVADA.**

Letter returned unclaimed from former office, Hall St., Goldfield, Nev. Mine office: Greenwater, Inyo Co., Cal. Robt. T. Todd, president; Milton M. Detch, vice-president; T. F. Carney, treasurer; J. B. Hainer, secretary; preceding officers, Lewis W. Aubury, N. M. Willett and Leonard Merrell, directors. Organized under laws of Nevada, with capitalization $240,000, shares $240 par. Lands, 27 claims, circa 30 miles west of Goldfield, 6 claims in the Tule district, and 10 claims in the Greenwater district. Presumably idle.

NEVADA CALUMET COPPER MINING CO. **NEVADA.**

Office: 52 Journal Bldg., Boston, Mass. Mine office: Buckskin, Lyon Co.,

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Nev. John D. Kazar, president and general manager; Francis E. Higgins, vice-president; John O. Brigham, secretary; Chas. E. Hayes, treasurer; preceding officers, Arnold Schaer, Henry A. Stearns, Thos. Malcolm, Geo. W. Dryden and Wm. E. Blanchard, directors; Philip J. Stacey, superintendent; Arthur Prill, engineer. Organized May 4, 1907, under laws of Arizona, with capitalization $200,000, shares $5 par.

Lands, 22 claims, unpatented, area circa 440 acres, 6 miles northeast of Buckskin and circa 10 miles northwest of Yerington, showing diorite, porphyry and silicious limestone, carrying 3 contact deposits with gossans estimated as averaging 12′, 30′ and 40′ in width, and traceable 500′ to 1,200′, of which two, under development, opened by vertical shafts of 60′ and 200′, show cuprite, malachite, chalcocite and chalcopyrite, giving assays of 4 to 6% copper and $5 to $8 gold per ton.

Equipment includes two 25-h. p. gasoline hoists, good for 600′ each and 5 mine buildings, including a 20-room boarding house. Company plans continuous development and deepening both shafts to 500′. While no great quantity of ore has been developed as yet, the cappings are wide and promising, and if the company continues development, its prospects of finding a mine are considered fair.

NEVADA CARBONATE COPPER MINING CO. **NEVADA.**

Letter returned unclaimed from former office, Globe, Ariz. Mine office: Siegel, White Pine Co., Nev. D. A. McCarthy, president and treasurer; A. J. Rieman, vice-president; M. E. Brooke, secretary. Organized Oct. 10, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 120 acres, adjoining the Vulcan, having a 33′ tunnel.

NEVADA CENTRAL COPPER CO. **NEVADA.**

Office: 157 Michigan Ave., Chicago, Ills. Mine office: Palisade, Eureka Co., Nev. Col. Chas. Lay, president; Geo. W. Leighton, vice-president; Robt. L. Benson, secretary and treasurer; preceding officers, Wm. Andrews, Jos. D. Wright, John A. Saull and Edwin L. Wilson, directors. Organized under laws of District of Columbia, with capitalization $1,000,000, shares $10 par, in $750,000 preferred non-cumulative 7% stock and $250,000 common stock.

Lands, 10 claims, area 200 acres, in the Antelope district, on the western slope of the Sulphur Mountains, opened by a 130′ shaft, showing ore said to give average assays of 21% copper. There is some litigation over titles, but company seems likely to win out. Property formerly was held by Whalen Consolidated Copper Mining Co., for which Wm. Whalen, while president, secured large sums, but did little work. Whalen eventually was driven out by shareholders, but not until he had destroyed the standing of the company, so that it went to pieces in 1903. Whalen is in prison at San Quintin, California, sentenced to 10 years for swindling women of Sacramento and Minneapolis out of about $8,000, on alleged gold mines at Alpha, this being Whalen's second sentence, as he served 5 years in the Missouri penitentiary. The company has taken action in the Federal courts against Davies and others. The company seems to be making a brave fight against considerable odds. Only development work was in progress at last accounts.

NEVADA CENTRAL GOLD & COPPER CO. **NEVADA.**

Mine office: Pioche, Lincoln Co., Nev. R. D. Montgomery, secretary and treasurer; L. F. Peer, manager. Lands adjoin the Nevada Horn Silver Mining Co., in the Bristol district, and property was under development at last accounts.

NEVADA CHAMPION COPPER CO. **NEVADA.**

Office: care of J. C. McCormick, president, Goldfield, Nev. Mine office: Mina, Esmeralda Co., Nev. E. J. Amann, vice-president; C. M. Miller, secretary; F. M. Dorsey, treasurer; J. F. Meikle, general manager; preceding

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officers and A. E. Beetles, directors; Geo. Oswell, superintendent. Organized circa February, 1907, under laws of Arizona, with capitalization $500,000, shares $5 par.

Lands, 7 claims, area 130 acres, 9 miles northwest of Mina, carrying a 6′ to 25′ contact deposit between limestone and quartzite. Has a 400′ three-compartment shaft, planning to be sunk to 700′, and about 15 other shallow shafts, pits and tunnels, showing ore assaying 3.7 to 11.2% copper and up to 6 oz. silver per ton. Sulphides were encountered at depth of circa 300′. Has considerable ore on the dumps, ranging 2 to 3% only in copper tenor. Is claimed to have contracted to furnished 100,000 tons of ore to a new smelter, but developments scarcely seem adequate to warrant such a contract.

NEVADA-COLORADO COPPER CO. **NEVADA.**

Office: Colorado Springs, Colo. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Lands, 19 claims, near the Ludwig, said to have been bought for circa $30,000. Idle.

NEVADA-COLORADO GOLD & COPPER MINING CO. **COLORADO & NEVADA.**

Office: care of B. Ross, general manager, Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. Grant L. Hudson, president; Ben K. Duffy, vice-president; Robt. H. White, secretary. Capitalization, supposedly $3,000,000, shares $1 par. Lands, 7 claims, on Chicago Mountain, near Idaho Springs, and 10 claims and a millsite in the Walker Lake district of Nevada. The Colorado property has a 200′ tunnel. Early 1908 was developing Colorado properties only.

NEVADA-COMMONWEALTH MINING & MILLING CO. **NEVADA.**

Office: 502 Hall Bld., Kansas City, Mo. Mine office: Galena, Lander Co., Nev. J. B. Hamner president; W. F. Miller, secretary and treasurer; C. W. Clapp, general manager; Jas. W. Boileau, engineer. Organized 1906, under laws of Arizona, with capitalization $10,000,000, shares $1 par, practically all issued.

Lands, 20 claims, 1 patented, area circa 400 acres, also a 12-acre millsite, showing 8 ore bodies, reported as fissures in andesite and as contact deposits, of 35′ average width, of which 3, under development, are said to carry an average of 1% copper, 4% lead, 5% zinc, 60 oz. silver and 60 cents gold per ton. A new ore body showing chalcopyrite, with occasional bornite, is said to give average assays of 6% copper and up to 170 oz. silver and $18 gold per ton.

Development is by a shaft of 500′ and by tunnels of 600′, 800′ and 1,550′, with about 5,000′ of workings, estimated to show 800,000 tons of ore, with about 500,000 tons blocked out for stoping, which estimates are excessive. Ore is argentiferous and auriferous antimonial arsenical copper, lead and zinc sulphides, badly mixed for either milling or smelting purposes.

Equipment includes a 200-h. p. water plant, with a Pelton wheel, and several mine buildings.

The mill, 70x150′, of wood, rated by company as of 300 tons daily capacity, has a 9x16″ Blake crusher, 4 rolls, 4 jigs, 4 Wilfley tables and 4 buddles, the rating of the mill seeming excessive.

The mine shipped, 1907, some ore of 6 to 7% copper tenor, and has about 8,000 tons of low grade ore on the dump. At present values are mainly in lead and silver, with indications of increasing copper values at depth. Idle, owing to low price of metals, and need of additional equipment, but management hopes for an early resumption.

NEVADA CONSOLIDATED COPPER CO. **NEVADA.**

Office: City Investing Bldg., New York, N. Y. Mine office: Ely, White Pine Co., Nev. Jas. Phillips, Jr., president; Silas W. Eccles, vice-president;

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G. M. Borden, secretary; preceding officers, W. Hinckle Smith, M. L. Requa, Col. Chas. Hayden, Wm. B. Thompson, F. W. Hills and J. K. MacGowan, directors; Pope Yeatman, general manager; Jos. Gazzam, local manager; Thos. W. Cox, general superintendent; E. F. Gray, mine superintendent; Peter B. McCracken, chief engineer.

Organized Nov. 17, 1904, under laws of Maine, as a merger of the Boston & Nevada Copper Co. and White Pine Copper Co., with capitalization $5,000,000, shares $5 par, increased, Feb. 5, 1908, to $8,000,000, shares $5 par, increase being made to provide for retirement of a $3,000,000 issue of first-mortgage 6% convertible gold bonds, dated Apr. 1, 1908, due April, 1918, convertible into shares, at any time prior to Apr. 1, 1913, on the basis of $10 per share, and redeemable, by company, at par, on one month's notice. Ended fiscal year Sept. 30, 1908, with $793,940 in cash and call loans, with $178,152 in accounts payable, and expenditures, to that date, aggregated $4,481,208. Stock is listed on the Boston Stock Exchange and New York Produce Exchange. Boston Safe Deposit & Trust Co., transfer agent. Annual meeting, first Tuesday in November.

The Nevada Consolidated is controlled by the Guggenheim interests, through their control of the American Smelting & Refining Co., through control by latter of the American Smelters Securities Co., which controls the Nevada Consolidated Copper Co., through the ownership of 51% of the stock issue.

The company controls, through stock ownership, the Nevada Northern Railroad, circa 90 miles in length, running from Ely to Cobre Station, on the Southern Pacific Railway. Company also owns a half interest in the Steptoe Mining & Smelting Co., and a large share interest in the Cumberland-Ely, the par value of stock held in subsidiary companies, Sept. 30, 1908, being $4,848,500. The company's financial arrangements with the subsidiary and affiliated companies are not as clear as might be desired, and the reason for some of the juggling with shares and bonds, between the Nevada Consolidated, Cumberland-Ely and subsidiary corporations, is not readily apparent.

Lands, 63 claims, partly patented, area circa 850 acres, being the Eureka group of 27 claims and the Ruth group of 36 claims. The company took over the Chainman property, but surrendered it later.

Lands include properties formerly held by White Pine Copper Co., New York-Nevada Copper Co., and sundry other corporations and individuals. The company also owns the Georgetown Ranch, area circa 320 acres, including available water-rights on Murray Creek, which carries a flow of 4,000,000 gallons daily, assuring an ample water supply.

The company's mineral lands show an outcrop of gray sintery quartz, carrying occasional copper carbonates. One portion of the tract shows an extreme width of 2,000′ of these croppings, below which, at a depth of circa 300′, are found low-grade ores in the original plutonic quartz-porphyry, the ground above being quite thoroughly leached. The upper workings show melaconite and chalcocite, changing at depth to sulphides, mainly disseminated chalcocite, with some chalcopyrite, associated with pyrite, in fine seams, and as a coating of the gangue rock, also occurring as speiss, disseminated through the rock-mass. The ore body is without defined walls, the entire country rock being impregnated by ore to a greater or less extent. The mine water is strongly impregnated with copper, causing trouble with pumps and pump-columns. Estimates of ore in sight vary greatly, but the tonnage is enormous. It was estimated, November, 1907, by Mr. Yeatman, a competent authority, that the mine had in sight 14,432,962 tons of ore averaging 2% copper, with combined gold and silver values of circa 15 cents per ton, and, at the end of 1908, the mine had blocked out nearly or quite 20,000,000 tons of ore.

The Ruth group includes the Ruth and Star Pointer mines, operated as a

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unit, the mines being connected by a 2,700′ tunnel, with an extensive electric haulage system, with practically all hoisting done through the Star Pointer shaft. It is planned to use the caving system in the Ruth mine, as the ore is soft and can be broken cheaply. The Ruth has an incline shaft of circa 640′ depth, showing large bodies of low and medium grade ore, with a marked tendency toward decreased values at depth, leading to the opinion that the shaft may have reached the bottom limit of payable ore. Mr. J. Parke Channing estimated this mine, in 1905, to show 2,400,000 tons of ore, averaging 2.6% copper, 0.05 oz. silver and 0.02 oz. gold per ton, and the ultimate amount of ore available in the Ruth obviously will be much greater than the original estimate. Surface improvements at the Ruth include an engine-house, boarding-house, office, stable and numerous dwellings.

The Star Pointer mine has a mammoth 4-compartment shaft, of 3,500 tons estimated daily capacity. This great shaft has a timber compartment 9′ in the clear, handling loaded timber cars on cages. The shaft has a 140′ steel headgear, on concrete foundations, perhaps the largest in the world, and the equipment includes a crushing plant.

The Eureka mine, or group of mines, shows ore of somewhat lower average value than the Ruth group, though in larger tonnage, careful sampling of which, in 1905, gave average assays of 3.2% copper, 0.03 oz. silver and 0.02 oz. gold per ton. This group has 2 shafts, one being the Eureka, with vertical depth of 400′, bottomed in poor ore, the other shaft being known as the Star of the West, but the Eureka group is being worked open-cast, by steam-shovel. The ore is very soft, but requires blasting, and holes of 50′ to 670′ depth are drilled for the explosives, each blast breaking tremendous quantities of ground. There are five 95-ton steam-shovels, with dippers of 2½ cu. yds. capacity, to be replaced by shovels with dippers of 5 cu. yds. capacity. In November, 1908, in one day, there was removed, by steam-shovels, 9,680 tons of overburden and ore, of which circa 3,500 tons was ore. It is probable that the Eureka group has little less than 20,000,000 tons of ore in sight, with every prospect of a much larger tonnage eventually.

Ore is milled and smelted by the Steptoe Mining & Smelting Co., a subsidiary corporation, the works of which are separately described, under the title of that company.

The Nevada Northern Railway Co., controlled by the Nevada Consolidated Copper Co., has a standard-gauge line of circa 90 miles length, running from Ely to a junction with the Southern Pacific Railway at Cobre Station, 3 miles east of Toano. Capitalization of the railway company is $3,000,000, with a $1,000,000 bond issue, at 5%. This line does a large general business, in addition to handling the traffic of the Nevada Consolidated and affiliated companies.

Production for 1908, begun early in the year, was circa 20,000,000 lbs. jointly, for the Nevada Consolidated and Cumberland-Ely, of which the Nevada Consolidated had a major portion, and for August, 1908, the Nevada Consolidated produced 785,766 lbs. fine copper. For September, 1908, the company produced circa 46,000 tons of ore, putting about 12 into 1, ore assaying 2.7% copper and yielding an actual extraction of 69.3% of the assay values. The company hopes to make circa 25,000,000 lbs. fine copper in 1909, and eventually production should be much larger. Finished product is handled by the American Smelting & Refining Co., on a 1% commission basis.

The Nevada Consolidated is a property of the first magnitude, and mining costs are said to be as low as 40 cents per ton, for steam-shovel ore. The property has not been developed as rapidly as was anticipated at the time of organization of the company, but the work has been well done, and there is no question about the great future of the mine.

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NEVADA CONSOLIDATED COPPER & GOLD MINING & MILLING CO. NEVADA.

Dead. Formerly at Yerington, Lyon Co., Nev. Described Vol. VI.

NEVADA CONSOLIDATED EXTENSION CO. NEVADA.

Office: 475 Broadway, New York, N. Y. Mine office: Ely, White Pine Co., Nev. Organized circa 1907, under laws of Arizona, with capitalization $1,000,000. Presumably idle.

NEVADA CONSOLIDATED MINES, LTD. NEVADA.

Dead. Reorganized, circa 1907, as Philadelphia Searchlight Gold & Copper Mining Co. Formerly at Searchlight, Lincoln Co., Nev.

NEVADA CONSOLIDATED MINES & SELLING CO. NEVADA.

Office: 316 Lick Bldg., San Francisco, Cal. Alex Brown, president; Chas. L. Newton, vice-president; F. G. Carey, treasurer. Lands are said to be on Cat Creek, in Esmeralda county, Nevada, and company claims over 4,000′ of workings, which seems doubtful, and is said to plan a 100-ton concentrator. Officers are said to stand well, but the company's advertising is not liked.

NEVADA CONSOLIDATED SMELTING & REFINING CO. NEVADA.

Letter returned unclaimed from former office, 201 Exchange Bldg., Denver, Colo. Works office: Pioche, Lincoln Co., Nev. Wm. Gelder, manager. Was practically a subsidiary corporation of the Bristol Copper Mining Co., since reorganized, and stock is said to have been furnished gratis to shareholders of the latter. Property is a 200-ton smelter and a 22-mile narrow-gauge railroad. At last accounts was in debt and moribund.

NEVADA COPPER CO. NEVADA.

Office: 372 Bullitt Bldg., Philadelphia, Pa. Operating office: Tonopah, Nev. Mine office: Mina, Esmeralda Co., Nev. John W. Brock, president; Chas. R. Miller, vice-president; C. A. Higbee, secretary and treasurer. Lands, near the Blue Light mine, include the Dunlap property. Company declined to furnish a statement, September, 1908, and presumably is idle.

NEVADA COPPER CO. NEVADA.

Office and mine: care of W. K. Robinson, secretary, Goldfield, Esmeralda Co,. Nev. Organized 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 4 claims, including the Blue Jay and Gold Coin, circa 12 miles northwest of Goldfield, said to show argentiferous cuprite averaging 20% copper. Presumably idle.

NEVADA COPPER CO. NEVADA.

Dead. Merged, 1902, in Nevada Bell Copper Mining & Reduction Co. Formerly at Lovelock, Humboldt Co., Nev. Described Vol. II.

NEVADA COPPER CO. NEVADA.

Mine office. Sandy, Lincoln Co., Nev. N. M. McFatridge, president. Lands, 13 claims, showing an auriferous copper vein, assaying up to 32% copper and $20 gold per ton, paralleled by a silver-lead vein, showing gross assay values up to $150 per ton, opened by a 90′ shaft. A small smelter shipment, circa 1906, to El Paso, gave returns of 50% copper, with gold and silver values. Idle.

NEVADA COPPER CO. NEVADA.

Mine office: Yerington, Lyon Co., Nev. Lands are said to show a vein of 60′ to 100′ width, opened by a 330′ main shaft. Company is said to hold the old Boston & Nevada smelter, across the river from Yerington. Idle and apparently moribund.

NEVADA COPPER CO. NEVADA.

Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized, 1906, by residents of Spokane, Washington. Lands were 12 claims, adjoining the Vulcan, said to carry carbonate and sulphide copper ores.

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NEVADA COPPER BUTTE MINING CO. **NEVADA.**

Office: 2376 Mission St., San Francisco, Cal. Letter returned unclaimed from former mine office, Austin, Lander Co., Nev. J. Herbert Reeve, president; A. L. Hanson, vice-president and treasurer; Peter McAuslan, secretary; preceding officers, H. W. Matthews and F. A. Limbaugh, directors. Organized Dec. 18, 1906, under laws of Nevada, with capitalization $500,000, shares 50 cents par.

Lands, 5 claims, area 100 acres, in Trenton Cañon, near Valmy, in the Battle Mountain district, said to show a vein of argentiferous and auriferous copper ore up to 90′ in width, opened by tunnels of 40′, 50′ and 60′, yielding ore assaying up to 11.2% copper, 10 oz. silver and $2.20 gold per ton. Presumably idle.

NEVADA COPPER MINING & SMELTING CO. **NEVADA.**

Office: 806-25 Broad St., New York, N. Y. Mine office: Cuprite, Esmeralda Co., Nev. Col. Oliver P. Posey, president; Hon. W. E. Mitchell, vice-president; W. M. Hoagland, secretary and treasurer; preceding officers, Wm. Bayley, R. F. Stewart and Edwin B. Tustin, directors. Organized Aug. 28, 1906, under laws of Maine, with capitalization $5,000,000, shares $5 par. Owns a controlling interest in the Lida Thanksgiving Gold Mining Co., at Lida, Nev.

Lands, 85 claims, area circa 1,700 acres, in 3 groups, circa 4 miles apart, including the Cuprite group of 50 claims, the Rea group of 20 claims and the Parrot group of 15 claims. Company also owns a townsite. The Parrot group, slightly developed by shafts of 55′ and 70′, is said to show a 12′ vein of ore averaging 10 to 15% copper, which is doubted. Ores are said to carry copper, lead, silver and gold.

Early 1907 the company planned building a 500-ton smelter, and at last accounts was talking of building a smelter at Mina, Gillies, Goldfield, or elsewhere. Financial statement, as of date Aug. 1, 1907, gave total receipts of $303,395, with expenditures leaving a balance of $202,013, mainly in form of bills receivable, and a stockholders' committee has been appointed, to investigate the company, on an accusation of making fraudulent claims. Company is regarded with suspicion.

NEVADA COPPER, PLATINUM & NICKEL CO. **NEVADA.**

Office and mine: Bunkerville, Lincoln Co., Nev. Property is the Great Western group, with about one-fourth mile of openings, said to show ore averaging about 4% copper, 2.5% nickel and one-third oz. platinum per ton. Presumably idle.

NEVADA COPPER QUEEN MINING & MILLING CO. **NEVADA.**

Office: care of Raymond D. Frisbie, fiscal agent, Tonopah, Nev. Letter returned unclaimed from alleged former mine office, Mina, Esmeralda Co., Nev., with notation from postmaster that no such company is known there. Lands claimed were 5 claims, 7 miles northwest of Mina. Is not regarded favorably.

NEVADA DEVELOPMENT CO. **NEVADA.**

Office: 201 Walnut Place, Philadelphia, Pa. Mine office: Lovelock, Humboldt Co., Nev. Theo. H. Lowe, superintendent, at last accounts. Lands are the Copper Glance group and adjoining claims. Idle several years.

NEVADA-DOUGLAS COPPER CO. **NEVADA.**

Office: 60 State St., Boston, Mass. Operating office: 306 Auerbach Bldg., Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. Employs 60 men. J. D. Wood, president; Frank J. Hagenbarth, vice-president; Walter C. Orem, secretary and general manager; Windsor V. Rice, treasurer; Preceding officers, A. J. Orem, H. P. Henderson, E. R. Hastings, Frank A. Schirmer and Arthur L. Pearse, directors; S. S. Arentz, superintendent; C. S. Forbes, engineer. Organized Sept. 4, 1906, under laws of Utah, with capitalization $5,000,000, shares $5 par; issued, $3,750,000. Debentures, $600,000 first

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mortgage 5-year 6% convertible bonds, issued May 1, 1908, convertible into stock on basis of $7.50 per share. Of the 250,000 shares remaining unissued, 80,000 have been set aside for conversion and redemption of bonds. Of the bond issue $500,000 was issued to pay balance due on the Ludwig mine.

Lands, 30 claims, area circa 550 acres, also 80 acres in two millsites, with miscellaneous lands, including water-rights, giving total holdings of circa 700 acres, in the Buckskin district. Property includes former holdings of the Douglas Copper Mining Co. and Ludwig Copper Mining Co. The original group of 11 claims formerly was owned by the Douglas Copper Co., these and adjoining claims, circa 7 miles west of Yerington, lying at an average elevation of one mile above sea-level. The Ludwig group included 2 patented claims and 3 claims formerly in conflict with the Nevada-Douglas. There also is one claim carrying fluxing iron ore, at Buckskin, several miles distant.

The property shows granite-porphyry and wollastonite, carrying fissure veins and contact deposits, and is said to have 3 different intersecting ore systems. The principal ore bodies consist of contact metamorphic deposits, with quartz fissures carrying oxidized ores and cupriferous pyrite, mainly in wollastonite, walls being strongly impregnated with ore. The property shows very strong and promising gossans, the surface carrying low grade oxidized ores of about 2% copper tenor, followed by low grade garnetiferous sulphide ores of circa 3% tenor, and, at depth, by sulphide ores of 5 to 6% copper tenor. At surface and to depth of circa 10′ the property shows oxidized ores and chrysocolla, succeeded by a secondary zone carrying oxidized ores and secondary sulphides. The zone of oxidation and secondary enrichment apparently extends to depth of 500′, giving an ore zone of 100′ to 400′ thickness, in wollastonite, with claimed superficial area of 1,800,000 square feet, or approximately 42 acres, in addition to strong gossans showing elsewhere on the property. The principal ore body is chalcopyrite, associated with pyrite, in granules, in wollastonite. The vein system has a generally meridional strike, with average dip of circa 60°, and the 3 principal veins, of about 20′ average width, are estimated by company to carry an average of 6.5% copper.

The Douglas mine has a number of shallow shafts and open-cuts, in addition to the main workings, which include the 2,500′ Douglas tunnel, planned to cut the main ore body at a vertical depth of circa 600′, and 3 shafts, known as the Sunlight, Double Ess and Amalgamated, latter vertical. The mine as a whole has about 7,500′ of workings, showing large quantities of sulphide ore, with circa 150,000 tons of 3% ore blocked out, latter in the upper levels, with high grade ore ranging 10 to 30% in copper tenor. Ore has been proven to a depth of 700′ below the base of the mountain, and the lower levels show a sulphide ore body ranging upwards of 300′ in length and up to 80′ in width, giving a general average sample of 6.5% copper and 20% iron.

The Ludwig mine, bought June 29, 1907, for a price said to have been $1,000,000, includes 2 claims, on which the mine is opened, and a 40-acre tract in Smith Valley having a well and pumping station. The Ludwig, about one mile northwest of the main workings of the Nevada-Douglas, is developed by a 400′ vertical shaft, work by former owners being poorly planned, but the property was a shipper of small quantities of high grade auriferous and argentiferous ore for some years, production including some very handsome malachite and azurite, a portion of which was sold to lapidaries. The old ore bodies of high grade have been developed more extensively, and new ore bodies have been found, these including both oxidized ores and sulphides, with some carbonate ore assaying up to 25% copper, and a fair showing of chalcocite. The Ludwig mine was opened circa 1865, and was worked, at intervals, for bluestone and high grade copper, having been last reopened 1905.

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Equipment includes four 100-h. p. hoists, good for 1,000′ depth each, and an 18-drill 2-stage belt-driven air-compressor.

The property is operated by electric power, transmitted 20 miles from Como, Nevada, by the Truckee River General Electric Co.

Water is secured from artesian wells in Smith Valley, brought to the mines by a 17,000′ pipe-line.

The properties have 33 buildings, including a 14x16′ machine-shop, 14x18′ smithy, 14x20′ carpenter-shop, all of wood, also a compressor-house, office, laboratory and dwellings.

The nearest railway station is at Wabuska, 20 miles northward, on the Southern Pacific Railway, and the company plans organizing a subsidiary corporation to build a branch railway line. A wagon road has been built from the mine to a point on the Southern Pacific Railway 6 miles west of Wabuska, and transportation is by Best traction engine.

The company plans building a 100-ton smelter, which apparently is a mistaken policy, as the amount of ore already in sight would seem to warrant at least a 500-ton concentrator and a 250-ton smelter, which, in the end, probably would be cheaper, though requiring a much larger initial outlay.

The report of Mr. E. P. Jennings, 1906, estimated that the lands carry 10,000,000 tons of ore averaging 3.5% copper, and that, by expending $175,000 for a railroad, $750,000 for a 1,000-ton mill and $500,000 for a 500-ton smelter, the company should be able to produce 24,000,000 lbs. fine copper yearly, laid down on the Atlantic seaboard at 8.5 cents per pound.

Production, 1906, apparently was circa 300,000 lbs. fine copper, from the Douglas, in addition to a larger output from the Ludwig, then owned independently. In 1906 considerable ore was shipped, under numerous disadvantages, the Ludwig shipping ore returning 10.75 to 18.70% copper. During the last half of 1907 the company produced 1,065 tons of ore, returning an average of 15.3% copper, and yielding 319,748 lbs. fine copper.

The Nevada-Douglas is the leading property of the Yerington district, including practically all of the best ground on the west or Smith Valley side of the mountain. The property has numerous ore bodies, but some exaggerated claims have been made in the press, which were unnecessary, as the mine is sufficiently promising without exaggeration. The property is being developed systematically, and, when given a railroad and reduction works, which are absolutely necessary, should make a large and profitable mine.

NEVADA ELY COPPER CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Organized circa April, 1907, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 7 claims, including the Timberline group of 3 claims and the Copper Bottom group of 4 claims, on which some diamond drilling was done, 1907. Presumably idle.

NEVADA EMPIRE MINE. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Lands, west of Yerington, have been slightly prospected by churn drill. Presumably idle.

NEVADA EXPLORATION & MINING CO. **NEVADA.**

Office and mine: Bingham Canyon, Salt Lake Co., Utah. Organized circa 1907. Lands, 15 claims, near the Eagle Bird Mining & Milling Co. Presumably idle.

NEVADA GOLD & COPPER MINING CO. **NEVADA.**

Dead. Had an office, circa 1903, in the Parrot Bldg., San Francisco, Cal.

NEVADA GOLDFIELD MINING, MILLING & SMELTING CO. **NEVADA.**

Office: 404 Rector Bldg., Chicago, Ills. Mine office: Yerington, Lyon Co., Nev. John H. Reniger, vice-president; W. T. Watson, secretary and general superintendent; T. H. Windsor, treasurer; preceding officers, John E. Harper and Frank L. Wiles, directors. Capitalization $5,000,000, shares $5

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par. Lands, 50 claims, area 995 acres. Company's "conservative" figures claimed millions of tons of ore in sight, with at least 1,000,000 tons of ore in the Home Bee mine, said to assay 6 to 31% copper, but the information must have been obtained by a clairvoyant, as developments do not show the ore. Apparently merely a bit of stock-jobbery, and presumably idle.

NEVADA GREENWATER MINING CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Geo. Jones, superintendent. A Nevada Greenwater Mining Co. was organized November, 1906, under laws of Arizona, with capitalization $2,000,000, by Marius Duvall, Jas. Gleason and T. W. Kendall, and a Nevada Greenwater Mining Co. was organized circa November, 1906, under laws of Arizona, with capitalization $3,000,000, by A. J. Daggs and L. Morgan Darby. Lands, in Willow Creek section of the Greenwater district, are said to show a 16′ vein of 16% ore, which is not true.

NEVADA GREENWATER MINING, MILLING & SMELTING CO. **CALIFORNIA & NEVADA.**

Office: 1118-67 Exchange Place, New York, N. Y. Mine office: Greenwater, Inyo Co., Cal. Wallace H. Hopkins, president; T. H. McInnerney, vice-president; Thos. J. Delahunt, secretary; Maj. L. H. French, managing director. Capitalization $5,000,000, shares $5 par.

Lands, 15 claims, at Greenwater, 5 at Lida, 2 at Tonopah and 2 at Goldfield, with sundry alleged Goldfield leases. The president became an embezzler and fugitive from justice, and the company is considered merely a bit of stock-jobbery.

NEVADA NICKEL & COPPER CO. **NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. Property is the Key West group, said to have about one mile of workings, left by a former owner, said to give average assays of 5 to 6% copper, 2% nickel and 0.3 to 0.5 oz. platinum per ton. Presumably idle.

NEVADA NORTHERN COPPER CO. **NEVADA.**

Dead. Was reorganized, circa December, 1906, as Ely Northern Copper Co. Formerly at Ely, White Pine Co., Nev.

NEVADA NORTHERN COPPER MINING & MILLING CO. **NEVADA.**

Office: 51 Sherman St., Deadwood, S. D. Mine office: Winnemucca, Humboldt Co., Nev. Dr. Jas. A. Ogden, president; C. H. Miller, vice-president; G. S. Harper, secretary; S. T. Arnold, treasurer; J. C. Fuller, general manager; F. W. Barbee, mine superintendent. Organized May, 1907, under laws of South Dakota, with capitalization $1,500,000, shares $1 par; issued, $115,000.

Lands, 17 claims, unpatented, area 340 acres, also a 20-acre millsite, in the Sonora range, 12 miles southeast of Winnemucca, showing 8 contact deposits, of which 4, under development, are reported as of 18′ average width, traceable circa one mile, carrying native copper, oxides, bornite and chalcopyrite, with slate gangue, estimated by company to average 15% copper, 5 oz. silver and $1.50 gold per ton, which figures are excessive. Development is by 10′ and 20′ pits, a 50′ shaft and a 330′ tunnel. Company plans continuous development.

NEVADA-PHOENIX MINING CO. **NEVADA.**

Mine office: Beowawe, Eureka Co., Nev. P. V. Locker, manager. Lands, 22 claims, south of Beowawe, having a shallow 2-compartment shaft and a 300′ crosscut tunnel, showing a 3′ vein said to give average assays of 7.2% copper, 55 oz. silver and $16 gold per ton.

NEVADA QUEEN COPPER CO. **NEVADA.**

Office: care of D. Chisholm, Colorado Springs, Colo. Organized 1906, under laws of Colorado, with capitalization $1,500,000. Presumably is successor of the Nevada Queen Mining Co. Location of lands, if any, unknown.

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NEVADA QUEEN MINING CO. **NEVADA.**

Office: care of J. K. Miller, P. O. Box 1202, Colorado Springs, Colo. Never active and presumably succeeded, 1906, by Nevada Queen Copper Co.

NEVADA SMELTING & MINES CORPORATION. **CALIFORNIA.**

Office: 25 Broad St., New York, N. Y. Mine office: Greenwater, Inyo Co., Cal. Malcolm L. Macdonald, president; M. R. Ward, vice-president; Arthur W. Joseph, treasurer; H. L. Fridenberg, secretary; Chas. Kirchen, general manager. Organized June, 1906, under laws of South Dakota, with capitalization $5,000,000, shares $5 par. Lands include copper claims at Greenwater and gold claims at Kawich, Reveille and elsewhere in Nevada. Idle at last accounts.

NEVADA UNITED MINING CO. **NEVADA.**

Office: 51 Wall St., New York, N. Y. Mine office: Lovelock, Humboldt Co., Nev. Oliver G. Jennings, president and treasurer; Louis J. Merkel, vice-president; David R. Foster, secretary; John T. Reed, general manager; preceding officers, Geo. Lowther and John G. Gillig, directors. Organized May 1, 1906, under laws of Arizona, with capitalization $200,000, shares $1 par; issued, $145,000.

Lands, 33 claims, partly patented, area circa 500 acres, also a 68-acre millsite, in the White Cloud district of Churchill county, Nevada, showing mainly limestone, with 2 ore zones, having gossans of cupriferous hematite, carrying oxidized ores in the gossan, and sulphides at depth.

Development is by shafts of 40′, 60′, 70′ and 120′, and by 5 tunnels, longest 2,000′, with circa 4,000′ of workings, estimated to show 10,000 tons of ore, with 1,000 tons blocked out for stoping. Property was worked, 1871-1873, and again 1890-1895, and was reopened, 1906, by present management.

Equipment includes a 160-h. p. steam plant, with hoist good for 750′ depth, and a 4-drill Ingersoll-Rand air-compressor. There are 10 mine buildings, and an antiquated smelter having a 30-ton Fraser & Chalmers water-jacket blast-furnace, of no present value. Company plans continuing exploratory work, and adding new equipment as development will justify.

NEVADA-UTAH MINES & SMELTERS CORPORATION. **NEVADA & UTAH.**

Office: 100 Broadway, New York, N. Y. Mine offices: Pioche, Lincoln Co., Nev., Cactus, Beaver Co., Utah, and Bingham Canyon, Salt Lake Co., Utah. Geo. E. Learnard, president; Dr. L. R. Loomis, vice-president and manager; Frederick F. Burgin, treasurer; preceding officers, John W. Griffs and Heman Dowd, directors; Millard W. Baldwin, clerk; Morris D. Kirk, superintendent Bingham property. Organized 1904, under laws of Maine, with capitalization $7,500,000, increased later to $15,000,000, shares $10 par. On June 10, 1907, company took over the Imperial Gold & Copper Mining Co., of Beaver county, Nevada, and the Manhattan Copper & Gold Mining Co. and Pioche Consolidated Mining Co., two latter of Pioche, the Pioche Consolidated having been bought at a price said to be $425,000, less 7.5% cash discount. Debentures, $1,000,000, in registered 5-year 6% gold bonds, due Sept. 1, 1909, convertible, at option of holders, into common stock, at par. Is said to have circa 12,000 shareholders.

Landed holdings are extensive and valuable, but definite statements regarding same have not been secured, despite repeated efforts. The company once held options on various properties, including the Montreal, in Beaver county, Utah, which apparently were not exercised.

Landed holdings include property formerly held by the Pioche Consolidated, which had 38 claims, of which 33 were patented, also 51 town lots and 1,528 acres miscellaneous lands.

The Pioche mine, which was a good silver-lead property, circa 1870-1876,

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and which was closed down 1893, is popularly credited with a past production of $20,000,000 in gross value. The May Day mine of this property has a 1,100′ shaft, and there are 2 old shafts on the Yuba mine, an adjoining property, also the 400′ Meadow Valley No. 5 three-compartment incline shaft. The old Independence shaft is said to show a 40′ body of sulphide ore between the third and fourth levels. There is a 700′ Leschen aërial tram from the May Day shaft to the ore-bins on the company's private railway, running from the mine to Pioche. The Pioche has a good mining equipment.

The Half Moon group of 6 claims, area 42 acres, lies circa one and one-half miles west of Pioche.

The Manhattan mine, in the Pioche district, is supposed to be owned by this company, but apparently is idle.

Company's holdings in the Jack Rabbit district, 15 miles west of Pioche, are 5 patented claims, area 115 acres, including the Day and Onondaga mines. The Day mine has a tunnel, completed late 1908, with a back of 1,300′, showing ore said to assay up to 2.5% copper, 217 oz. silver and 0.06% gold.

The Imperial group, which includes the Comet mine, area 400 acres, lies near the Horn Silver, Cactus and Majestic mines, in Beaver county, Utah. The Imperial group, developed by tunnels, has carbonate ores above and sulphides at little depth, ore being claimed to average circa 3% copper, 15% lead, 18 oz. silver and $9 gold. Ore is mainly of concentrating grade, but considerable ore has been shipped to smelters, from time to time. The Comet mine, a single claim, adjoining the Cactus, undoubtedly carries a continuation of the Cactus ore bodies of the Newhouse Mines & Smelters. The Comet has a single shaft of circa 300′ depth, in a gossan carrying about 1% copper, and company planned beginning crosscutting on the 300′ level. The former management figured on 3.5% copper ore in the Comet, which carries ore mainly of concentrating grade, with values in copper, silver and gold. The adjoining Cactus mine is opened by a 6,000′ tunnel, and the development of the Comet would necessitate an even longer tunnel, or an extensive aërial tram.

The Last Chance mine, 13 claims, area 115 acres, formerly owned by the New England-Utah Mining Co., lies between the Highland Boy and United States, southwest of the Boston Consolidated, in the West Mountain district of Utah, and shows fissure veins and contact deposits of 3′ to 50′ width, carrying fair values in copper, lead, silver and gold, with values mainly in silver and lead. The principal ore body is said to have produced circa $1,250,000 in ore values. Development is by tunnels of circa 7,000′ aggregate length, with about 2 miles of workings.

The Last Chance has a mill of 125 tons rated daily capacity, in commission February, 1907, which, a few months later, was producing about 5 tons daily of concentrates averaging circa 10% lead and 70 oz. silver per ton. The mill was closed October, 1907. The Last Chance is well located, and is considered promising.

The Jack Rabbit group is connected with Pioche by a 20-mile narrow-gauge railway, and Pioche is connected with the San Pedro Railway by a 28-mile branch line, known as the Caliente & Pioche, completed 1907, toward the construction of which the company is said to have advanced $80,000, to apply on first freights.

There is an old smelter, with 2 small furnaces, about a mile from Pioche, owned by the company, but this is antiquated in design and equipment, and of small present value. It was claimed, July, 1907, that the Nevada-Utah might buy the reduction plant of the Consolidated Arizona Smelting Co., at Humboldt, Arizona, but it is difficult to see how a smelter in Yavapai county, Arizona, could be of any particular value to the mines of this company in Utah and Nevada.

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The standing of the company has been greatly injured by its connection with the notorious Thos. W. Lawson, who concocted a very clever scheme, in connection with the rigging of the stock market, in March, 1907. On Feb. 28, 1907, Lawson advertised, at heavy cost, that he was planning taking up Nevada-Utah, and, by clever manipulation, strung along the speculators for two weeks, but, on March 13, announced that he was through with the property, as it was not as represented, following this statement with another that he, himself, would double the market price, or thereabouts, to help out the speculators, and, of course, unloaded his holdings. The stock was sold mainly to street hawkers, newsboys, bar porters, scrubwomen and other unfortunates of similar caliber, who comprise the bulk of Lawson's following. These, as a rule, were wiped out completely, and the profits accruing doubtless went to the virtuous Lawson. The company states that Lawson took an option on a large amount of its stock, and allowed the option to lapse, this being the company's version of its connection with this malodorous campaign.

Apparently it was predicted by President Learnard that at the end of 1908 the Day mine would be producing daily 250 tons of silver-lead ore, netting the company $45,000 per month. Apparently only the Day mine is being worked at present. Forces were greatly reduced, October, 1907, owing to the slump in the metal market. The property includes several mines of promise, but, on account of Lawson's connection, the company necessarily rests under a cloud, in the minds of prudent investors.

NEVADA VERDE COPPER CO. **NEVADA.**

Office: Goldfield, Nev. Mine office: Yerington, Lyon Co., Nev. Organized Oct. 24, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. F. G. Sienecke, president; W. D. Boulter, vice-president; C. Barnes, secretary and treasurer; preceding officers, L. L. Bradford and Chas. Patrick, directors. Lands, 25 claims, area 500 acres, near Yerington, with about one-fourth mile of openings, showing copper carbonates and sulphides.

NEVADA VULCAN MINES CO. **NEVADA.**

Dead. Was successor of the Vulcan Consolidated Copper Co. Formerly at Sodaville, Esmeralda Co., Nev.

NEVER SWEAT MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

NEVILL, DRUCE & CO. **WALES.**

Office: 4 Corbet Court, Gracechurch St., London, E. C., Eng. Works office: Llanelly, Caermarthenshire, Wales. Property is the Llanelly copper works, built 1805.

NEW AMERICAN MINING & MILLING CO. **UTAH.**

Dead. Formerly at Brigham, Box Elder Co., Utah.

NEW ANNIVERSARY MINE. **AUSTRALIA.**

Mine office: Herberton, Queensland, Australia. Ore is shipped to Chillagoe smelter, and production, 1907, was 550 long tons of ore, yielding 208,320 lbs. fine copper and 5,600 oz. silver.

NEW ARIO COPPER & EXPLORATION CO., LTD. **MEXICO.**

Dead. Dissolved, May 7, 1907. Formerly at Ario de Rosales, Ario, Michoacán, Mex. Described Vol. VI.

NEW BALLA BALLA COPPER MINES, LTD. **AUSTRALIA.**

Office: 6 Great St. Helen's, London, E. C., Eng. Mine office: Port Balla Balla, Western Australia. Theophilus W. Williams, J. P., chairman; Ernest A. Foster, secretary; W. H. Mitchell, legal manager in Western Australia. Organized Apr. 16, 1901, under laws of Great Britain, as a reconstruction of the Balla Balla Copper Mines, Ltd., with capitalization £250,000, shares £1 par; issued, £138,599. Lands, 130 acres, in 2 groups, known as the Balla Balla and Mons Cupri groups, in the Pilbarra district, 14 miles from Port Balla Balla.

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Has a 30-ton smelter, and a smelting test, 1905, is said to have given satisfactory results. Receiver appointed and company being liquidated.

NEW BINGHAM CONSOLIDATED MINING CO. **UTAH.**

Office: care of Jesse Knight, president, Provo, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Wm. W. Mathews, vice-president; W. Lester Mangum, secretary and treasurer; preceding officers, Wm. Christopherson and J. Wm. Knight, directors. Organized circa January, 1907, under laws of Utah, with capitalization $100,000, shares $1 par. Lands, 6 claims, in the northern part of the Bingham district.

NEW BOSTON MINING CO. **MONTANA.**

Office: Eden Valley, Minn. Mine office: Corbin, Jefferson Co., Mont. Jas. Davidson, president; Hugo Traylor, secretary and treasurer. Capitalization $600,000, shares $1 par. Lands, 8 claims, 2 fractional, adjoining the Boston & Corbin, said to carry upwards of 20 different veins, including the Daphne claim, showing a 5′ vein with a 16″ paystreak assaying 10.5% copper, 42 oz. silver and $3 gold per ton, balance of vein assaying about 3% copper. Company's fiscal agent advertised that it would make its shareholders wealthy, and that its stock is "fully guaranteed by 10-year gold bonds, bearing 3% interest—50 per cent. commission to agents—why not become a mining king?" Property considered somewhat promising, but company not regarded favorably.

NEWBURY MINING CO. **ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. W. V. Lander, vice-president; C. M. Schofield, superintendent. Organized circa 1901, with capitalization $2,000,000, shares $10 par. Lands, 49 acres, and a smelter-site on the Gila River. Company also is said to have 22 claims in the Pioneer district of the Superstition Mountains. Mine has a 300′ tunnel, and 4 shafts of 285′ to 350′ depth, and is said to have several miles of workings, with reserves estimated at 175,000 tons of ore, said to average about 4% copper and $6 gold per ton. Property formerly was a silver mine, having 4 practically parallel veins, but values changed to copper at depth. Has steam and electric power and a 15-drill air-compressor, and plans an aërial tram from mines to railway. Property considered promising, though some advertising by the fiscal agents, F. W. McAleer & Co., was decidedly raw. Employs circa 30 men.

NEW CALEDONIA COPPER CO., LTD. **NEW CALEDONIA.**

Dead. Reorganized, 1899, as Caledonia Copper Co., Ltd. Formerly at Noumea, Diahot district, New Caledonia.

NEW CENTURY COPPER MINING CO. **WYOMING.**

Office: Enid, Okla. Mine office: Battle, Carbon Co., Wyo. G. F Hinton, superintendent. Organized 1907. Lands are the Century group, adjoining the Verde mine, in the Battle Lake district.

NEW CENTURY EXPLORATION & INVESTMENT CO. **IDAHO, OREGON & WASHINGTON.**

Office: 500-125 La Salle St., Chicago, Ills. Mine office: Darrington, Snohomish Co., Wash. J. W. McCoy, president; J. C. Morehouse, vice-president; Joseph G. English, treasurer; H. A. Burdick, secretary; T. T. Watson, assistant secretary; N. L. Franke, mine manager. Organized November, 1903, under laws of Arizona, with capitalization $7,500,000, shares $10 par. Lands, 46 claims, area circa 900 acres, including claims near Atlanta, Elmore Co., Idaho, claims near Baker City, Baker Co., Oregon, and the Forrest-Chickamun mine, on Gold Mountain, near Darrington, area circa 400 acres, which is claimed by company to have 700,000 tons of auriferous and argentiferous copper ore, worth $10 per ton, blocked out, which claim is regarded as preposterous. A projected 250-ton reduction plant did not materialize. Regarded with suspicion.

NEW CHICAGO MINING CO. **IDAHO.**

Mine office: Murray, Shoshone Co., Idaho. Geo. H. Heller, manager.

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Development is by a crosscut tunnel, said to show a 6′ vein of argentiferous copper ore of good grade.

NEW CHILLAGOE RAILWAY & MINES, LTD. **AUSTRALIA.**

Dead. Title changed back, 1905, to Chillagoe Railway & Mines, Ltd. Formerly at Chillagoe, Queensland, Australia.

NEW CLARA ST. DORA MINING CO., N. L. **AUSTRALIA.**

Office: Kennedy St., Port Adelaide, South Australia. Mine office: Alberin Creek, South Australia. F. S. Chany, chairman and secretary; Hermann Paull, manager. Organized March, 1898, under laws of South Australia, with capitalization £10,000, shares £1 par; issued, £5,345.

Lands, 4 claims, area 160 acres, held under 40-year lease, in the Hergott district, showing limestone country rock, carrying an ore body, opened by shallow shafts and open-cuts, showing malachite and chalcocite, occurring as nodules in hard limestone, and as veins in soft limestone. Equipment includes a 38-h. p. steam plant, with hoist good for 400′ depth. Ores, as treated, average 26% copper, without gold or silver values. Has a small mill, with one crusher, one set of rolls and one Mays jig. Mine is served by the South Australian Railway, 5½ miles distant.

NEW COLUMBIA MINING CO. **IDAHO.**

Mine office: Salmon, Lehmi Co., Idaho. Ores carry copper and gold. Has steam power and a 10-stamp mill. Idle.

NEW CLONCURRY COPPER & SMELTING CO., LTD. **AUSTRALIA.**

Offices: 116 St. Vincent St., Glasgow, Scotland. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. R. L. Alston, chairman; B. F. G. Meldrum, secretary. Organized Oct. 29, 1895, under laws of Great Britain, with capitalization £3,300, shares 6s. each, as successor of Cloncurry Copper & Smelting Co., Ltd. Lands, sundry small mines in North Queensland. Idle for some years, pending construction of a hoped-for railroad.

NEW DEPARTURE MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Dillon, Beaverhead Co., Mont. Lands, 12 miles from Dillon, show irregular deposits of 2′ to 20′ width, carrying auriferous and argentiferous copper ores, values being mainly in silver. Has a 100′ shaft and a 700′ tunnel. Shipped ore, 1907, giving returns of 2.2% copper, 338 oz. silver and $1 gold per ton.

NEW DOMINION MINES CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Organized 1905, with capitalization $1,000,000. Lands, about a quarter-mile west of the Gibson Copper Co., are said to show a 12″ vein, opened by 240′ shaft. Presumably idle.

NEW EINASLEIGH COPPER MINES, LTD. **AUSTRALIA.**

Offices: 522 Salisbury House, London, E. C., Eng., and Queen St., Brisbane, Queensland, Australia. Mine office: Einasleigh, Gilbert Co., Queensland, Australia Hon Reginald Parker, chairman; W. H. Woodhead, managing director; Thos. Mullett, secretary. Organized Jan. 17, 1907, under laws of Great Britain, with capitalization £200,000, shares £1 par; issued, £150,500. Debentures, £32,000, first-mortgage 6% bonds, redeemable Jan. 19, 1912, with option to holders of conversion into fully paid shares. Company is said to have expended about £45,000 in development.

Lands, 200 acres, freehold, at junction of Einasleigh and Copperfield rivers, showing an outcrop of about 100′ width where cut by Einasleigh river, carrying high grade ore said to average circa 10% copper, and low grade ore of about 6% copper tenor Has a 191′ main shaft, with a 14x20″ first-motion hoist and air-compressor. Smelter, burning wood, has a 32x75″ water-jacket blast-furnace. Development has been hampered by lack of transportation facilities, which now seem assured. Production, 1901, was 1,009 long tons of ore smelted, yielding 232,960 lbs. fine copper and 1,330 oz. silver.

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NEW ENGLAND-ARIZONA COPPER CO. **ARIZONA.**

Dead. Merged, 1907, in Verde River Copper Co. Formerly at Cherry, Yavapai Co., Ariz.

NEW ENGLAND-ARIZONA COPPER-GOLD MINING CO. **ARIZONA.**

Office: care of J. W. Stonehouse, Douglas, Ariz. Mine offices: Paradise, Cochise Co., Ariz., and Dudleyville, Pinal Co., Ariz. Organized 1905, with capitalization $3,000,000. Idle.

NEW ENGLAND & ARIZONA GOLD & COPPER CO. **ARIZONA.**

Office: 69 Pearl St., Boston, Mass. Mine office: McCabe, Yavapai Co., Ariz. Geo. A. Whitney, president; Frank Harlow, vice-president; Louis Harlow, secretary and treasurer; preceding officers, J. J. Bernie, W. R. Lambert, A. H. Smith, A. M. Ireland, F. J. Rolfe, Fred C. Bidwell and E. P. Libby, directors; John H. Farrell, general superintendent. Organized Jan. 19, 1901, under laws of Arizona, with capitalization $750,000, shares $1 par. Lands, 6 claims, area 120 acres, including the Red Star group of 3 claims and the Calumet group of 2 claims, circa 4 miles north of McCabe and about 2 miles from the Humboldt smelter. Mine, opened by a number of short tunnels, pits and a 325′ two-compartment main shaft, has 2 practically parallel veins, about 30′ apart, carrying paystreaks up to 2′ in width, of about 10% average copper tenor. Has steam power and several mine buildings.

NEW ENGLAND & CLIFTON COPPER CO. **ARIZONA.**

Office: 43 State St., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. E. Rollins Morse, president; Edmund Bristol, vice-president and managing director; Alex. Veitch, general manager; C. E. Phippen, secretary and treasurer; Horace Moses, superintendent. Organized 1903, under laws of Maine, with capitalization $5,000,000, shares $5 par, in $2,000,000 preferred 8% stock, cumulative after payment of 8% dividends, and $3,000,000 common stock. Issued, $1,373,745 preferred and $2,722,750 common shares. Offered, September, 1908, for sale, $100,000 first-mortgage 7% bonds, running 2 years, to raise funds for building a 100-ton concentrator. Company was a merger of the New England Copper Co. and Clifton Consolidated Mines of Arizona. Annual meeting, second Monday in August.

Lands, 78 claims, area 1,006 acres, lying mainly near the Shannon, circa 5 miles northwest of Clifton, on the north side of the San Francisco river. The property includes the Clifton, New England, Antietam and Copper King mines, with principal developments of value mainly on the New England. The principal group shows a main vein, occurring as a fissure in granite, of about 5′ average width, said to show an extreme width of 150′, with an ore chute up to 400′ in length, carrying highly silicious sulphide ores, mainly chalcopyrite, with some chalcocite and occasional oxides and carbonates, all slightly auriferous and argentiferous, said to average about 12% copper to depth of circa 350′, the ore chute declining rapidly in grade below depth of 350′, running to silicious sulphides of about 2.5% average copper tenor on the tunnel level. The main group is opened by shafts and tunnels, connecting at depth of circa 750′. The Clifton has 7 shafts, of 70′ to 315′ depth, and tunnels of 220′, 450′, 700′, 800′, 1,000′ and 1,700′. The New England is opened by shafts of 200′ and 400′, and by a 2,000′ tunnel, the principal vein of the latter being circa 5′ in average width, carrying high grade cuprite, chalcocite and chalcopyrite. The various mines of the company show a considerable amount of ore, ranging in grade from very rich to very poor.

The Antietam mine, area 3 claims, has a 140′ two-compartment shaft, showing an ore body of 15′ to 35′ width, carrying chalcocite and chalcopyrite giving assays of 4 to 10% copper, up to 7 oz. silver and $2 gold per ton, and is said to have about 40,000 tons of ore in sight. There is a tram-line from the Antietam to the Shannon railway. The property has ore-bunkers about 2

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miles below the mine, connected therewith by wagon road, and connecting by a 3-mile ground-tram, of 20″ gauge, with the Arizona Railroad.

The Copper King mine, which apparently is but slightly developed, is said to have about 40,000 tons of ore in sight, which estimate perhaps is high.

Equipment includes steam, gasoline and electric power, and there are a number of mine buildings.

Production has been as follows: 1,140,770 lbs. fine copper, 10,472 oz. silver and 43 oz. gold in 1906; 1,981,189 lbs. fine copper, 19,578 oz. silver and 62 oz. gold in 1907. The property has shipped considerable ore averaging better than 10% in copper tenor, and, until the break in the metal market, 1907, was shipping circa 1,000 tons monthly. Work was resumed March, 1908. Management considered good and property promising.

NEW ENGLAND-COLORADO COPPER MINES CO. **COLORADO.**

Dead. Formerly in Chaffee and Frémont counties, Colorado.

NEW ENGLAND COPPER CO. **ARIZONA.**

Dead. Succeeded, circa 1904, by New England & Clifton Copper Co. Formerly at Clifton, Graham Co., Ariz.

NEW ENGLAND COPPER CO. **MICHIGAN.**

Dead. Wound up, 1907, by Jeremiah T. Finnegan, receiver. Formerly owned circa 500 acres of land, in Town 58 N., Range 27 W., about 2 miles from the end of Keweenaw Point, Keweenaw county, Michigan.

NEW ENGLAND GOLD & COPPER MINING CO. **UTAH.**

Office: 67 Milk St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs circa 40 men. Daniel W. Williams, president; E. E. Abercrombie, vice-president and managing director; Geo. F. Bradstreet, secretary and treasurer; preceding officers, Jas. S. Williams, Geo. Bancroft, Woodford Yerxa and Thos. Kellough, directors; David J. Cook, superintendent. Organized June, 1899, under laws of Colorado, with capitalization $2,000,000, shares $10 par; issued, $1,201,130. Bonds, $500,000 authorized, at 6%; issued, $119,800. Federal Trust Co., Boston, registrar; Geo. F. Bradstreet & Co., transfer agents. Annual meeting, first Monday in June.

Lands, 13 claims, 9 patented, area circa 115 acres, including a group of 9 fractional claims, area circa 18 acres, in the West Mountain or Bingham district, and sundry claims near Goldfield, Esmeralda Co., Nev.

The Bingham group shows porphyritic country rock, carrying 3 principal fissure veins, of 30″ average width, 1,000′ average length and known depth of 400′, opened by the 1,600′ Nast tunnel, and the 1,670′ Benton tunnel, both in ore, and a 159′ shaft, with a total of circa 5,600′ of workings. Apparently the veins are growing wider at depth. Ores are said to give average assays of 30% lead, 10% zinc, 15 oz. silver and $4.50 gold per ton, with small and variable values in copper, in addition to which the monzonite country rock carries small copper values, and perhaps may prove workable, in parts, at some later date.

Equipment includes a steam plant, with a 30-h. p. hoist good for 800′ depth.

The concentrator, of 50 tons rated daily capacity, uses electric power, bought from a commercial company. Equipment includes a 4x12″ Sturtevant crusher, 2 rolls, 2 double Hartz jigs and 1 Wilfley table.

Production, 1907, was 2,108 tons of lead concentrates and 165 tons of copper ore. Property closed down, late 1907, on account of low metal prices.

NEW ENGLAND MINING CO. **MASSACHUSETTS.**

Office: 35 School St., Greenfield, Mass. Mine office: Charlemont, Franklin Co., Mass. Othello A. Fay, president; Capt. Geo. H. Davenport, treasurer and general manager. Organized 1902, with capitalization $500,000, shares $5 par. Lands, circa 1,000 acres, 2 miles west of the Davis pyrite mine. Vein,

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traced 700', is approximately vertical, conforming closely in dip and strike with the Savoy schist in which it occurs, and apparently is a fahlband, lacking well-defined walls, ore occurring scattered through 15' to 20' of the schist, with a 6" to 12" vein of quartz, well mineralized, on the south wall, and a heavy impregnation of chalcopyrite, 1' to 2' wide, on the north wall. Has been partly stripped, and vein trenched across. Idle several years.

NEW ENGLAND-UTAH MINING CO. **UTAH.**

Mine office. Bingham Canyon, Salt Lake Co., Utah. Is controlled by Nevada-Utah Mines & Smelters Corporation.

NEW ERA MINING CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Lands are south of La Cananea. Idle since circa 1903 and presumably moribund.

NEWFOUNDLAND COPPER CO., LTD. **NEWFOUNDLAND.**

Dead. Absorbed, 1901, by Carmen Copper Mines, Ltd. Formerly at Lady Pont, Newfoundland. Described Vol. III.

B. NEWGASS & CO. **SPAIN.**

Office: 7 Lothbury, London, E. C., Eng. Mine office: Changoa, Navarra, Spain. Lands, at Arricta and Changoa, include the Ollin, Arrieta and Changoa mines, carrying silver, lead and copper ores. Idle some years.

NEW HIGHLAND GOLD & COPPER MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, 1209 Broadway, Oakland, Cal. Mine office: Georgetown, El Dorado Co., Cal. Thos. F. Graber, vice-president; C. L. Colvin, secretary and treasurer. Organized Sept. 11, 1903, under laws of California, with capitalization $2,000,000, shares $1 par. Lands, 11 copper claims and 9 gold claims, area 355 acres, on the mother lode, in the Georgetown district, showing a fissure vein in slate, giving assays of 15% copper, 15 oz. silver and $2.50 gold per ton. Copper property idle several years and company apparently moribund.

NEWHOUSE MINES & SMELTERS. **UTAH.**

Office: 512-71 Broadway, New York, N. Y. Operating office: P. O. Box 1388, Salt Lake City, Utah. Mine office: Newhouse, Beaver Co., Utah. Employs circa 250 men. Samuel Newhouse, president; Jas. W. Hoban, vice-president; John Josten, secretary and treasurer; preceding officers, J. F. A. Clark, Alvin Untermeyer and Hon. Heber M. Wells, directors; Lafayette Hanchett, general manager; Lawrence Townsend, assistant manager; Thos. R. Drummond, superintendent; Harry Kee, mill superintendent; A. C. Dart, engineer.

Organized May 16, 1903, under laws of New York, with capitalization $6,000,000, shares $10 par. Debentures, $1,500,000 first-mortgage 6% sinking fund gold bonds, due 1913, of which amount it is variously reported that $900,000 and $1,400,000 are outstanding. Colonial Trust Co., New York, transfer agent; Windsor Trust Co., New York, registrar. Stock is listed on the Boston Stock Exchange and New York Produce Exchange. Annual meeting, fourth Friday in March.

A dividend of 50 cents per share, amounting to $300,000, was paid August 31, 1907, and was called the first quarterly, but was not succeeded by other quarterlies, owing to there being no profits to divide. The management should have known, when declaring this dividend, in July, 1907, that market conditions were such that a continuation of quarterly dividends was something more than doubtful, and apparently the action of the management, in calling this a quarterly dividend, was for market effect only, hence highly censurable. For fiscal year ending June 30, 1908, the property made net earnings of $79,921, against which was bond interest of $81,000, showing a small actual net loss on the year's operations

Lands, 13 claims, patented, area 201 acres, in Copper Gulch, 7 miles from Frisco, carrying about one mile of the strike of the Cactus vein, also the Mid-

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vale placer, area 168 acres, available water rights at Wah Wah Springs, and agricultural and grazing lands, giving total holdings of 7,882 acres.

The Cactus group, formerly operated, in a small way, without success, by several previous owners, shows country rock of monzonite porphyry, and the Cactus mine is essentially a pyritic impregnation, near the limestone contact, the ore being largely mineralized monzonite, carrying some oxidized ores in the upper workings, but at depth mainly chalcopyrite in pyrite, both slightly argentiferous and auriferous, averaging perhaps 30 cents per ton in combined gold and silver values, and being practically without lead and zinc. Previous to 1905 the Cactus ores are said to have averaged about 1% copper only, and the average grade of ore in the mine is very low, though there is some high grade sulphide ore, mainly chalcopyrite, assaying up to 15 to 20% in copper tenor. The mine has ore bodies of large size, ranging up to 200′ in width and 600′ in length, and the company reports its main ore body as 175′ wide, 700′ long and 600′ deep, with a northwesterly strike and vertical dip. Reserves were estimated, early 1908, at 4,332,023 tons, averaging 2.5% copper, above the 700′ level. There are persistent rumors that the mine shows diminished values at depth, and that the high grade ore body is nearing exhaustion.

Development is by two 3-compartment main shafts, of 600′ and 900′ depth, with levels at 100′ intervals, connected on the 600′ level with a 6,200′ tunnel, which has a grade of 5%, and is laid with 30-lb. steel rails. There is an electric hoist on the second level. The lower level is reported to be developing satisfactorily, and the mine is said to have a good ore body on the 800′ level, averaging circa 4% copper. Tramming in the tunnel is done by 2 electric locomotives, each hauling trains of 21 cars. The tunnel is electric-lighted throughout, and cut several cupriferous veins before reaching the main vein. The mine has about 3 miles of workings, and for fiscal year 1908 made 3,025′ of new openings.

A steam-shovel, used for stripping, is capable of handling about 1,000 tons of material daily, and company plans extracting a large portion of its ore by steam-shovel, first blasting with black powder. There was some trouble, 1908, from caving, and the management is said to plan winning ore by the caving system.

After reaching the portal of the main tunnel, the electric trains pass over a high trestle to an ore-building, where 7 cars at a time are run into a great steel tube, which is partially rotated, and the ore in the cars dumped onto grizzlies, oversize going to Blake crushers, that reduce it to lumps of 1″ size and smaller, fines and crushed ore going to 800-ton storage bins, whence the ore is loaded into railroad cars and taken to the mill.

The mine has a 200-h. p. steam plant, with a 150-h. p. hoist good for 600′, and a 40-drill Ingersoll-Sergeant air-compressor, both hoist and compressor being operated electrically. Power formerly was furnished the mine from the central plant, by compressed air, piped through a line 13,000′ long, this operating steam-shovels and hoists, water for steaming purposes not being available at the mine.

The mine and mill are connected by the Newhouse, Copper Gulch & Sevier Lake Railroad, 2.3 miles in length, of standard gauge, owned by the company, which connects with the San Pedro & Salt Lake Railroad, equipment including a Shay mountain-climbing locomotive and 5 dump-cars.

The mill is 100x400′ in size, in two 500-ton duplicate sections, being designed on the unit plan to allow for future expansion. The western section, which is the concentrator proper, is of structural steel, with corrugated iron sides and roof, while the power plant, under the same roof, is of structural steel and brick. Equipment includes three 10x24″ Blake crushers, 4 sets of rolls, 18 Hartz jigs, 32 Wilfley tables, 8 Wilfley slimers, Sherman settling tanks

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and classifiers and a 15-ton Whiting traveling crane. Ore is dumped, as received, into 1,000-ton steel bins, whence it is drawn out by belt-conveyors, equipped with plunger feed, and transferred to elevators, of which there are 2 for each section, one for dry and one for wet ore. Some additional machinery was installed, 1908, bringing the mill up to its rated capacity of 1,000 tons daily. The mill puts about 8 tons into 1, and is said to effect a saving of circa 80% of assay values, making a concentrate carrying 10 to 25% excess of iron, which commands a premium of about 10 cents per unit.

In connection with the mill is a 40-ton experimental lixiviation plant, planned to leach oxidized ores of the Cactus, which average circa 2.5% copper, with small gold and silver values. This plant has certain features patented by Mr. D. H. Waterbury.

The power plant includes five 350-h. p. Babcock & Wilcox boilers and a Green fuel economizer, the boiler plant having a 165′ self-supporting steel smokestack of 8′ diameter. The steam plant is held in reserve, machinery being actuated by electric energy, brought 50 miles over the lines of the Telluride Power Co. There are two 500-h. p. Westinghouse-Parsons steel turbines, making 3,600 revolutions per minute, formerly direct-connected to two 400-kw. generators that furnished all power, except compressed air, used in the mine and mill.

The property has an antiquated old smelter, put up by a French company that formerly owned the Cactus, but this is of no particular value at present.

Water is brought from 6 large springs, at Wah Wah, 8½ miles from the mill, through a line of 12″ and 14″ riveted steel pipe, laid across Preuss valley, discharging into a cement reservoir of 300,000 gallons capacity, located on high ground above the mill and townsite, the springs having a flow of circa 1,000 gallons per minute.

Buildings of the company include a 30x50′ brick machine shop, 30x40′ carpenter shop, smithy, bunk-house and boarding-house. There also is a saw-mill and a 3-ton ice plant, the latter being necessary in summer, as the property is on the edge of the Escalanta desert.

A townsite called Newhouse has been platted near the mill, and the company owns therein 47 dwellings, a club-house and a brick hotel with accommodations for 150 men. From the profits of the club-house and clubs, sufficient money was realized to build a small opera-house, which is much appreciated by the company's employes.

Production has been as follows: 5,020,992 lbs. fine copper for 1906; 5,670,993 lbs. fine copper, 53,862 oz. silver and 2,272 oz. gold for fiscal year ending June 30, 1906; 176,766 tons of ore, of which 10,014 tons was smelting ore, and 19,367 tons of concentrates, yielding 7,244,179 lbs. fine copper, 48,595 oz. silver and 1,721 oz. gold, for fiscal year ending June 30, 1908. The property was closed down October, and reopened December, 1907, but in March, 1908, the mill was being run only one shift daily, and production was about half from smelting ore and half from concentrates. The mine and mill have been handled with skill and technical ability, and a large tonnage has been extracted and treated with a comparatively small force. The property has milling capacity for an output of 12,000,000 lbs. copper yearly, or upwards.

Samuel Newhouse, president of the company, was quoted January, 1908, as stating that company was then producing copper for 6 cents per pound, including refining and selling. This simply was not the case. Costs were said to have been 8 cents per pound for 1907, but apparently these figures do not include marketing. Costs are said to be about 40 cents per ton for milling, which probably is rather low, though the mill is doing excellent work, at low cost. For fiscal year 1908 the management figures copper costs at 7.05 cents per pound or 10.5 cents per pound with freight, refining and smelting charges

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added, but the fiscal year 1908 showed that the entire net profits had been absorbed by bond interest, leaving a small deficiency. Apparently there has been much manipulation of this stock in the New York and Boston markets, and many misleading statements have been put out regarding production, costs and net earnings.

NEW JERSEY-ARIZONA MINING CO. **MEXICO.**

Office: P. O. Box 750, Bisbee, Ariz. Letter returned unclaimed from former mine office, Fronteras, Arizpe, Sonora, Mex. Property was claimed to be in the vicinity of the Greene Consolidated, Hidalgo, Picacho and Moctezuma mines, which was physically impossible. Apparently the only certainty as to location is that the property was claimed to be in northern Mexico, and apparently in Sonora. Property supposedly is controlled, through stock ownership, by United Mining Co., of New York, F. L. Brinkerhoff, president. The company claimed to have 18,000,000 tons of ore, capable of making a profit of $450,000,000, and these figures tell the story of what it was—or wasn't.

NEW JERSEY METAL REFINING WORKS, LTD. **NEW JERSEY.**

Works office: Elizabeth, Union Co., N. J. Is controlled by Mountain Copper Co., Ltd.

NEW KING SOLOMON'S MINES, LTD. **TRANSVAAL.**

Office: Johannesburg, Transvaal. Capitalization, £5,000. Property is the Farm Anjater's Kop No. 152, in the Zeerust district of the Transvaal.

NEW LINCOLN COPPER CO. **WYOMING.**

Dead. Was merged, circa 1907, in Rambler Copper & Platinum Co. Formerly at Holmes, Albany Co., Wyo. Described Vol. VI.

NEW MAMMOTH MINING & MILLING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Ores carry gold, silver and copper. Idle several years and apparently moribund.

NEW MESSINA COPPERS, LTD. **TRANSVAAL.**

Office: National Mutual Bldg., Rissik St., Johannesburg, Transvaal. Organized, 1907, under laws of Transvaal, with capitalization £10,000, shares 5s. par; working capital, £4,000. Property is 192 base metal claims, on the government farm Oestenryk No. 1421, in the Zoutpansberg district, Transvaal.

NEW MEXICO COPPER MINING & SMELTING CO. **NEW MEXICO.**

Dead. Formerly at Lucero, Mora Co., N. M.

NEW MEXICO DEVELOPMENT CO. **NEW MEXICO.**

Mine office: Fierro, Grant Co., N. M. Idle and apparently moribund.

NEW MEXICO GOLD & COPPER MINING CO. **NEW MEXICO.**

Office: 39 Cawker Bldg., Milwaukee, Wis. Mine office: Tres Piedras, Taos Co., N. M. Wm. H. Devos, president; Geo. R. Hayden, secretary. Organized 1897, under laws of New Mexico, with capitalization $2,500,000, shares $1 par. Bonds, $25,000 authorized, $4,850 issued, at 7%.

Lands, 11 claims, area 140 acres, in the Bromide district, showing fissure veins in schist, and contact deposits between schist and granite. Five veins developed, are claimed to average 7′ in width and to carry native copper, carbonate and sulphide ores, assaying 5 to 40% copper, with occasional high values in gold. Has a 130′ shaft with 350′ of workings. Has steam power and a Norwalk air-compressor. Has a worthless townsite, called Bromide City. Is in debt, and facing bankruptcy.

NEW MEXICO IRON & COPPER CO. **NEW MEXICO.**

Office: care of Hon. J. Maurice Finn, president and manager, Denver, Colo. Mine office: Corona, Lincoln Co., N. M. Lands, in the Red Cloud district, were undergoing development, 1907.

NEW MEXICO VERDE COPPER CO. **NEW MEXICO.**

Office: 100 First St., Elizabeth, N. J. Organized, late 1906, under laws

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of New Jersey, with capitalization $1,000,000, by Walter A. Smith, Cornelius M. Garrison and Wm. P. Wallace. Location of lands, if any, unknown.

NEW MICHIGAN COPPER MINING CO. **WYOMING.**

Office and mine: Laramie, Albany Co., Wyo. Idle since circa 1904, and presumably moribund.

NEW MOONTA MINE. **AUSTRALIA.**

Office and mine: Mount Perry, Queensland, Australia. T. Hanifan, superintendent. Property, 12 miles northeast of Mount Perry, was a small producer, 1906, employing 59 men.

NEW MOUNT HOPE COPPER MINING CO., LTD. **AUSTRALIA.**

Dead. Succeeded, circa 1906, by Mount Hope Copper Proprietary. Formerly at Mount Hope, Blaxland Co., N. S. W., Australia.

NEW MOUNT HOPE COPPER MINING CO., LTD. **AUSTRALIA.**

Dead. Formerly at Mount Hope, Blaxland Co., N. S. W., Australia. Described Vol. VI.

NEW ORE KNOB COPPER CO. **NORTH CAROLINA.**

Dead. Formerly at Jefferson, Ashe Co., N. C.

NEWPORT & ARIZONA COPPER & GOLD MINING CO. **ARIZONA.**

Dead. Had an office, circa 1900, at 60 State St., Boston, Mass.

NEW RED WING MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Benj. L. Corum, president; A. D. Lee, vice-president; F. M. Orem, secretary and treasurer. Organized circa 1900, with capitalization $500,000, as successor of Red Wing Gold Mining Co. Is said to have a $50,000 bond issue. Is controlled, through ownership of majority of stock, by Utah Development Co., and owns a half interest in the Markham Gulch Milling Co., which has a 200-ton concentrator. Lands, 110 acres, partly patented, with 2 adverses in litigation. Mine has 3 tunnels, No. 3, circa 700′ long, being claimed to show a 15′ vein of milling ore, carrying values mainly in lead and silver. Also has a 5′ vein, carrying a 3′ paystreak, said to assay 23.2% copper, 12% lead, 60 oz. silver and $1 gold per ton.

NEW RIO TINTO COPPER CO., LTD. **SPAIN.**

Dead. Absorbed, circa 1904, by Caridad Copper Co., Ltd. Formerly at Lozoyuela, Madrid, Spain.

NEW RIVER COPPER CO.

Office: care of F. W. Pratt, Huntsville, Ala. Organized August, 1902, under laws of Delaware, with capitalization $1,000,000. Apparently abortive.

NEWSBOY COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

NEWS COPPER MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Lands, sundry claims, 1½ miles southeast of Jerome. Shaft was unwatered and retimbered, 1905, after several years' idleness, and property was investigated by F. August Heinze, but not taken by him, failing to prove as represented. Since idle.

NEW SOUTH WALES MINES & SMELTERS, LTD. **AUSTRALIA.**

Mine office: Blayney, N. S. W., Australia. Organized circa January, 1907, with capitalization £75,000, shares 10s. par. Property is the Blayney mine, known also as the Great Blayney and Annandale, reopened April, 1907, showing a 40′ vein carrying chalcopyrite with andesitic gangue, opened by a 390′ shaft. Has a 50-ton smelter, with 2 small water-jacket blast-furnaces. In 1901 produced 418 long tons of copper, from 18,666 long tons of ore smelted.

NEW STATE COPPER MINING CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. James W. Bogan, president; Chas. Bent, vice-president; Lyman W. Wakefield, treasurer; Ralph K. Shelton, secretary. Capitalization, $2,000,000, shares $1 par. Lands, 9 claims, in the

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Tucson Mountains, 14 miles west of Tucson, showing a prominent gossan, carrying oxidized ores and a little chalcocite with small gold and silver values, suitable for fluxing ore, and presumably underlaid by copper ores of better tenor. Has a 40′ shaft showing a little chalcopyrite, and a short tunnel, with circa 400′ of workings. Has shipped about 300 tons of ore. Idle.

NEW STRATAN COPPERS, LTD. **TRANSVAAL.**

Office: P. O. Box 1276, Johannesburg, Transvaal. J. M. Calderwood, M. I. M. M., consulting engineer. Organized under laws of Transvaal, with capitalization £11,000, shares £1 par, fully issued. Lands include 96 claims on the Limpopo River, and 360 base metal claims on government Farm Stratan No. 1,386, in the Zoutpansberg district of the Transvaal, latter, slightly prospected, giving, 1907, average assays of 17.72% copper, with traces of silver and gold.

NEWTON COPPER CO. **CALIFORNIA.**

Office: 420 Montgomery St., San Francisco, Cal. Mine office: Ranlett, Amador Co., Cal. Col. Horace D. Ranlett, president and general manager. Organized 1887, under laws of California, with capitalization $200,000, shares $5 par. Lands, 100 acres, patented, showing 3 fissure veins in slate, carrying mainly sulphide ores, averaging circa 8% in copper tenor. Mine, opened 1861, has shafts of 200′ and 430′, with about 20,000 tons of ore in sight. Has steam power, and smelter with an 80-ton water-jacket blast-furnace, also a 100-ton leaching plant, ore being especially adapted to lixiviation. Idle since circa 1903.

NEWTON COPPER MINING CO. **WYOMING.**

Dead. M. B. McKillep was manager. Property, near Elwood, 7 miles from Encampment, was said to have 12′ vein of copper ore, opened by a 125′ shaft. Formerly at Encampment, Carbon Co., Wyo.

NEWTON, KEATES & BOLTON. **ENGLAND.**

Office: 13 Charles St., Princess St., Manchester, Eng. Works office: St. Helens, Lancashire, Eng. Property is copper smelting and refining works.

NEW UTAH MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Ibapah, Tooele Co., Utah. Hugh Heffernan, president; W. W. Thompson, vice-president; Geo. A. Udall, secretary; James Norman, treasurer; Timothy Manion, manager. Lands are near the Flying Dutchman mine. Idle.

NEW VELVET-PORTLAND MINE, LTD. **BRITISH COLUMBIA.**

Office: 535 Salisbury House, London, E. C., Eng. Letter returned unclaimed from former mine office, Rossland, Trail district, B. C. Allan Maclean, chairman; F. A. Labouchere, secretary; S. Severin Sörensen, general manager. Organized Nov. 18, 1905, as successor of the Velvet-Portland Mine, Ltd., with capitalization £10,000, shares £1 par; issued, £5,699. Lands on Sophie Mountain, Rossland, carry low-grade auriferous copper ores. Has a 75-ton concentrator with three Tremaine two-stamp mills, 2 Overstrom tables, two sets of Brown's hydrometric classifiers, and one Jenckes crusher, putting five tons into one. Idle.

NEW VIGSNAES COPPER CO., LTD. **NORWAY.**

Office: 32 Charles St., Cardiff, Wales. T. J. Masters, chairman; Herbert A. Evans, secretary. Organized Oct. 28, 1905, under laws of Great Britain, with capitalization £10,000, shares £1 par; issued, £9,000. Property is the Vigsnaes copper mine, on Karme Island, Norway. Presumably idle.

NEW WEST MUTOOROO COPPER MINING CO. **AUSTRALIA.**

Office: Melbourne, Australia. Mine office: Cockburn, South Australia. Lands, 120 acres, leasehold, 12 miles from Cockburn, having a 110′ shaft, sunk vertically for 60′, cutting an 8′ vein carrying 2 to 3% copper ore, after which the shaft follows the dip of the vein, which is said to be 20′ wide on the 110′

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level. Company planned, late 1907, installing a 100-ton reduction plant, but apparently failed to do so.

NEW WORLD SMELTING CO. **MONTANA.**

Office: 306 Pacific Blk., Seattle, Wash. Mine office: Gardiner, Park Co., Mont. Dr. G. L. Tanzer, president. Lands are 60 miles from Gardiner and 3½ miles east of Yellowstone National Park. Company contracted with the Colorado Iron Works Co. for a 100-ton copper matting furnace. Presumably idle.

NEW YELTA COPPER MINING & SMELTING CO., LTD. **AUSTRALIA.**

Dead. Mines, sold, 1903, to Paramatta Copper Mines, Ltd. Formerly at Wallaroo, Daly Co., South Australia.

NEW YORK-ARIZONA COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Dewey, Yavapai Co., Ariz. Lands are the Denver group, in the Black Hills district, 3 miles east of Dewey. Has a 400′ shaft. Idle and apparently moribund.

NEW YORK & ARIZONA COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 261 Broadway, New York, N. Y. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Lionel Hagenaers, president; E. G. Macqueston, secretary. Organized 1901, with capitalization $3,000,000. Management poor, property fair, company moribund. Idle since circa 1902.

NEW YORK-ARIZONA GOLD & COPPER CO. **ARIZONA.**

Office and mine: Morenci, Graham Co., Ariz. A. L. Work, president; J. F. Cleaveland, vice-president; C. E. Tyler, secretary and treasurer; preceding officers, R. E. Moore, W. C. Crawford and D. M. Causler, directors; John C. Molder, general manager; J. R. Wester, superintendent. Organized Apr. 15, 1907, under laws of Arizona, with capitalization $900,000, shares $1 par.

Lands, 30 claims, unpatented, area 600 acres, in the Copper Mountain district, 4 miles west of Morenci, also a 150-acre millsite. Property includes the Buzzard Shadow and adjacent groups, showing quartzite, shale, limestone and porphyritic rocks, carrying contact ore bodies having a generally east and west strike, with vertical dip. Four ore bodies, under development, range from a few inches to 50′ in width, one showing auriferous and argentiferous sulphides assaying 15% copper, 10 oz. silver and $10 gold per ton.

Development is by 5 shafts, deepest 80′, and by 4 tunnels, of 100′, 450′, 600′ and 900′ length, with a total of circa 2,500′ of workings, estimated to show 100,000 tons of ore. The Lillian tunnel is said to show a 50′ ore body carrying average values of $12 gold per ton, which, in all likelihood, is an overestimate. The Buzzard Shadow group shows a 2′ to 4′ vein carrying auriferous and argentiferous copper ore. Values, as developed, are mainly in gold.

Equipment includes a 19-h. p. gasoline hoist, and 5 mine buildings. Company plans drifting and sinking on the Lillian and Buzzard Shadow groups, adding an air-compressor, and building a 10-stamp mill and cyanide plant. Development on the principal copper claim has been hampered by excess of water.

NEW YORK CANADIAN COPPER CO., LTD. **ONTARIO.**

Dead. Formerly at Kashaboiwe, Rainy River district, Ont. Fully described Vol. IV.

NEW YORK CONSOLIDATED MINING CO. **MICHIGAN.**

Office: Leopold Bldg., Houghton, Mich. Lands, 720 acres, being Sections 3, 10 and 15, in Town 57 North, Range 32 West, Keweenaw County, Michigan, lying just east of the Manhattan. Idle many years.

NEW YORK COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 46 North Stone Ave., Tucson, Ariz. Mine office: Helvetia, Pima Co., Ariz. Frank H. Lee, president; Samuel Seinsheimer, vice-president; E. J. Trippel, secretary; Harry A. Drachman, treasurer; Henry Buehman, general

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manager. Organized Nov. 4, 1901, under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 8 claims, area 110 acres, showing contact deposits between limestone and porphyry, opened by 3 shafts, with total depth of 175′, and 3 tunnels with total length of 475′, showing copper carbonates and sulphides giving average assays of about 4% copper.

NEW YORK & ELY CONSOLIDATED COPPER CO. **NEVADA.**

Dead. Formerly had an office at 1103-66 Broadway, New York, N. Y. Formerly at Ely, White Pine Co., Nev.

NEW YORK & GREENWATER COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Organized October, 1906, under laws of Arizona, with capitalization $1,000,000. Idle.

NEW YORK & INYO COPPER CO. **CALIFORNIA.**

Office: 254 Wilcox Bldg., Los Angeles, Cal. Mine office: Citrus, Inyo Co., Cal. G. J. Lang, president; A. G. Lang, vice-president; A. N. Francisco, secretary; T. D. Gordon, treasurer; F. S. Gordon, consulting engineer. Lands, 5 claims, area 100 acres, circa 6 miles from Citrus, taken over from the Inyo County Consolidated Copper Co. Property has a 100′ tunnel, showing oxidized ores assaying 2.5 to 17% copper, with combined gold and silver values of $1.50 to $7.50 per ton.

NEW YORK & MEXICO EXPLORATION & DEVELOPMENT CO. **ARIZONA & MEXICO.**

Dead. Was organized March 1, 1906, under laws of Maine, and name changed, Oct. 31, 1906, to Cananea & Globe Exploration & Development Co. Formerly at Globe, Gila Co., Ariz., and La Cananea, Arizpe, Sonora, Mex.

NEW YORK & MONTANA COPPER MINING CO. **MONTANA.**

Office: 32 Broadway, New York, N. Y. Mine office: Corbin, Jefferson Co., Mont. J. H. McCabe, general manager. Organized 1903, under laws of Delaware, with capitalization $1,000,000, shares $1 par. Lands, circa 250 acres, including the Erickson, Scioto and Copper Gulch groups, opened by 3 two-compartment shafts, said to make a good showing of medium-grade ore. Idle several years.

NEW YORK & NEVADA COPPER CO. **NEVADA.**

Dead. Lands sold, 1905, to Nevada Consolidated Copper Co. Fully described Vols. III. and IV.

NEW YORK-NEVADA GOLD-COPPER MINING CO. **NEVADA.**

Office: 504 Rector Bldg., Chicago, Ills. Mine office: Goldfield, Esmeralda Co., Nev. Jas. Rice, president; W. B. McConnell, vice-president and treasurer; Geo. S. Webb, secretary; Harry F. Parker, general manager. Organized August, 1907, under laws of Arizona, with capitalization $5,000,000, shares $1 par.

Lands are said to be 31 claims, including 12 claims 3 miles from Copperfield, Esmeralda Co., Nev., circa 50 miles northwest of Tonopah, which are said to show veins of 7′ to 12′ width, carrying high grade copper ores; 19 claims 12 miles northeast of Goldfield, near Red Mountain, and a 5-acre millsite near Acme, Nev. The company claims to have one mile of workings, with 20,000 tons of ore blocked out, carrying values in copper, lead, silver and gold.

NEW YORK & SALTESE COPPER MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Organized 1906, with capitalization $5,000,000, shares $10 par, as a reconstruction of the National Mining & Smelting Co. Presumably idle.

NEW YORK-SEATTLE COPPER MINING CO. **WASHINGTON.**

Office: 237 Broadway, New York, N. Y. Mine office: Index, Snohomish Co., Wash. Harry D. Cowden, president; R. H. Hingston, secretary; Philip Hingston, treasurer and superintendent. Organized Aug. 17, 1901, with capitalization $1,000,000, shares $1 par.

Lands, 8 claims, area 160 acres, well timbered and watered, with an avail-

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able water-power, 13 miles from the Great Northern railroad, with a good wagon-road thereto, in the Mineral City and Silver Creek districts. Mine has a 212′ shaft and circa 1,250′ of tunnels, showing 4 veins, of 4′ to 20′ average width, carrying copper ore that gave average returns of $14.42 per ton, in mill tests.

Equipment includes a hydraulic power installation, air-compressor and sawmill. Has a 100-ton concentrator, milling circa 60 tons daily, at last accounts, shipping concentrates to Everett smelter. Management seems vigorous and efficient.

NEW YORK & UTAH COPPER & GOLD MINING & MILLING CO. UTAH.

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Milford, Beaver Co., Utah. J. E. Galigher, president; A. F. Schneider, vice-president; G. D. B. Turner, secretary and treasurer. Organized July, 1907. Property is the Blue Bird group, formerly owned by Blue Bird Copper-Gold Mining Co., near the Hickory group of the Majestic Mines Co., having a 275′ shaft.

NEW YORK & VIRGINIA COPPER CO. VIRGINIA.

Office: 50 Broadway, New York, N. Y. Letter returned unclaimed from former mine office, Woltz, Carroll Co., Va. Ambrose C. Dunn, president and general manager; Wm. D. Boggs, secretary and treasurer. Organized 1901, under laws of West Virginia, with capitalization $2,500,000, shares $1 par. Lands, 740 acres, showing 7 cupriferous fissure veins and 2 gold veins, 2 copper veins being developed by shafts of 372′ and 381′ and 2 tunnels of 100′ each. Main vein is claimed by company to average 96′ width, and to show argentiferous melaconite, bornite and chalcopyrite, carrying 10% copper, 25 oz. silver and 1 oz. gold per ton, which is an exaggeration. Claims to have about 40,000 tons of smelting ore on the dumps, with a larger amount blocked out for stoping. Idle and presumably moribund.

NEW ZEALAND COPPER ESTATES CO., LTD. NEW ZEALAND.

Dead, though not buried at last accounts. Formerly in New Zealand.

NIAGARA COPPER CO. ARIZONA.

Office and mine: Prescott, Yavapai Co., Ariz. Herman Voge, president and treasurer; G. H. Schuerman, vice-president; J. P. Bauder, secretary and general manager. Capitalization $1,000,000, shares $1 par.

Lands, 7 claims, area 140 acres, and a 5-acre millsite, in the Copper Creek district, circa 25 miles southwest of Prescott, showing native copper, melaconite, malachite, azurite, chalcocite, bornite and chalcopyrite. Property formerly was claimed to show a vein of 50′ to 150′ width, with footwall and hanging wall paystreaks, giving assays up to 50% copper, 9 oz. silver and $1.55 gold per ton, opened by shafts of 60′, 60′, and 125′ and by several tunnels. The property was reported, 1908, by company to have shafts of 40′, 50′ and 85′, with tunnels of 50′, 200′, 100′, 400′, 200′ and 260′, with circa 2,000′ of workings, showing ore estimated to average 3 to 6% copper, 2 to 7 oz. silver and $1 to $10 gold per ton. The shrinkage in depth of shafts doubtless was due to seismological disturbances causing severe contraction of the earth's crust in Yavapai county, whereby the shafts were forced upwards and the portions thus protruding above the earth's surface were broken off by their own weight. This would seem the most plausible explanation, as none other has been supplied.

NIAGARA MINING & SMELTING CO. UTAH.

Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Is controlled, through ownership of majority of stock, by United States Mining Co., which operates the mine. To all practical intents and purposes, is out of business.

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NIBLACK COPPER CO. **ALASKA.**

Office: 310 American Trust Bldg., Cleveland, Ohio. Mine office: Niblack, Prince of Wales Island, Alaska. M. P. O'Brien, president and treasurer; Frank B. Richards, vice-president; S. C. Vessy, secretary; Benedict Crowell, consulting engineer; Burton B. Nieding, general manager; Wm. N. Fink, engineer. Organized Oct. 12, 1904, under laws of Arizona, with capitalization $250,000.

Lands, 2 claims, leased from the Geo. M. Wakefield Mineral Land Co., with litigation over royalties, on the eastern side of the island, having a lake estimated as capable of developing 2,000 h. p. under a 290′ head. Main shaft, 275′, with 4 levels opened at 50′ intervals. Geology of property is similar to that of the Ketchikan district, on the mainland, showing sedimentary deposits, mainly limestone of Devonian or Silurian age, having a general dip to the southwest, with intrusions of later eruptive rocks, that have forced their way between the beds, and altered them to such an extent that identification is difficult. The greenstone, in various phases of alteration, carries a mineralized zone parallel to the fault planes, with ore-bodies having a general strike of northwest to southeast, with dip of circa 60° to southwest. The principal ore body is a lense in greenstone, having a width of 60′, with another ore body on the 160′ level, estimated at 20′ width, and a third lense outcropping on the mountain above the mine. Ore is chalcopyrite, averaging circa 4% copper, and high in iron, silica and sulphur, with combined gold and silver values of about $1.50 per ton. Property also shows covellite and chalcopyrite, in quartz-sericite schists, at present undeveloped

Equipment includes a steam hoist, good for 1,000′, and a 6-drill air-compressor. Buildings include a power-house, machine-shop, carpenter-shop, smithy, office, general store, boarding-house and cabins for miners. Large ore-bunkers, near the shaft, are connected by tramway with a 700′ wharf, tramway and wharf being double-tracked, and tram operated by gravity. The wharf is on Niblack Anchorage, a nearly landlocked harbor having deep water, but high tides, necessitating a long pier, which is built with pockets, similar to those at the Lake Superior iron ports. Production, 1905, was 10,209 tons of ore, containing circa 850,000 lbs. fine copper.

NIBLACK COPPER DEVELOPMENT CO. **ALASKA.**

Dead. Succeeded Oct. 12, 1904, by Niblack Copper Co. Formerly at Niblack, Prince of Wales Island, Alaska.

NICHOLS CHEMICAL CO. **QUEBEC & NEW YORK.**

Dead. Succeeded May, 1905, by Nichols Copper Co. Formerly at Capelton, Sherbrooke Co., Que. Fully described Vol. VI.

NICHOLS COPPER CO. **QUEBEC & NEW YORK.**

Office: 25 Broad St., New York, N Y. Mine office: Capelton, Sherbrooke Co., Quebec. Works office: Laurel Hill, Queens Co., N. Y. Employs about 250 men. Wm. H. Nichols, president; John B. F. Herreshoff, vice-president; Geo. Martin Luther, secretary and general manager; Edw. R. Nichols, treasurer; preceding officers, Wm. H. Nichols, Jr., G. G. Teller and Sanford T. Steele, directors; W L. Spofford, mine superintendent. Organized May, 1905, under laws of New York, with capitalization $10,000, shares $100 par, as successor of Nichols Chemical Co. Controls, through ownership of majority of stock, the San Carlos Copper Co., of Tamaulipas, Mexico.

The Albert mine, at Capelton, area 640 acres, carries lenses of chalcopyrite and pyrite, the former carrying circa 5% copper and the latter about 38% sulphur. Development is by 6 shafts, 4 under 500′ depth each, with one of 800′ and one of 2,000′, with upwards of 5 miles of workings.

Equipment includes steam power, a 150-ton concentrator, and a smelter. There also is an acid plant at Capelton, completed, 1907, at a cost of about $1,000,000, with capacity of about 150 tons of commercial sulphuric acid daily,

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which is one of the most complete in existence. The acid plant burns pyrites, and cupriferous cinder is smelted in a small blast-furnace, producing 1 to 2 tons daily of matte averaging about 40% copper, with small silver contents, which is shipped to the Laurel Hill works for refining, production being circa 350,000 lbs. fine copper yearly.

The company also operates the Davis pyrite mine, at Davis, Franklin Co., Mass., which produces slightly cupriferous pyrites, the principal values being in the sulphur, with copper as a small by-product.

The Laurel Hill works include a smelter and electrolytic refinery, with steam and electric power. Material treated is mainly ores and matte from outside producers in the smelter, and western blister copper in the electrolytic plant.

The Laurel Hill smelter has 10 reverberatory furnaces, taking 40-ton charges, with hearth-linings of quartz sand containing a small quantity of feldspar, each furnace heating a tubular boiler with waste gases. There are two 46x120" Herreshoff water-jacket blast-furnaces, of 210 tons rated daily capacity each. Matte and slag flow, in an uninterrupted stream, to a large settler, whence slag skims into pots, and matte is tapped into an iron bed. Fuel charges average 14%. Waste gases pass into a 1,000' main flue, of iron and brick, leading to a 300' chimney. About 100 tons of flue-dust, recovered monthly, is briquetted and resmelted. The first-fusion product is a matte of 40 to 60% copper tenor, which is resmelted in a water-jacket blast-furnace, with 9% coke charges.

The converter department of the Laurel Hill works has 4 stands, tilted by hydraulic accumulators, with 12 shells, linings for which are made of 85% crushed quartz and 15% clay, ground and mixed in 3 silica-mills with revolving bottoms, linings being tamped by hand, to a thickness of 18". The linings last from 12 to 16 blows, and the shells vary in capacity, according to the state of linings, from 2 to 6 tons each. The converter blast, at only 8 to 10 lbs. pressure per square inch, is furnished by 100-h. p. and 120-h. p. Connersville blowers. The final converter product is blister copper assaying 99 to 99.5% copper, 50 to 100 oz. silver and 1 to 2 oz. gold per ton. There is a Herreshoff casting table, with 9 moulds, casting anodes. After electrolytic refining cathodes are melted down, in 8 reverberatory furnaces, taking charges of 30 to 45 tons each.

The Laurel Hill electrolytic plant is operated on the series system, with a current of 800 amperes, at 155 volts, generated by 17 dynamos, and the plant has 120 tanks. Anodes are cast ¼x16x59", with an average weight of 57 lbs., and are smoothed by passing between rolls, after casting. The final product is cast mainly into wire-bars, in moulds painted with a mixture of lampblack and benzine after each casting. This company enjoys a deservedly high reputation for the purity of its product and the efficiency of its metallurgical practice.

JOHN NICHOLSON & SONS, LTD. **ENGLAND.**

Office: Leeds, Eng. Mine office: Hunslet, Yorkshire, Eng. Property is copper reduction works using the wet process for extracting values from cupriferous cinders remaining from the burning of iron pyrites for making sulphuric acid.

NICKEL-COPPER CO. **ONTARIO.**

Office and mine: Worthington, Algoma, Ont. Company experimented with a new process of reducing nickel-copper ores, with the result of failure. Mine idle some years, finances muddled and company apparently hopelessly involved.

NICKEL PLATE MINE. **BRITISH COLUMBIA.**

Owned by Daly Reduction Co.

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NIGHT HAWK MINING CO. **WASHINGTON.**

Office: 201 Uihlein Bldg., Milwaukee, Wis. Mine office: Loomis, Okanogan Co., Wash. W. E. Stevens, president; A. W. Schroeder, vice-president; H. D. James, secretary and general manager; Chas. A. Druse, treasurer; preceding officers, P. Meehan and Edward Kolb, directors; Chas. T. Peterson, superintendent. Organized 1901, under laws of Montana, with capitalization $5,000,000, shares $1 par.

Lands, 65 claims, 10 fractional, area circa 1,250 acres, also 150 acres miscellaneous lands, including a millsite and townsite, on Mount Ellemeham, in the Wannicut Lake district, east of the Similkameen River. Company bought the Grand View property, at Loomis. Development is by 3 shallow shafts and 4 tunnels, longest circa 1,200′. Property shows numerous fissure veins, of which 5 have been partly developed, these ranging 6′ to 10′ in width, carrying estimated averages of 8% copper and 1 oz. gold per ton, which estimate unquestionably is excessive.

Equipment includes an electric plant, installed 1908, and a 20-stamp mill, bought, 1908, from the Grand View Mining Co. Property considered promising.

NIKKO COPPER WORKS. **JAPAN.**

Owned by Furukawa Mining Co.

NIKOLAJAV WORKS. **RUSSIA.**

Office and works: Nijni Novgorod, Russia. Property is a copper reduction plant, with an electrolytic refinery of 70 tanks having multiple arrangement of electrodes, with a daily capacity of 1 ton of electrolytic copper.

NILPENA COPPER MINING CO., LTD. **AUSTRALIA.**

Mine office: Blinman, South Australia.

NIPISSING COPPER & SILVER CO., LTD. **ONTARIO.**

Office: 609 Temple Bldg., Toronto, Ont. Mine office: Cobalt, Nipissing, Ont. A. Aubin, president; Duncan Donald, vice-president; F. Asa Hall, secretary; T. Baycroft, mine manager. Organized under laws of Ontario, with capitalization $3,500,000, shares $1 par. Lands, 2,200 acres, said to show a 19′ vein of sulphide ore assaying 11% copper and 41 oz. silver per ton. Company not regarded favorably, on account of the extravagant nature of its advertising.

NIPPER CONSOLIDATED COPPER CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. F. August Heinze, general manager; Stanley Gifford, secretary and treasurer. Capitalization $3,750,000; bonded debt, $2,500,000. Is a subsidiary corporation of the United Copper Co. Lands sold, 1906, to Butte Coalition Mining Co.

NIPPER MINE. **MONTANA.**

Owned by Butte Coalition Mining Co.

NISHINOKAWA MINE. **JAPAN.**

Mine office: Oboki-mura, Nii-gori, Iyo, Japan. Property shows lenses of 3′ to 12′ thickness, in quartz-schists carrying chalcopyrite associated with sphalerite, pyrite, magnetite and hematite, with quartz gangue, assaying 3 to 4% copper. Production was 183,415 lbs. fine copper in 1900; 242,215 lbs. in 1903, and 164,645 lbs. in 1907.

NIZINA GOLD & COPPER CO., OF ALASKA. **ALASKA.**

Dead. Formerly at McCarthy Creek, Copper River district, Alaska. Described Vol. VII.

N'KANDHLA SYNDICATE, LTD. **NATAL.**

Office: 1 Great Winchester St., London, E. C., Eng. A. Lee, secretary. Organized March 13, 1902, under laws of Great Britain, with capitalization £2,000, shares £1 par; issued, £1,800. Property was prospecting rights over 4 blocks, each 600 yards square, on the Umhlatuzi river, N'Kandhla district, Zululand. Moribund and should be buried.

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NOBLE GOLD MINES, LTD. **MONTANA.**

Dead. Was organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands were 11 claims, area 320 acres, in the Silver Star district, said to carry gold and copper ores, and company claimed to have a mill. Formerly at Sheridan, Madison Co., Mont.

NOBLE MINING & MILLING CO. **MONTANA.**

Office: 209 Railway Exchange Bldg., St. Louis, Mo. Mine office: Sheridan, Madison Co., Mont. S. M. Kennard, president; J. H. Wyeth, secretary and treasurer; D. H. Noble, general manager. Organized 1887, under laws of Montana, with capitalization $2,000,000, shares $10 par.

Lands, 7 claims, area 75 acres, patented, also a 20-acre millsite, in the Wisconsin district, carrying fissure veins in gneiss, of which two 4′ veins are developed by a 200′ shaft and by tunnels of 16′, 200′, 333′ and 2,150′, showing silicous sulphide ores claimed to average 1.5% copper, 10 oz. silver and $60 gold per ton. Equipment includes a small hoist and a 2-drill Ingersoll-Sergeant air-compressor. Has a small concentrator and a 10-stamp mill. Presumably idle.

NOGALES COPPER CO. **ARIZONA & MEXICO.**

Dead. Reorganized, 1904, as Black Mountain Mining Co. Formerly at Nogales, Santa Cruz Co., Ariz. Described Vol. IV.

NOLANGENI NICKEL & COPPER SYNDICATE, LTD. **CAPE COLONY.**

Mine office: Mount Ayliff, Griqualand, Cape Colony. A. E. Gilson, E. S. Campbell, J. Taylor and Maj. A. Webster, directors; J. P. Johnson, engineer. Capitalization £10,000, vendors taking £200 cash and £7,800 in shares. Lands are 2 areas, bought of E. S. Campbell, showing surface ores assaying up to 0.97% copper and 2.08% nickel. A short tunnel shows chalcopyrite disseminated in pyrite, assaying 7.6% copper and 4.89% nickel.

NOME-MONTANA-NEW MEXICO MINING CO. **NEW MEXICO & MONTANA.**

Office: Iron Blk., Milwaukee, Wis. Mine offices: Tusas, Rio Arriba Co., N. M., and Elliston, Powell Co., Mont. Chas. E. Freet, president; Geo. C. Weiss, secretary. Organized 1902, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands include 8,000 acres of placer ground, on creeks near Nome, Alaska, estimated by company to carry an average of $1 gold per cubic yard of gravel, which probably is much too high, also 6 claims adjoining the Copper Cliff mine, near Elliston, and 3 claims in the Bromide district of New Mexico, showing copper and lead sulphides. Is said to have a bucket dredge working in Alaska. Montana and New Mexico properties idle. Is not regarded favorably.

NONESUCH MINE. **MICHIGAN.**

Office: 78 Prospect Ave., Milwaukee, Wis. Mine office: Ontonagon, Ontonagon Co., Mich. A. K. Camp and M. P. O'Brien, owners; Thos. Wilcox, superintendent. Lands, 640 acres. This is the pioneer and principal mine of the Porcupine Mountain district, carrying native copper freely in an argillaceous sandstone-conglomerate. Property was idle for many years, until tested, under option, 1906-1907, through diamond drill borings, by the Calumet & Hecla Mining Co. Very fully described Vol. II.

NONOALCO REFINERY. **MEXICO.**

Owned by Société Affinage des Metaux.

SOCIEDAD FRANCESCA DE MINAS y FUNDICION DE NONOGASTA. **ARGENTINA.**

Mine and works office: Nonogasta, Rioja, Argentina. Lands include the Andueza, Atacama, Muerto and San Toribio copper mines, also various silver mines, in the Tigre district. Ores of the Andueza are claimed to average 5 to 20% copper, 3 oz. silver and 2 oz. gold per ton, which either is an excessive

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estimate, or veins are very narrow. Has steam power and a small smelter, built 1887 to treat dry silver ores, but altered to smelt copper.

NONPAREIL CONSOLIDATED COPPER CO. **WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. Dr. S. P. Ecki, president; Monroe Harmon, vice-president; F. G. Mahlman, secretary; R. S. McCreery, treasurer. Lands, adjoining the Sunset, show 3 veins, slightly developed.

NONPAREIL COPPER MINING CO. **IDAHO.**

Office: Wallace, Idaho. Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Amos M. Stroud, president and general manager. Lands, 8 claims, patented, across Willow Creek from the Carney, having a tunnel planned to give a back of 700′ at length of 1,200′. Surface ores have assayed up to 1.5% copper and 8 to 19 oz. silver per ton.

NORDDEUTSCHE AFFINERIE. **GERMANY.**

Office and works: Hamburg, Germany. Works have a yearly capacity of about 3,000 metric tons of refined copper. Electrolytic plant includes 600 tanks, with multiple arrangement of electrodes.

NORMANBY SYNDICATE, LTD. **AUSTRALIA.**

Office: 16 O'Connell St., Sydney, N. S. W., Australia . Mine office: Mount Perry, Bowen Co., Queensland, Australia. J. G. Tait, secretary; W. E. Dent, mine manager. Lands, 240 acres, freehold, known as the Harpur's Hill mine, circa 8 miles northwest of Mount Perry, in the Tenningering district. In 1907 the Lady Jane shaft, having 4 levels, was retimbered, the White shaft was cut down to 3-compartment size and retimbered and the Manning shaft was retimbered, deepened and given a new hoist, and the tunnel was extended 400′. Principal production, 1907, was from Virgin No. 1 and Virgin No. 2 shafts, which yielded good ore. Selected ores, averaging circa 13% copper and 10 to 15 dwts. gold per ton, were sent, first to Aldershot smelter, and later to Mount Perry, for reduction, and company plans building a small smelter at Harpur's Hill. Property considered promising. Employs circa 125 men.

NORMANTON-CLONCURRY RAILWAY & COPPER MINES, LTD. **AUSTRALIA.**

Dead. Name changed, 1902, to North Queensland Railway Co., Ltd.

NORSK-BELGISK MINEKOMPANI. **NORWAY.**

Dead. Formerly at Melhus, Flaa sogn, Trondhjem, Norway. Described Vol. VI.

NORTH ALICE MINING CO. **MONTANA.**

Office and mine: care of John Bielenberg, Butte, Silver Bow Co., Mont. Organized Dec. 8, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par. Presumably idle.

NORTH AMERICAN COPPER CO. **NEW MEXICO.**

Office: 30 Trust Bldg., Williamsport, Pa. Mine office: Lordsburg, Grant Co., N. M. J. W. Christman, president and general manager; Dr. F. A. Godcharles, vice-president; K. E. Jackson, secretary; D. F. Dieffenbacher, treasurer; preceding officers, J. W. Villinger, Samuel Stabler, C. E. Heller, G. M. Metzger, W. Hager and C. A. Barron, directors. Organized Apr. 30, 1906, under laws of Arizona, as successor of North American Mining Co., with capitalization $750,000, increased later to $1,000,000, shares $1 par; issued, $748,000. Annual meeting, last Monday in April.

Lands, 280 acres, in the Pyramid district, including the Nellie Bly and Cobra Negra groups, showing fissure veins in porphyry carrying argentiferous copper oxides, carbonates and sulphides, giving assays up to 18% copper, 15 oz. silver and $10 gold per ton, said by company to average 5.5% copper, the ore body being stated, by an observer not connected with the company, to carry flakes of copper in absolutely unpayable percentages.

Equipment includes steam power, with a hoist good for 1,000′ depth, sev-

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eral mine buildings and 4 dwellings. Company shipped, 1907, to El Paso and Douglas smelters, 98 carloads of ore netting $43,333.36. Company plans moving the Lena concentrator to the Nellie Bly mine, and deepening the shaft 300'.

NORTH AMERICAN COPPER CO. **OREGON.**

Office: Baker City, Ore. Mine office: Burkemont, Baker Co., Ore. A. B. Spencer, president; W. G. Drawley, vice-president; D. W. C. Nelson, secretary, treasurer and general manager. Organized circa 1907, with capitalization $3,000,000, shares $1 par, as a reconstruction of the North American Mining Co., which was organized, 1905, as a reconstruction of a company organized 1898 under same title. Has authorized a $25,000 bond issue.

Lands, 26 claims, 4 patented, also 440 acres of timber land, circa 25 miles northeast of Baker City, showing a mineralized zone up to 500' in claimed width, opened by numerous pits and trenches, and by a 2-compartment incline main shaft, circa 300' deep, said to have cut several low grade bodies of copper ore carrying circa $5 per ton in combined silver and gold values. Property shows auriferous and argentiferous ores of copper assaying up to 10% in copper tenor, also a little native copper.

Equipment includes a first-motion hoist and a small air-compressor. The old management lied atrociously in its advertisements, until the reorganization in 1905, but apparently the new officials have no connection with the old management.

NORTH AMERICAN COPPER CO. **WYOMING.**

Dead. Succeeded by Penn-Wyoming Copper Co. Formerly at Encampment, Carbon Co., Wyo. Fully described Vol. IV.

NORTH AMERICAN EXPLORATION CO. **ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. Geo. W. Middelton, superintendent. Ores carry gold and copper. Idle some years and apparently moribund.

NORTH AMERICAN EXPLOITATION CO. **ARIZONA & MONTANA.**

Office: 327 New York Life Bldg., Chicago, Ills. William R. Everett, president; Chas. W. Cheney, vice-president; Davis Ewing, secretary; Western Trust & Guaranty Co., treasurer; Frank F. Day, managing director; Frank A. Summerilh, assistant general manager. Capitalization $10,000,000, shares $1 par. Controls, or did control, under lease, the Rambler Mining & Smelting Co., of Wyoming, Mormon Girl Mining Co., of Arizona, Bradshaw Mining Co., of Arizona, and sundry gold mining companies. The North American Exploitation Co. claimed to own 54% of the Rambler stock, 91% of the Bradshaw and 96% of Mormon Girl stock. Company has sold stock on a special repayment contract, alleging that under these terms investments will be repaid in full, with interest, and that the stock is certain to advance immediately upon the installation of smelters. The plan of promotion is a self-evident delusion, as no corporation, even those of the most philanthropic intent, sells stock that is backed by a thoroughly sound guaranty. Stockholders must take their chances, and a guaranteed stock always should be viewed with distrust. Company claimed, in an advertisement, March, 1906, to have 40,000 tons of ore developed, ready for smelting, and to plan installing copper furnaces, of some patent design, at each property, in the near future, notwithstanding which the Mormon Girl property, controlled by this company, was sold for debt, early in 1906, this property bringing the truly magnificent price of $400, cash, at sheriff's sale. The Rambler Mining & Smelting Co. has been reorganized. Company is regarded with deep suspicion as a mere bit of stock-jobbery, or something worse.

NORTH AMERICAN LEAD CO. **MISSOURI.**

Office: 824 Columbus Savings & Trust Bldg., Columbus, Ohio. Mine office: Fredericktown, Madison Co., Mo. Jos. F. Davidson, president; E. A. Cole, vice-

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president; Wm. D. McCullough, secretary; V. Hybinette, assistant general manager; preceding officers and N. Gumble, directors. Employs 400 men. Organized 1906, under laws of Ohio, with capitalization $2,000,000, shares $100 par, divided into 5,000 shares of 8% preferred and 15,000 shares of common stock, of which 3,500 shares preferred and all common stock are issued. Bonds, $150,000 authorized, at 6%; issued, none.

Lands, 2,000 acres, about 2 miles east of Fredericktown, including the old Buckeye copper mine, which, circa 1860, was worked in a small way for copper. Property is a short distance southeast of the celebrated Mine La Motte, country rock being magnesian limestone, with porphyritic intrusions, carrying practically horizontal blanket veins, the ore body having a width of about 500′ and being traceable about 4 miles, carrying chalcopyrite, linnéite, galena and marcasite, estimated by company to average 5% copper, 4% lead, 2% nickel and 1% cobalt.

The predecessor of the present company opened, circa 1901, a new lead mine, northeast of the old copper mine, and, in addition to opening one of the best lead mines in southeastern Missouri, also has a very extensive body of copper-nickel-cobalt-lead ore. The mine has shafts of 280′, 200′ and 125′, with a total of about 5,000′ of workings, and is estimated to show about 1,000,000 tons of workable ore.

Equipment is excellent, including a 2,000-h. p. steam plant, 600-kw. electric plant and 350-h. p. air plant, 2 hoists, and Norwalk and Laidlow-Dunn-Gordon air-compressors of 50 drills combined capacity.

The reduction plant includes a 500-ton lead concentrator and a copper smelter, latter, begun July, 1906, and completed late 1907, having been built on the plans and under the supervision of Mr. Hybinette, who was general manager of the Orford works for 10 years, and was the inventor of the greater part of the processes for nickel reduction used at those works, which unquestionably lead in the metallurgy of nickel. Several new processes and modifications of old processes were devised by Mr. Hybinette for the North American plant, which has shaft-furnaces, and a complete electrolytic refinery, for the making of both copper and nickel.

The company has a 2-mile standard-gauge railroad, with one locomotive, connecting with Iron Mountain railway at Fredericktown.

Production includes varying quantities of lead concentrates, also high grade electrolytic copper, electrolytic nickel in cathodes, cobalt oxide and lead concentrates, amounting, 1907, to 125,000 lbs. electrolytic copper, 50,000 lbs. electrolytic nickel and 15,000 lbs. cobalt oxide monthly. Production, 1908, was circa 500,000 lbs. fine copper. Property considered valuable and management good.

NORTH AMERICAN MINING CO. **NEW MEXICO.**

Dead. Succeeded, 1906, by North American Copper Co. Formerly at Lordsburg, Grant Co., N. M. Fully described Vol. VI.

NORTH AMERICAN MINING CO. **OREGON.**

Dead. Succeeded, circa 1907, by North American Copper Co. Formerly at Burkemont, Baker Co., Ore. Fully described Vol. VI.

NORTH AMERICAN PROSPECTING & MINING ASSOCIATION. **COLORADO.**

Office: 405 Temple Court Bldg., Denver, Colo. Mine office: White Pine, Gunnison Co., Colo. Chris. C. Sierk, president and general manager; Jas. T. Chase, secretary. Lands, 60 acres, showing 7 contact veins, between limestone and shale, said to give average assays of 2% copper, 25% lead and 20% zinc, from carbonate and sulphide ores. Has water power and a small concentrator, making 55% zinc concentrates and 55% lead concentrates, carrying copper and gold values, when working. Idle.

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NORTH ARKANSAS ZINC, LEAD, COPPER, SILVER & GOLD MINING CO. **ARIZONA, ARKANSAS & CALIFORNIA.**

Dead. Formerly at Morristown, Maricopa Co., Ariz. Described Vol. VII.

NORTH BAY SMELTER. **ONTARIO.**

Owned by North Ontario Reduction & Refining Co., Ltd.

NORTH BISBEE DEVELOPMENT CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. H. S. Jones, president; W. E. Davis, vice-president; Oscar Zapf, secretary; E. H. Clark, superintendent. Organized Apr. 19, 1906, under laws of Arizona, with capitalization $600,000, shares $3 par, increased, Apr. 9, 1907, to $999,999, shares $3 par. Lands, 23 claims, area 400 acres, in Tombstone Cañon, near the Mountain View Development Co., circa 4 miles northwest of Bisbee, opened by a shallow shaft and a 260′ tunnel, showing ore assaying up to 19.7% copper, with small gold and silver values. Has gasoline power.

NORTH BURRO COPPER MINING CO. **NEW MEXICO.**

Office: Silver City, N. M. Mine office: Leopold, Grant Co., N. M. Geo. Sublett, manager. Lands, 14 claims, adjoining the National Copper Mining Co., in Whitewater Cañon, Burro Mountains.

NORTH BUTTE EXTENSION COPPER MINING CO. **MONTANA.**

Office: 1911-74 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. W. T. Van Brunt, president; Thos. Lavell, vice-president; Fayette Harrington, secretary and treasurer; D. S. Harding, assistant secretary and treasurer; G. A. Lauzier, managing director; preceding officers, Geoffrey Lovell, Chas. Passmore and Wm. McDermott, directors; John A. Ryan, superintendent. Organized October, 1906, under laws of Arizona, with capitalization $5,000,000, shares $5 par, as North Butte Extension Mining Co., and name changed, January, 1907, to present title. Is said to have circa 2,500 shareholders. In August, 1908, contemplated an issue of $400,000 five-year 6% bonds, but apparently was unable to place same.

Lands originally were 4 claims and 2 millsites, area 55 acres, lying north of the Butte & London and supposed to carry the extension of the Black Rock vein. In March, 1908, the company added the Michigander and Third Sphinx claims, on which options were extended, October, 1908. The company allowed its options on the Occidental and Free Trade claims to lapse, 1908, after payment of $90,000 on the bonds. Apparently the only property owned outright is the Black Crow fractional claim, of circa 2½ acres area, and the Clipper and Assay millsites.

Development was by a 600′ shaft, planned to have been sunk to 1,000′, which proved to be quite wet. A crosscut on the 300′ level showed a small vein, slightly mineralized, and on the 520′ level a plat, cut April, 1908, showed a stringer of 2″ to 18″ width, carrying ore assaying up to 20% copper, 3 oz. silver and 50 cents gold per ton.

The company planned a large electric installation, including a double-drum hoist, air-compressor and pump, but failed to get it.

A curb pool in the stock of this company was badly nipped, through the dumping of shares held by a bank, as collateral for a loan, hence the property has few friends among the New York curb brokers, who rest under the impression that they were handed a package, by friends in Butte.

It is alleged that G. A. Lauzier, vendor, made a contract, Jan. 17, 1907, with W. T. Van Brunt, the president, giving an option on 700,000 shares at 76 2/7 cents per share, and that, by conspiracy, false and fictitious shares, to the amount of 222,150, were issued from the treasury, with a further over-issue of 100,000 shares, held by Lauzier, and there also is alleged a misappropriation of $50,000.

The first bankruptcy proceedings begun against the vendors were settled

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in the company's favor, but a second series was started. Both Lauzier, the vendor, and John A. Ryan, the manager, sued the company.

In October, 1908, sundry interests planned a reorganization, under the laws of Maine, with capitalization $1,500,000, shares $1 par, these plans calling for the elimination of the entire former directorate, which is in exceedingly bad odor with investors. The title selected for the proposed reorganization was North Butte Extension Development Co., and the plan of reorganization called for the issue of 1,000,000 shares of stock in the new corporation, in exchange for old shares on a parity, plus payment of a 50-cent assessment, in 2 installments, the first money to be turned over to the old company for settlement of its debts, which are pressing. The company owed, late 1907, a large balance on its bonds on 2 claims, in addition to floating indebtedness estimated at $125,000, but, on June 27, 1908, the floating debt, amounting to circa $70,000, was partially met by the sale of notes. The entire proposition has been badly handled, and everybody connected with it comes out with a smirched reputation, while some of the principals can congratulate themselves as lucky in having escaped jail.

NORTH BUTTE EXTENSION MINING CO. **MONTANA.**

Dead. Was organized October, 1906, under laws of Arizona, with capitalization $5,000,000, and title changed, January, 1907, to North Butte Extension Copper Mining Co. Formerly at Butte, Silver Bow Co., Mont.

NORTH BUTTE MINING CO. **MONTANA.**

Office: 508 Lyceum Bldg., Duluth, Minn. Mine office: Butte, Silver Bow Co., Mont. Employs circa 900 men. Capt. Jas. Hoatson, president; Chas. A. Duncan, vice-president and treasurer; Jos. Cotton, second vice-president and solicitor; preceding officers, Wm. J. Olcott, John Uno Sebenius, Chester A. Congdon, James Gayley, Thomas F. Cole and Daniel M. Clemson, directors; Frederic R. Kennedy, secretary; Arthur C. Carson, general manager.

Organized Apr. 5, 1905, under laws of Minnesota, with capitalization $9,000,000, shares $15 par; issued, $6,000,000. American Loan & Trust Co., Boston, transfer agent; Old Colony Trust Co., Boston, registrar. Shares are listed on the Boston Stock Exchange. Has about 5,000 shareholders.

Dividends have been as follows: $1.25 per share in 1905; $7.25 per share in 1906; $6 per share in 1907; $3 per share in 1908; a total of $17.50 per share, or $7,000,000, for four years' operations. Last regular dividend was passed at end of 1907, owing to depression in the metal market. Net earnings, 1907, were $2.14 per share. Company ended 1908 earning at the rate of about $7 per share per annum. Balance sheet, at end of fiscal year March 31, 1907, gave actual cost of lands at $7,211,277.

Lands are circa 200 acres, mainly owned outright, but with some small fractional interests outstanding, in the case of several properties. The tract is as compact as could be expected in a district where claims are so irregularly located as in Butte, with small fractions so valuable as is the case. Holdings include the following claims: Speculator, Edith May, Jessie, Adirondack, John Emmett, Berlin, Ground Hog, Gustavus, East Gem, West Gem, Copper Dream, Croesus, Miners' Union, Eva, Emily, Snow Ball, Margaretha, Hancock, Lynchburg and Mill View. Several small fractional interests were exchanged, 1907, with the Davis-Daly Estates Copper Co. The Berlin group includes 5 claims, and the Ground Hog claim is a small 700′ fraction between the Jessie and Hancock. The lands are in the northern part of the proven portion of the Butte district, near the Anaconda and Boston & Montana mines.

The North Butte is the largest single mine in the camp, and also mines the highest average grade of ore of any Butte mine. The ore is typical of the Butte district, including much high grade chalcocite, frequently massive, but mainly disseminated, with considerable quantities of enargite, and smaller

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proportions of other secondary sulphides and chalcopyrite. All ores are more or less argentiferous, frequently carrying high silver values.

Development is mainly on the Speculator, Jessie and Edith May properties, the lands carrying about one-half mile of the Edith May vein. All ore is raised through the Speculator shaft, and the mines are connected underground with the High Ore mine of the Anaconda, and the new Badger State shaft of the Boston & Montana. The old Speculator shaft, taken over in bad condition, was cut down to 4 compartments, and entirely retimbered, in 19 weeks, in 1905, during which time ore was hoisted through the High Ore shaft. The Speculator shaft, 1,700′ deep when the property was taken over, 1905, is now 2,240′ deep, with levels opened at 200′ intervals, from the 1,400′ to 2,200′ levels inclusive. At the end of 1908 stoping was in progress on the 1,400′, 1,600′ and 1,800′ levels, with development in progress on the 2,000′ and 2,200′ levels. This shaft develops the Speculator, Edith May, Gem and Jessie veins.

The veins are treacherous, requiring heavy timbering and close attention, square sets being employed throughout, with monthly timber requirements of about 1,000,000′, board measure. No waste is hoisted, all ore being sorted underground, and culls used for dry filling. Cull material is largely low grade ore, a considerable portion of which probably will be available for smelting at some future date, and can be extracted merely by loading. On Apr. 1, 1907, the mine had about 18,000′ of workings, and 6,961′ of new workings were made in 1907. The company ended 1907 with 4 years' ore reserves, and at the end of 1908 had ore reserves of at least 8 years, the openings on the 2,000′ and 2,200′ levels at least doubling the amount of former reserves, with every prospect of immense bodies of exceptionally rich ore at greater depth. The first ore was hoisted September, 1908, from the 2,200′ level.

The Edith May vein, the principal ore body of the property, as now developed, is 18′ to 42′ in width, carrying phenomenally high grade ores. This vein is opened at 200′ intervals from the 800′ to the 2,200′ levels, carrying much chalcocite and bornite, with considerable enargite, the vein increasing in richness at depth, the north drift on the 1,800′ level of the Edith May vein being the show stope of Butte, and one of the most phenomenal stopes ever opened in any copper mine. The Edith May vein divides east of the shaft, and on the 1,600′ and 1,800′ levels shows no commercial ore in the south branch, but apparently these branches should unite, some distance west of the shaft.

The Jessie mine has an old and idle 500′ shaft, extraction being through the Speculator, which reaches the Jessie vein by crosscuts. The Jessie shows a well-mineralized 12′ vein, with a paystreak of high grade chalcocite on the 1,600′ level.

The Gem mine has an old 700′ shaft, now idle, and to all practical purposes may be considered a portion of the Jessie workings.

The Miners' Union claim, reached on the 1,600′ level through the Speculator shaft, via the Edith May vein, shows a fine body of high grade ore.

The Ground Hog mine, reached from the Jessie workings, shows good ore on the 1,600′ level.

The Adirondack mine has an old 500′ shaft, and presumably will be opened by crosscuts from the Speculator shaft.

The Berlin mine, to the north of the Speculator, Edith May, Gem and Jessie, has an old 350′ two-compartment shaft, out of commission, and a new shaft of larger capacity is planned. The Berlin has been opened from the Speculator shaft by crosscuts on the 1,000′ and 1,200′ levels, showing rather disappointing ore of low average grade, but, late 1908, crosscutting was in progress on 3 levels, from the Speculator shaft, for the Berlin vein, the 1,600′

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crosscut showing low grade ore. The Berlin, however, should prove to carry higher grade ore with further development.

The Speculator shaft has a 128' steel gallows-frame, standing on a 41x60' concrete foundation, having self-dumping skips and pockets with a daily capacity of circa 1,500 tons of ore, as no waste is hoisted, all being used to advantage for underground filling.

The engine-house has a 20-ton traveling crane and a 32x72" Nordberg duplex-cylinder hoist, operating two cages in counterbalance, with two 8-ton Kimberley skips swung under each, hoisting with 1½" steel cable, and is capable of raising 2,000 tons daily from an average depth of 2,000', with capacity to hoist from a depth of 3,500'. An 18x36" duplex-cylinder hoist operates a double-deck cage in a third compartment, for handling men, material and timber, and the shaft has a fourth compartment for ladder and pipes.

The compressor-house, 24x70' in size, has a 40-drill air-compressor, with piston efficiency of 3,282 cubic feet of free air per minute reduced to a pressure of 70 lbs. per square inch.

The boiler-house has two batteries of boilers, including boilers of 500 h. p. capacity installed late 1907.

Ore is smelted by the Washoe works of the Anaconda. The original 3-year contract, made 1905, was renewed for 3 years June 1, 1908, the new contract reducing the cost of smelting by about $1 per ton, and providing for settlements on the basis of the average price of copper for the third month after delivery of ore, on the 14th day of the month, which is advantageous on a rising market, but disadvantageous on a falling market. The North Butte contract with the Washoe smelter permits the North Butte to supply the smelter to one-fifth of its capacity, which nominally is 10,000 tons, and actually is nearly or quite 12,000 tons, providing for smelting an output from the North Butte of 2,000 to 2,400 tons daily, which is beyond the present possible productive capacity of the mine, with a single shaft. The Butte Reduction Works treated some ore for the North Butte, when the Washoe works were closed, 1907-1908.

Relations between the North Butte and the Amalgamated Copper Co. are very close and cordial. While this may prove to the disadvantage of the company at such times as the Amalgamated interests see fit to hold the umbrella over the metal market, there can be no question that, on the whole, the North Butte is in better position for being on such friendly terms with its powerful neighbor.

Production for fiscal years ending March 31 has been as follows: 30,954,788 lbs. in 1906; 32,865,907 lbs. in 1907; 16,520,062 lbs. in 1908. For calendar year 1908 the production was circa 37,500,000 lbs. Production was curtailed for the fiscal year ending March 31, 1907, by repairs on the shaft and the installation of a new hoisting plant, and for fiscal year ending March 31, 1908, production was greatly curtailed by suspension of output late in 1907 until early 1908. Company shipped, for last 3 quarters of 1908, circa 1,400 tons daily of ore returning 3,500,000 to 4,000,000 lbs. fine copper monthly.

Gross earnings and net profits, after the deduction of all expenditures for improvements, have been as follows, for fiscal years ending March 31: $5,005,788 gross earnings, from copper, silver and gold produced, with net profits of $2,720,670, in 1906; gross earnings of $6,694,844 and net profits of $3,623,162 in 1907; gross earnings of $2,703,971 and net profits of $857,880 in 1908. Company ended fiscal year March 31, 1908, with $174,774 cash on hand, with accounts receivable of $10,620, and accounts payable of $74,412.

Returns to the State of Montana, for year ending June 1, 1908, gave a production of 284,003 short tons of ore, with average gross values of $11.36 per ton, with gross proceeds of $3,224,763 and net profit of $1,113,647. Costs were

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$3.49 per ton for mining and $3.76 per ton for reduction, with average cost of $7.43 per ton. Apparently the gross costs for refining, freight and selling charges are about 2.05 cents per lb. Mining costs, for year ending June 1, 1908, of $3.49, were $1.40 per ton lower than for the preceding year, and mining costs are said to have been reduced to $2.70 per ton, which is a very creditable figure. Costs for July, 1908, were 7.35 cents per lb. of copper, with average extraction of about 6.5%, or about double the average of the Anaconda, and costs were said, October, 1908, to be between 7 and 8 cents per lb. Production includes circa 150,000 oz. silver monthly, with considerable gold values, on a basis of 1,400 tons of ore daily, or nearly $1,000,000 yearly returns from the precious metals.

Apparently the company's ores returned an average of about 5% copper only, for fiscal year ending March 31, 1907, as against 7% in the preceding year, but this apparent decline in values was due to the policy of the company in extracting largely second class ores, during the era of high prices for copper. This policy greatly increased the gross cost per lb., but secured a handsome profit on ores that would net the company nothing during a period of low prices. While this policy is criticized, it seems fundamentally sound, as it permits the profitable extraction of much ore that otherwise would be unavailable.

The North Butte is capable of making nearly or quite the cheapest copper produced from any mine in the camp. The company has been criticized for its smelting contract with the Anaconda, but a careful consideration of the facts leads to the conclusion that its contract is advantageous, rather than the reverse, to the North Butte Mining Co. The property is capable, with its present equipment, of producing, at its full capacity, from high grade ores, nearly or quite 60,000,000 lbs. fine copper yearly, but is following a better policy by extracting considerable quantities of medium grade ores in periods of low prices for copper, and large quantities of low grade ores in times of high copper prices. The North Butte is a magnificent property, and is excellently managed.

NORTH BUTTE MOUNTAIN COPPER CO. **MONTANA.**

Letter returned unclaimed from former office, 803-43 Exchange Place, New York, N. Y., and from former mine office, Butte, Silver Bow Co., Mont. Thos. A. Marlowe, president; Chas. M. Webster, vice-president; J. L. Smith, treasurer; E. L. Mayo, secretary and manager; preceding officers, F. E. Kessler, H. L. Wilson, Thos. Bryant, M. S. Largy, T. B. Miller and H. R. Cunningham, directors; Jas. E. Higgins, superintendent. Organized April, 1906, under laws of Montana, with capitalization $5,000,000, shares $5 par. Lands, 8 claims, area circa 150 acres, lying north of Walkerville and northwest of the Butte & Bacorn, including the J. I. C. group, 8 claims, circa one mile north of the Jessie mine of the North Butte, said to have a good surface showing, with 5 veins, one of which, of 7′ estimated width, shows a little copper and silver, at depth of 35′. Lands are said to include 9 distinct veins, with one, of 6′ to 8′ width, giving surface assays of 0.2 to 1.25% copper, 6 to 14 oz. silver and $4 to $6 gold per ton. Idle at last accounts, but said to have cash on hand, and to plan resumption.

NORTH BUTTE SUMMIT COPPER MINING CO. **MONTANA.**

Dead. Was organized January, 1907, by residents of Butte. Lands were 7 claims, in the Lost Child district, circa 5 miles northeast of Butte, showing ore giving assays of 1.3% copper. Formerly at Butte, Silver Bow Co., Mont.

NORTH CAROLINA & VIRGINIA DEVELOPMENT CO. **NORTH CAROLINA & VIRGINIA.**

Dead. Formerly at Virgilina, Halifax Co., Va.

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NORTH CERRO MURIANO COPPER MINING CO., LTD. **SPAIN.**

Office: 6 Queen Street Place, London, E. C., Eng. Mine office: Estación de Cerro Muriano, Córdoba, Spain. Lord Vaux, chairman; Richard Eshott Carr, resident agent; John Taylor, manager; preceding officers, J. P. Champney and Edgar Taylor, directors; W. H. Rundall, resident agent; H. F. Collins, mine superintendent; F. H. Williams, secretary. Organized March 8, 1906, under laws of Great Britain, with capitalization £250,000, shares £1 par; issued, £134,000 fully paid and £116,000 having 16s. per share paid in. Property was bought for £159,500, paid £29,500 cash and £130,000 in shares.

Lands, 155 hectares, adjoining the Cerro Muriano Mines, Ltd., circa 10 miles from Córdoba, showing extensive traces of ancient workings, presumably dating from Roman times. To June 30, 1907, company had made 2,873′ of workings.

NORTH CERRO MURIANO COPPER MINING CO., LTD. **SPAIN.**

Dead. Was succeeded, March 8, 1906, by North Cerro Muriano Copper Mines, Ltd. Formerly at Cerro Muriano, Córdoba, Spain. Described Vol. VI.

NORTH COAST MINING & MILLING CO. **WASHINGTON.**

Office: 508 Bankers Trust Bldg., Tacoma, Wash. W. W. Shenk, president; W. H. McAllister, vice-president; A. M. Richards, secretary and treasurer. Organized Jan. 2, 1908, under laws of Washington, with capitalization $1,500,000, shares $1 par. Lands, 3 groups, on Thunder Creek, in Whatcom and Skagit counties, Washington, said to carry 2 parallel veins of bornite and silver-lead ore.

NORTH COAST MINING & REDUCTION CO. **WASHINGTON.**

Office: 547 First National Bank Bldg., Chicago, Ills. Mine office: Darrington, Snohomish Co., Wash. J. W. McCoy, president; J. C. Moorehouse, treasurer; Glenn M. Deuel, secretary. Organized under laws of Arizona, with capitalization $5,000,000. Has authorized a $300,000 bond issue.

Lands, 300 acres, on Gold Mountain, known as the Chickamun-Forest group, claimed by company to have upwards of 2,000′ of tunnels, exposing more than $7,000,000 worth of ore, which is an overestimate, and to be capable of producing upwards of 5,000 tons of ore daily, which is a ridiculous perversion of the truth. Claims to plan a 500-ton mill. Advertisements make preposterous claims, and apparently company is merely a stock-jobbing enterprise.

NORTH COPPER CO., LTD. **SWEDEN.**

Office: 24 Queen Victoria St., London, E. C., Eng. W. Watson Rutherford, M. P., chairman; Andrew Findlay, secretary. Organized July 4, 1906, under laws of Great Britain, with capitalization £1,000,000, shares £1 par, half preferred and half deferred ordinary shares. Lands are 12 copper and zinc claims, area circa 100 acres, and the Inglamala iron mines, in the Province of Småland, Sweden.

NORTH COAST COPPER CO.

Office: Everett, Wash. Location of lands, if any, unknown.

NORTHEAST BUTTE COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Organized Feb. 8, 1906, under laws of Oklahoma, with capitalization $1,000,000, shares $1 par, by Martin P. Winston and others. Lands are north and west of the Butte & Bacorn. Idle.

NORTHERN COPPER (B. S. A.) CO., LTD. **RHODESIA.**

Office: Salisbury House, London, E. C., Eng. Mine office: Bulawayo, Rhodesia, South Africa. Lord Gifford, V. C., chairman; preceding officer, E. Davis, H. Wilson Fox and P. C. Tarbutt, directors; Bechuanaland Exploration Co., Ltd., and name changed June, 1899, to present title, with capitalization Thos. D. Davey, resident engineer; Tom Donald, secretary. Organized Feb. 16, 1895, under laws of Great Britain as Northern Territories (B. S. A.) Exploring

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Co., Ltd., and name, changed June, 1899, to present title, with capitalization £250,000, shares £1 par; issued, £178,000. Debentures, £45,900 outstanding, at 6%; issued 1903, redeemable at £105, December, 1908, and convertible, when fully paid, into £10 shares, on one month's notice, in writing.

The company large share interests in the Rhodesia Copper Co., Ltd., also in the Kafue and other corporations. Apparently the Bwana M'Kubwa mine, formerly owned by this company, has been sold to a subsidiary corporation, the Northern & General Syndicate, Ltd. Owing to the interchange of share ownerships between these different companies, it is extremely difficult to arrive at their true status, such vast and loose financing rendering the work of investigation extremely difficult, while the various companies give reports upon the properties in which they are interested, without detailed explanation of whether such properties are owned outright, or are merely interests owned through holding shares in other corporations possessing direct title.

Lands, originally were 500 square miles, near the Zambesi river, also 12,000 acres of coal lands and 220 gold claims in the Umniati and Guay districts, but 500 square miles were sold to the Rhodesia Copper Co., Ltd., leaving 5 blocks of 10 square miles each, on either side of the northern reach of the Kafue river, scattered over an area of 160 miles east and west by 100 miles north and south. Lands include the Silver King, Sable Antelope, North Star, Maurice Gifford, True Blue, Wonder Rocks, Crystal Jacket, Blue Jacket, Bob, Lou-Lou, Sugar Loaf, Lishambika, Inyarka, Kwemba, Hippo, and Beehive, in the main concession, also the Chanobi concession of 10 square miles, southeast of the main concession. Of the 11 so-called mines, but 3 are really worthy the name, these being the Chanobi, Silver King and Sable Antelope, the two latter being small, pockety mines. Apparently the lands are being prospected in connection with the Rhodesia Copper Co., Ltd.

The principal copper deposits so far located are at and near sundry ancient workings, located in a belt of limestone, about 10 miles wide, running nearly north and south for almost the entire length of the concession. The limestone belt is flanked and sometimes intruded by talcose, quartzose and micaceous schists, and by granite, feldspar and quartz-porphyries, the copper occurring as irregular deposits in limestone, and in veins traversing schists, with oxidation at surface, the predominant ores being tetrahedrite and chalcocite, with occasional bornite and chalcopyrite, the ores in schists being more highly oxidized than those in limestone. The company has secured ores in greater or less quantities, ranging from 2.5 to 50% copper tenor, and also has ores of lead and zinc, sundry gold claims and a 12" to 24" seam of bituminous coal, with indications of the existence of larger coal measures of better quality.

The company's main camp is at the Silver King mine, in south latitude 14° 36' 11" and east longitude 26° 55', twelve miles south of the northerly reach of the Kafue river. The main shaft was 205' deep at last accounts, the ore body, which apparently is a lense, pinching out before the bottom of the shaft was reached, with the possibility that other lenses will follow.

The Chanobi mine, 45 miles from the Silver King, has 5 shafts on 4 separate outcrops. No. 1 shaft is 100'; No. 2 outcrop has a north shaft of 92' and a south shaft of 98', latter showing favorable copper values at bottom; No. 3 outcrop has a 78' shaft showing chalcopyrite and occasional chalcocite; No. 4 outcrop shows copper carbonates on surface. Apparently the various outcrops are of the same small sulphide vein. The Chanobi has a warehouse, and a compound for native workmen.

The Sable Antelope has 3 shafts, showing high-grade chalcopyrite in a vein of 20' width, on the 50' level.

The Hippo mine has a 99' shaft, showing from depth of 34' to 99' a good vein of 4' 8" average width, assaying 21.36% copper and 2.4 dwts. to 13 dwts.

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gold per long ton. A second shaft, of 100', seems not to have developed anything of especial promise.

The True Blue mine has steam power and a pump. The Sugar Loaf mine has an immense ore outcrop standing 120' high, and a tunnel showing a considerable body of low-grade copper ore. No. 3 shaft of the Blue Jacket mine, 138' deep, shows carbonate copper ores and chalcopyrite.

Transportation is by traction engines to the nearest railroad, which is planned to reach the Kafue river eventually, and probably will touch the mines.

The management seems good, and some of the copper properties are considered promising, but further extensive development will be required before the company can become a producer, with any reasonable degree of safety, none of the properties having been opened to sufficient depth to give assured tonnage.

NORTHERN EXPLORATION CO. **BRITISH COLUMBIA.**

Office: 655 New York Blk., Seattle, Wash. Mine office: Gribbell Island, Skeena River division, Cassiar district, B. C. Capitalization $500,000, shares $1 par. Presumably idle.

NORTHERN & GENERAL SYNDICATE, LTD. **RHODESIA.**

Office: 19 St. Swithin's Lane, London, E. C., Eng. H. T. Adams, secretary. Organized Apr. 12, 1905, under laws of Great Britain, with capitalization £13,050, in 13,000 ordinary shares of £1 par and 1,000 deferred shares of 1s. par. Was organized to take over the Bwana M'Kubwa mine of the Rhodesia Copper Co., Ltd., but apparently has done nothing with same.

NORTHERN LIGHT COPPER CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Lands, 6 claims, said to carry 3,000' of the strike of a vein of sulphide copper ore 5' wide on the 150' level. Is developing by shaft.

NORTHERN MINING & SMELTING CO. **SOUTH AUSTRALIA.**

Mine office: Mount Rose, South Australia. Lands, in the Lehigh's Creek district, circa 2 miles north of Mount Rose and about 66 miles northeast of the Blinman mine, show good gassans carrying considerable malachite and some azurite. Apparently ore occurs in 2 or 3 short pipe veins, with steep westerly dip, ore being mainly sulphide, including chalcocite and chalcopyrite, associated with pyrite in a gangue of micaceous slaty shale. Development is by shafts of 60', 78' and 198'. To February, 1906, property, under various ownerships, had produced 370,720 lbs. fine copper. Production, last half of 1907, was 51 long tons of ore shipped, yielding 17 long tons 17 cwts. fine copper.

NORTHERN ONTARIO CONSOLIDATED COPPER CO., LTD. **ONTARIO.**

Office: Sault Ste. Marie, Ont. Mine office: Dean Lake, Algoma, Ont. Dr. John H. Gimby, president; A. Cyril Boyce, M. P. P., treasurer; Uriah McFadden, secretary; preceding officers, Dr. W. E. Gimby, A. A. Burk, A. Jury, R. W. Freemuth, Dr. W. H. Preston and A. B. McMahon, directors; J. A. Montague, superintendent. Organized 1906, under laws of Ontario, with capitalization $1,500,000, shares $1 par, as successor of Northern Ontario Copper Co., Ltd.

Lands, 768 acres, in the townships of Thompson and Cobden, including the Lizert and Bronson mines, showing 2 contact veins, of about 9' width, one being between clay-slate and a trap dyke, with intrusions of granite and quartzite, slate, granite and trap being impregnated, near the contact, with slightly auriferous and argentiferous chalcopyrite, of low average tenor. No. 1 shaft, 9x16', with 3 compartments, on the south vein, is 130' deep, showing ore assaying 4.6% copper, 2.5 oz. silver and $1 gold per ton. To end of 1907 made several small shipments to Chicago, returning 13.83% copper. Has necessary mine buildings and planned, 1906, a smelter. Presumably idle.

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NORTHERN ONTARIO COPPER CO., LTD. **ONTARIO.**

Dead. Succeeded, 1906, by Northern Ontario Consolidated Copper Co., Ltd. Formerly at Dean Lake, Algoma, Ontario. Described Vol. VI.

NORTHERN SIERRA MADRE MINING CO. **MEXICO.**

Mine office: Suaqui de Batuc, Ures, Sonora, Mex. Lands are 2 copper properties, La Reina de Cobre and Providencia, and a silver-lead mine, known as El Colosus, lying circa 25 miles west of Suaqui de Batuc. Idle and apparently moribund.

NORTHERN TERRITORIES MINES OF AUSTRALIA, LTD. **AUSTRALIA.**

Office: Broad Street House, London, E. C., Eng. Mine offices: Palmerston, Northern Territories, South Australia, and Dundas, Montagu Co., Tasmania. H. J. Nevill, chairman; T. I. Dyson, manager; H. Simpson, secretary. Organized Jan. 25, 1905, under laws of Great Britain, as a reconstruction of Northern Territories Mining & Smelting Co., Ltd., with capitalization £175,000, shares 10s. par; issued, £160,003.

Lands are in two groups, in South Australia and Tasmania, including the Howley mine and adjoining properties, area 604 acres, circa 70 miles from Palmerston and 113 miles by rail from Port Darwin. The copper properties of this group include the Mount Ellison mine, opened by a 143′ shaft, showing auriferous and argentiferous copper ores, assaying up to 12% in copper tenor. The mine is very wet, and apparently nearly exhausted. The Iron Blow mine has a 196′ main shaft, and a mining plant with an air-compressor, with ore-bins at the mine, connected by a one-mile tram with the smelter.

The Yam Creek smelter, in South Australia, formerly had two reverberatory furnaces, and a converter that was not installed. This smelter, completed 1904, ran 3 months only, treating an average of 66 long tons of ore daily, producing 204 long tons of matte carrying 61 long tons copper, circa 17,500 oz. silver and 350 oz. gold. In 1907 the smelter was dismantled, and material shipped to Tasmania.

The Northern Territories property includes a 40-stamp mill at the Howley mine, Yam Creek, and a 20-stamp mill at Brock's Creek. Apparently both are idle.

The Tasmanian properties include the Adelaide lead mine, area 160 acres, at Dundas, where operations are largely centered, with a small lead smelter.

The company and its various predecessors have struggled against financial difficulties, due mainly to lack of cash, from their births.

NORTHERN TERRITORIES MINING & SMELTING CO., LTD. **AUSTRALIA.**

Dead. Succeeded, Jan. 25, 1905, by Northern Territories Mines of Australia, Ltd. Formerly at Palmerston, Northern Territories, South Australia.

NORTH FORK COPPER MINING CO. **WYOMING.**

Dead. Formerly at Battle, Carbon Co., Wyo.

NORTH FORK COPPER MINING & MILLING CO. **IDAHO.**

Office: Wardner, Idaho. Mine office: Mullan, Shoshone Co., Idaho. S. P. Herron, manager. Lands show a 6′ fissure vein in quartzite, carrying cupriferous silver-lead ore, cut by a 715′ tunnel.

NORTH FRANKLIN MINING CO. **IDAHO.**

Office: Wallace, Idaho. Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Organized under laws of Idaho, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, area 120 acres, near the Morning mine, in the Hunter Creek district, circa 2 miles north of Mullan, having an 80′ shaft and tunnels of 160′, 60′ and 40′, showing argentiferous lead and copper ores.

NORTH HORN SILVER & COPPER MINING CO. **UTAH.**

Mine office: Frisco, Beaver Co., Utah. C. C. Thompson, president. Lands,

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adjoining the Frisco Contact mine, show argentiferous lead and copper ores.

NORTH LAKE MINING CO. **MICHIGAN.**

Office: 50 Congress St., Boston, Mass. Operating office: Shelden Bldg., Houghton, Mich. Mine office: Greenland, Ontonagon Co., Mich. Stephen R. Dow, president; Alvin R. Bailey, secretary and treasurer; Richard M. Edwards, superintendent; preceding officers, Henry Tolman and John C. Watson, directors. Organized Aug. 22, 1908, under laws of Michigan, with capitalization $2,500,000, shares $25 par, fully issued; paid in, $8. Company began business with full title to lands and $300,000 cash in treasury. American Trust Co., Boston, transfer agent; Federal Trust Co., Boston, registrar. Shares are listed on the Boston Stock Exchange.

Lands, 1,120 acres, in Sections 28, 29, 32 and 33, lying immediately north and east of the Lake Copper Co. The tract should carry about 880 acres of the underlay of the Lake amygdaloidal bed, with circa 7,000′ of the strike of the lode. Property also carries the copper bearing series of the Evergreen belt of amygdaloidal beds. The company's lands are traversed by both the Mineral Range and Copper Range railways, and are crossed by the Fire Steel river.

The rich copper bearing chute of the Lake Copper Co. apparently rakes to the northeast, hence should be found well mineralized on the property of the North Lake. Work was begun about the center of the southwest quarter of Section 28, near the Fire Steel river, but the lands carry an extremely heavy overburden of alluvium, and, Nov. 15, 1908, the first sand pipe being driven to the ledge was down nearly 400′, without having encountered solid rock, and the management was planning to start sinking a second pipe.

The company's plans call for a thorough test of the ground, by diamond drilling, previous to locating permanent shafts. There is practically no question that this property carries the extension of the Lake amygdaloid. Property considered decidedly promising and management good.

NORTHLAND DEVELOPMENT CO. **ALASKA.**

Office: care of P. A. Tucker, manager, Seattle, Wash. Letter returned unclaimed from former mine office, Ketchikan, Alaska. Mine, on Big Harbor, is said to have shipped, to April, 1908, circa 300 tons of ore, secured from development work. Company planned a tram-line, with a locomotive. Idle.

NORTH MOUNT LYELL CONSOLIDATED MINING CO., N. L. TASMANIA.

Office: 60 Queen St., Melbourne, Australia. Mine office: North Mt. Lyell, Montagu Co., Tasmania. N. Madden, manager. Capitalization £50,000, shares 10s. par. Lands, 70 acres, leasehold. Idle some years and apparently moribund.

NORTH MOUNT LYELL COPPER CO., LTD. **TASMANIA.**

Dead. Absorbed, 1903, by Mt. Lyell Mining & Railway Co., Ltd. Formerly at North Mt. Lyell, Montagu Co., Tasmania.

NORTH MOWRY MINES CO. **ARIZONA.**

Dead. Was organized 1906. Property was the Golden Gate group and 4 adjoining properties, shortly north of the Mowry mines. S. M. Franklin was manager. Formerly at Patagonia, Santa Cruz Co., Ariz.

NORTH NYMAGHE COPPER MINING CO., N. L. **AUSTRALIA.**

Office: Sydney, N. S. W., Australia. Mine office: Nymagee, N. S. W., Australia. John Waugh, chairman. Idle.

NORTH ONTARIO REDUCTION & REFINING CO., LTD. **ONTARIO.**

Office: 88 Yonge St., Toronto, Ont. Works office: Sturgeon Falls, Nipissing, Ont. Lieut.-Col. J. I. Davidson, president; A. Ansley, vice-president; J. J. Wright, secretary; O. L. Young, superintendent. Property is a smelting plant, built for treating the silver-cobalt ores of the Cobalt district and the copper ores of the Nipissing and Algoma districts.

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NORTH PARK (U. S. A.) COPPER SYNDICATE, LTD. **WYOMING.**

Office: 110 Cannon St., London, E. C., Eng. Mine office: Keystone, Albany Co., Wyo. Henry C. Batchelor, president; H. Blondell, secretary. Organized July 11, 1906, under laws of Great Britain, with capitalization £25,000, shares £1 par; issued, £20,000. Lands, in the Keystone district of Albany county, Wyoming, and in northern Colorado, apparently show values mainly in gold. Is said to plan a 20-stamp mill.

NORTH PLATTE COPPER MINING & SMELTING CO. **WYOMING.**

Dead. Was a swindle, perpetrated by F. S. Pusey, of Philadelphia. Formerly at Douglas, Converse Co., Wyo.

NORTH POLE MINING CO. **COLORADO.**

Office: Aspen, Colo. Mine office: Crystal, Gunnison Co., Colo. Jas. T. Stewart, chairman and general manager; Geo. N. Smalley, vice-president; W. Porter Nelson, secretary; Frank Meyer, treasurer; preceding officers, James R. O'Hara, Geo. H. Poor and A. T. Ferris, directors; C. Casagrande, mine superintendent. Organized 1902, under laws of Colorado, with capitalization $500,000, shares $5 par. Lands, 37 claims, area circa 640 acres, in the Rock Creek district, showing 9 fissure veins, of which 3, of 3′ average width, have tunnels of 340′, 680′, 450′, 300′ and 600′, with a total of 3,000′ of openings, estimated to show 100,000 tons of ore, with 50,000 tons blocked out for stoping, ore being mainly chalcopyrite with quartz gangue, claimed to give average returns of 8% copper, 1.5% lead, 2% zinc, 8.75 oz. silver and $1 gold per ton, which estimates are considered excessive. Has a 50-h. p. steam plant, with a 7-drill Rand air-compressor, 15x30′ machine shop, and several other small mine buildings.

NORTHPORT SMELTING & REFINING CO., LTD. **BRITISH COLUMBIA.**

Controlled and operated by Le Roi Mining Co., Ltd.

NORTH PRINCE LYELL CO., N. L. **TASMANIA.**

Dead. Formerly at North Mt. Lyell, Montagu Co., Tasmania.

NORTH SHANGO COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized circa January, 1907, under laws of New South Wales, with capitalization £2,640, shares £1 par. Has a shallow shaft showing gold, with indications of copper at greater depth.

NORTH SHORE COPPER & SMELTING CO. **ONTARIO.**

Dead. A stock-jobbing scheme. Formerly in Aberdeen Twp., Algoma, Ont.

NORTH STAR MINING CO. **MICHIGAN.**

Office and mine: 420 East McLeod Ave., Ironwood, Gogebic Co., Mich. Peter Lofberg, president; Adolf W. Peterson, secretary. Organized May 1, 1903, under laws of Michigan, with capitalization $25,000, shares $25 par. Lands, 240 acres, under option, showing several cupriferous amygdaloids, on which a 60′ shaft was sunk. Idle several years and apparently moribund.

NORTH STAR MINING CO. **WASHINGTON.**

Office: 502 Mutual Life Bldg., Seattle, Wash. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. J. T. Ronald, president; Hon. John S. Jurey, vice-president; J. S. Chase, secretary; John A. Soderberg, treasurer; preceding officers and E. L. McAllister, directors. Organized 1901, under laws of Washington, with capitalization $1,500,000, shares $1 par. Is controlled, through stock ownership, by Cheha Consolidated Copper Co.

Lands, 70 claims, area 1,200 acres, of which one group, of 11 claims, lying between the Ethel and Bunker Hill-Sullivan properties, shows a 4″ vein with a 6″ paystreak carrying high grade bornite. Development is by a 220′ shaft and crosscut tunnels of 200′ and 600′, with circa 2,000′ of workings. Ore is mainly bornite and chalcopyrite, said to give average assays of 10% copper.

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A second group of 120 acres lies on the western slope of the Cascade Mountains.

The third group of 53 claims, on Red Mountain, in the Leavenworth district, lying on the eastern slope of the Cascade Mountains, adjoining the Chelan Consolidated Copper Co., is said to show gold ore, with several shafts and open-cuts, and tunnels of 20′ and 100′.

The properties have several mine buildings, with a flume, water pipe and air-compressor.

NORTH STAR MINING & MILLING CO. **COLORADO.**

Dead. Property sold to Silverton Mining Co. Formerly at Silverton, San Juan Co., Colo.

NORTH STATE GOLD & COPPER MINING CO. **NORTH CAROLINA.**

Mine office: Jamestown, Guilford Co., N. C. Has a vein of 2′ to 25′ width, carrying auriferous copper sulphides, opened to depth of circa 400′. Has steam and water power, 50-ton concentrator and a mill with 20 gravity stamps. Idle.

NORTH UTAH MINING CO., OF BINGHAM. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized Feb. 23, 1906, under laws of Maine. No trace of operations secured.

NORTH VERDE COPPER CO. **ARIZONA.**

Office: 303-167 Dearborn St., Chicago, Ills. Mine office: Jerome, Yavapai Co., Ariz. W. P. Cooper, president; E. C. Weatherley, vice-president; John Tierney, general manager; J. J. O'Donohue, secretary and treasurer; J. F. Mowles, superintendent. Organized January, 1904, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 6 claims, area 120 acres, near the United Verde, having an 80′ shaft and a 250′ tunnel, latter showing calcspar, iron and soft rock, in a zone of circa 150′ width, with a very little ore carrying about 2.5% copper and 3 oz. silver per ton, with traces of gold. Equipment includes a 40-h. p. Fairbanks-Morse double-cylinder hoist and an air-compresser. Lands were jumped, January, 1908, but company claims 1907 assessment work was done properly, and jumping illegal. Idle and practically moribund.

NORTHWEST COPPER CO. **BRITISH COLUMBIA.**

Dead. Operated the Van Anda mine, 1901-1902. Formerly at Van Anda, Texada Island, B. C.

NORTHWESTERN CONSOLIDATED LUMBER, OIL & COPPER CO. **OREGON.**

Office: care of Glenn M. Deuell, secretary, Grand Rapids, Mich. Mine office: Baker City, Baker Co., Ore. Dr. O. A. Lacrone, president and general manager. Idle several years and presumably moribund.

NORTHWESTERN COPPER MINING CO. **WYOMING.**

Office: 509 New York Life Bldg., Omaha, Neb. Letter returned unclaimed from former mine office, Dillon, Carbon Co., Wyo. Chas. R. Courtney, president; W. D. Reed, vice-president; F. E. Brown, secretary and general manager; N. A. Kuhn, treasurer; H. H. Roberts, secretary; preceding officers, W. H. Dakin, J. H. Farlie, C. W. Murdock and R. E. Sutherland, directors; C. A. Nevitt, superintendent. Organized 1902, under laws of Wyoming, with capitalization $100,000, shares 10 cents par.

Lands, 15 claims, area 300 acres, including the Batchelder group of 9 claims and the Eclipse group of 6 claims. The Batchelder mine, in the Battle Lake district, circa one mile from the Ferris-Haggarty mine of the Penn-Wyoming Copper Co., carries about one mile of the strike of a vein, formerly reported as of 10′ to 50′ width, but apparently of 2′ to 15′ actual width, which presumably is a continuation of the Ferris-Haggarty vein. Development is by a tunnel and a 100′ shaft, with circa 1,000′ of workings, showing some copper

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oxides and carbonates, with mainly auriferous sulphide ores of concentrating grade, giving assays of 3 to 40% copper and $2 to $20 gold per ton. A little ore was shipped, late 1907, to the Penn-Wyoming smelter. Property considered promising. Idle.

NORTHWESTERN GOLD & COPPER MINING CO. **OREGON.**

Mine office: Susanville, Grant Co., Ore. J. R. Murrin, general manager; Lewis Walker, superintendent. Organized circa 1907. Lands, 9 claims, opened by a shaft of 90′ and a tunnel of 120′, showing good gold and copper values.

NORTHWESTERN MINING CO. **IDAHO.**

Office: Baltimore, Md. Mine office: Lucile, Idaho Co., Idaho. Employs 18 men. Wm. B. Clark, president; Francis T. Homer, vice-president; Chas. G. Heim, secretary and treasurer; Frank E. Johnesse, general manager. Organized May, 1905, under laws of New Jersey, with capitalization $200,000, shares $1 par. Lands, 10 claims, area 200 acres, surveyed for patents, and a 5-acre mill site, showing diorite, diabase and altered schists, having 2 ore bodies, estimated to range 40′ to 70′ in width, carrying oxidized ores above circa 200′ depth, followed by native copper, chalcocite and chalcopyrite, ore being estimated to average 5% copper, 5.5 oz. silver and $2.80 gold per ton. Development is by shafts of 100′ and 650′, and an 868′ tunnel, with circa 4,100′ of workings, estimated to show 60,000 tons of ore, with 25,000 tons blocked out for stoping. Company expects a railroad by 1910, and plans production thereafter.

NORTHWESTERN SMELTING & REFINING CO. **BRITISH COLUMBIA.**

Dead. Smelter sold, 1905, to Britannia Smelting Co., Ltd. Formerly at Crofton, Vancouver Island, B. C. Described Vol. IV.

NORTHWEST GOLD & COPPER CO. **OREGON.**

Dead. Formerly at Sumpter, Baker Co., Ore.

NORTHWEST MINING CO. **WASHINGTON.**

Dead. Formerly at Kettle Falls, Stevens Co., Wash.

NORTH WISCONSIN COPPER MINING CO. **WISCONSIN.**

Dead. Succeeded, circa 1899, by Chippewa Copper Mining Co., also dead. Formerly in Douglas county, Wisconsin.

A. O. NORTON. **QUEBEC.**

Office: 286 Congress St., Boston, Mass. Mine office: Suffield, Sherbrooke Co., Que. A. O. Norton, manager; Wm. Jenkins, superintendent. Lands, 350 acres freehold, and 150 acres of mining rights in Ascot township, 7 miles from Sherbrooke, with railroads within 2 miles on either side. Property, known as the Suffield and King mines, opened circa 1865, has a 165′ shaft with about 900′ of workings, on a vein of 8′ to 9′ average width, and a shaft of 245′ on a vein of 2′ to 20′ width, developing ore said to give average assays of 6% copper, from a trace to 10% zinc, 10 to 120 oz. silver and $2.50 gold per ton. Equipment includes a plant, installed 1907, having hoists, pumps and power-drills. Property considered promising.

NORVELL-PICKRELL COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

NORWAY MOUNTAIN GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. A swindle, put out by Thomas & Co., Philadelphia, who "guaranteed" dividends that never materialized. Formerly at Rossland, Trail district, B. C.

NORWEGIAN-AMERICAN COPPER MINING & SMELTING CO. **NORWAY.**

Office: 1618 Milwaukee Ave., Chicago, Ills. Mine offices: 3 Fjordgaden, Trondhjem, Norway, and Goulasjok, Lyngenfjord, Tromsö, Norway. Employs 100 men. Adolph Larson, president; John Iverson, vice-president; Andrew J.

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Breda, secretary; Hakon Thompson, treasurer; Hans Boholm, general manager; D. Bryn and J. Johansen, superintendents; Harald Bodtker, engineer. Organized Apr. 20, 1905, under laws of South Dakota, with capitalization $1,000,000, shares $1 par; issued, $450,000. Annual meeting, first Monday in April.

Lands, 54 claims, in 5 groups situated in 4 districts. Formation is much the same at the various properties, country rock being micaceous schists, of lower Silurian age, with eruptive greenstone conformable with the schists, ore bodies occurring as extended lenses, very persistent in strike and depth, on the contact of the schists with metamorphosed olivine gabbro. Ore is cupriferous iron pyrites, carrying 3 to 10% copper and 10 to 30% sulphur, with small gold and silver values.

The principal mines, known as Fines and Tingstad, formerly belonging to King Christian Frederik of Denmark, were worked, 1765-1817. These mines are circa 60 miles from Trondhjem, and about ½ mile from tidewater, lying in 2 different valleys of about 20 miles length, connecting with the Trondhjemsfjord, giving fine water transportation. The Fines mine is held under a contract, by which it can be bought for $40,000 cash, or the same price in yearly installments, or can be operated on a royalty basis for 90 years. This mine carries a 5′ vein, estimated to show 50,000 tons of ore averaging 6 to 7% copper. The Tingstad mine is held under a similar contract, on the basis of $45,000 cash, or a royalty of 35 cents per metric ton.

The company also has sundry claims, including the Lyngenfjord mine, having an aërial tram to Kaafjord. This mine is near tidewater that does not freeze in winter, and is favorably located for shipping. There also are claims on the Island of Vanden, at the mouth of the Lyngenfjord, 25 miles north of Tromsö.

The various lands of the company have several available water powers, and the company plans installing a concentrator and beginning shipments of cupriferous pyrites to Great Britain. Property considered promising.

NORWEGIAN COPPER MINES, LTD. **NORWAY.**

Dead. Dissolved, October, 1905. Formerly at Gonlasjok, Lyngenfjord, Tromsö, Norway. Described Vol. V.

NORWEGIAN EXPLORATION CO., LTD. **NORWAY.**

Office: 23 Leadenhall St., London, E. C., Eng. Mine office: Vaddasguisa, Oxfjordalen, Norway. Geo. B. Mee, chairman; I. C. Ozanne, secretary Organized Sept. 26, 1903, under laws of Guernsey, with capitalization £260,000, shares £1 par; issued, £119,259. Lands are 32 mining claims, at Vaddasguisa, Lankvarres, and Rojelguisa, in the Oxfjordalen, Norway. Presumably idle.

NORWEGIAN OTTA COPPER CO., LTD. **NORWAY.**

Dead. Formerly at Aasoren, Gudbrandsdalen, Christiania, Norway.

NOTAWAY GOLD & COPPER MINING CO. **COLORADO.**

Dead. Was a stock-jobbing enterprise. Formerly at Silverton, San Juan Co., Colo., and Central City, Gilpin Co., Colo. Described Vol. VI.

NOVARRA MINE. **ITALY.**

Mine office: Novarra, Piedmont, Italy. Is an old mine, which was a very small producer, at last accounts.

SOCIEDAD MINERA NUESTRA SEÑORA DE LA SALUD. **SPAIN.**

Office: Sevilla, Spain. Mine office: Chaparrita, por Rio Tinto, Huelva, Spain. Don Manuel Piérola y Orozco, manager. Lands, 110 hectares, including 11 old mine openings, idle for some years. A small production of cement copper is secured by leaching tereros left from former operations.

SOCIEDAD MINERA NUEVA AMALIA. **CHILE.**

Mine office: Chuquicamata, Antofagasta, Chile.

MINA NUEVA AUSTRALIA. **PERÚ.**

Mine office: Pacasmayo, Cajamarca, Perú. Hilarión Laforcade, manager; Juan Díaz, smelter superintendent. Mine has a lense of low grade disseminated

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pyritic ore, of considerable size, opened by tunnel. Has a smelter with calcining and reverberatory furnaces, burning wood, which is of good quality and available in large quantities. Product is shipped, as bars, to Cajamarca.

COMPAÑIA MINERA LOS NUEVES. **SPAIN.**

Dead. Formerly at Tijola, Almería, Spain.

NUMBER ONE MINING CO. **WASHINGTON.**

Mine office: Nighthawk, Okanogan Co., Wash. A. B. Lee, manager. Mine is said to have a 33′ vein carrying a 9′ paystreak of ore of concentrating grade, containing lead and copper values, developed by tunnel and shaft. Is said to plan a 25-ton mill.

NUMBER 7 MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Property sold to British Columbia Copper Co. Formerly at Greenwood, Boundary district, B. C. Described Vol. V.

NYACK MINING CO. **ARIZONA.**

Dead. Absorbed by Anita Consolidated Copper Co. Formerly at Williams, Coconino Co., Ariz.

NYMAGEE COPPER, LTD. **AUSTRALIA.**

Office: 95a Winchester House, Old Broad St., London, E. C., Eng. Mine office: Nymagee, Mouramba Co., N. S. W., Australia. Chas. J. McMahon, chairman; W. H. Corbould, managing director; J. D. Kendall, consulting engineer; H. A. McMahon, secretary. Organized Dec. 10, 1906, under laws of Great Britain, with capitalization £150,000, shares £1 par, fully paid. Lands, circa 50 miles from Cobar, include the Nymagee mine, area 750 acres, freehold, bought, 1907, of the Great Cobar Copper Mining Syndicate. Country rocks are slate and sandstone, showing a main vein of 15′ to 20′ width, carrying ore of about 2% average copper tenor, with a rich chute, of about 250′ length and unknown depth, carrying ore up to 10% in copper tenor. Mine, opened 1880, has 3 shafts, deepest 680′, with about 100,000 tons of ore blocked out, and 150,000 long tons additional reasonably inferred. Developments at depth are said to be promising. Old mining plant was replaced, 1907, by modern machinery, involving suspension of production for six months. The mine lacks railway facilities, which are much needed.

The smelter has 3 small water-jacket blast-furnaces, and 4 reverberatories for bringing up matte to blister copper of 99.5% copper tenor. Largest production, in 1886, was 1,468 long tons fine copper. Production, 1898, was 728 long tons fine copper, and for 1906 was 26,649 long tons of ore smelted, giving average returns of 2.5% copper, producing 1,491,840 lbs. fine copper. Property considered valuable, though average of ore is dangerously low in grade. Employs circa 200 men.

NYMAGEE COPPER MINING SYNDICATE. **AUSTRALIA.**

Dead. Lands sold to Great Cobar Copper Mining Syndicate. Formerly at Nymagee, Mouramba Co., N. S. W., Australia.

OAK CONSOLIDATED MINING & MILLING CO. **OREGON.**

Office: 226 Failing Bldg., Portland, Ore. D. L. McLeod, manager. Property includes the Oak and Hidden Fortune mines, in Josephine and Jackson counties, Oregon.

OAKESDALE COPPER CO. **MONTANA.**

Office: Wallace, Idaho. Mine office: Java, Dawson Co., Mont. Capitalization $1,000,000, shares $1 par. Lands, 8 claims, 1 fractional, on Beaver Creek. Development is by tunnel, showing ore assaying up to 59.9% copper, 6 oz. silver and $4 gold per ton.

OAKS MINING & MILLING CO. **UTAH.**

Office: Eagle Block, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. A. H. Cutright, secretary and treasurer. Capitalization $250,000.

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OASIS GOLD & COPPER MINING CO. **UTAH.**

Office: care of Joseph A. Jennings, secretary, Salt Lake City, Utah. Mine office: Oasis, Millard Co., Utah. M. S. Browning, president; John T. White, vice-president; Joseph B. Toronto, treasurer; J. D. Clive, manager. Organized April, 1904, under laws of Utah, with capitalization $250,000, shares $1 par. Lands, in the Drum district, are opened by a 185′ shaft, showing 6 ore chutes, from which ore assaying 4.3% copper, 10 oz. silver and $19.20 gold per ton, was shipped, 1904, to Salt Lake smelters. Idle several years.

OATES-NEWMAN COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. F. C. Alsdorf, superintendent, at last accounts.

OAXACA CONSOLIDATED COPPER CO. **MEXICO.**

Office: Ap. 49, Oaxaca, Oax., Mex. C. C. Lastinger, manager, at last accounts. Property includes the Magistral and Predilecta mines, near Oaxaca, carrying copper ores. Has water power.

OAXACA EXPLORATION CO. **MEXICO.**

Mine office· Ocotlán, Oaxaca, Mex. Has auriferous and argentiferous copper ores, opened by 2 shafts, of about 150′ each, and is equipped with steam power. Presumably idle.

OAXACA MINES & EXPLORATION CO. **MEXICO.**

Office: care of Kaye, DeWolf & Co., New York, N. Y. Works office: Oaxaca, Oaxaca, Mex. Harry M. Holbrook, president; O. F. Westlund, general manager; R. R. Moore, superintendent; Jos. T. Wallace, receiver.

Property is a smelter, 4 kilometers from Oaxaca; completed August, 1907, rated at 600 tons daily capacity, having two 46x162″ water-jacket blast-furnaces, 22′ high over all. These are planned for reduction of either lead or copper ore, with daily capacity each of about 175 tons of lead ore or 300 tons of copper ore. Has electric power and crushers. Receiver appointed, and bondholders plan reorganization. With finances on a substantial basis, and given good management, the plant might prove successful, as it could draw ore from a rich district.

OAXACA MINING, MILLING & INVESTMENT CO. **MEXICO.**

Office: Wilmington, Del. Mine office: Ixtlán de Juárez, Ixtlán, Oaxaca, Mex. C. Arthur, manager; Robert McCormick, superintendent. Property includes La Esperanza mine, having auriferous and argentiferous lead, copper and zinc sulphides, with water power and 10-stamp mill.

OAXACA SMELTING & REFINING CO. **MEXICO.**

Dead. Property was sold, circa July, 1908, at public auction, and was bid in, by bondholders, for $275,546. Formerly at Oaxaca, Oaxaca, Mex.

OBIE MINE. **JAPAN.**

Mine office: Nakanosha-mura, Tsu-gori, Bitchu, Japan. Employs circa 1,200 men. T. Sakamoto, owner; K. Ogawa, manager. Is a very old mine, having numerous 2′ to 4′ veins carrying chalcopyrite, and small quantities of argentiferous galena, with quartz gangue, traversing clay-slate and granite. Has steam power and a good smelter. Production was 1,281,146 lbs. fine copper in 1903; 1,455,488 lbs. in 1906, and 1,541,806 lbs. in 1907.

O. B. GRAY COPPER CO. **NEW JERSEY.**

Dead. Formerly at Pennington, Mercer Co., N. J. Described Vol. VI.

OCALA COPPER CO. **NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. R. P. Thompson, superintendent. Lands, in the Burro Mountains, said to give a promising surface showing, have a 185′ shaft, showing low grade copper sulphide ore.

OCAMPO MINING CO. **MEXICO.**

Mine office: Cuatro Ciénegas, Monclova, Coahuila, Mex. José Marco, manager. Lands include El Barrio mine, carrying auriferous and argentiferous

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copper ores, equipped with steam power. Employed circa 100 men, at last accounts.

CAMILO OCAÑA. **CHILE.**

Office and mine: Taltal, Antofagasta, Chile. Ramón A. Heredia and David B. Contreras, superintendents. La Estrella de Venus mine, opened to depth of 125 meters, but hampered in operation by excess of water, produces ore said to average 24.1% copper, after selection. La Ligua and La Gyacolda mines carry auriferous and argentiferous copper ores. Equipment includes steam power and a concentrator with 4 Chilean mills. Mine and works employ circa 75 men.

OCCIDENTAL COPPER CO. **MEXICO.**

Office: 120 Broadway, New York, N. Y. Mine office: Hachita, Grant Co., N. M. Idle. Saml. W. Fergusson, president and general manager; Walter R. Hensey, vice-president and treasurer; Joseph R. Draney, secretary; preceding officers, Garth W. Fergusson, Emlyn Lewys, Anthony J. Romagna, Geo. Rosendale, Geo. F. Small and Horace P. May, directors. Organized Dec. 4, 1906, under laws of Arizona, with capitalization $5,000,000, shares $5 par; issued, $3,025,000, as successor of the Royal Morelos Copper Co. Annual meeting, first Tuesday in December.

Lands, circa 700 acres, in the Suna Rica district of Chihuahua, Mexico, 7 miles south of El Paso & Southwestern railway and just south of the New Mexico line, showing limestone, with eruptive dikes, carrying mainly oxidized ores, with some bornite and chalcopyrite. Development is by 5 pits and shafts, of 16′ to 68′ depth, and a small tunnel. Property has 8 buildings. Idle.

OCCIDENTAL MINING CO. **CALIFORNIA.**

Office: 6 Eddy St., San Francisco, Cal. Mine office: Keswick, Shasta Co., Cal. Lands are claimed to be 3 miles south of the Iron Mountain mine, opened by 2 tunnels. Company's advertising is filled with misstatements, and corporation presumably is merely a stock-jobbing device.

MINERAL DE COBRE LOS OCOTES, S. A. **MEXICO.**

Dead. Lands sold, 1906, to Teziutlán Copper Mining & Smelting Co., for $565,000. Formerly at Ejutla, Oaxaca, Mex. Described Vol. VI.

OCTAVIA MINING CO. **WYOMING.**

Mine office: Cambria, Weston Co., Wyo. David Jones, president. Lands, 54 claims, including the Straight Up group, near the head of Jack Creek, slightly developed by a 60′ tunnel. Idle, since circa 1904, but for annual assessment work.

ODIN MINING CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. Main tunnel, 740′, cuts the Odin and Columbus veins, former, of about 2′ width, showing an average of about 3% copper, with some ore assaying up to 4% copper, 40% lead and 18 oz. silver per ton. First smelter shipment returned 2.7% copper, 11.3% lead, 49 oz. silver and $2 gold per ton.

O'DONNELL COPPER CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

OGDEN-BUCKHORN MINING CO. **UTAH.**

Office and mine: Ogden, Weber Co., Utah. F. L. Woods, manager; Chas. S. Burluck, superintendent. Lands, in Coldwater Cañon, shortly east of Ogden, have a 17′ vein, with paystreak giving assays of 34% copper, 9 oz. silver and $3 gold per ton.

OGOYA MINE. **JAPAN.**

Mine office: Nishio-mura, Nomi-gori, Kaga, Japan. T. Yokoyama, owner and general manager.

Mine, opened 1878, carries chalcopyrite, associated with melaconite, azurite, bornite, native copper and pyrite, with quartz gangue, in numerous

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veins traversing liparite. Three practically parallel veins main are worked, these ranging 1" to 4' in width, and 500' to 2,000' in length. Mining plant is modern, and property has a hydro-electric power installation. Smelter is rated at only 30 tons daily capacity, but probably is larger. Production was 1,503,967 lbs. fine copper in 1906 and 1,412,706 lbs. in 1907, an increase of practically 50% in eight years.

O'HARA MOUNTAIN GOLD & COPPER CO. **NEVADA.**

Office: Denver, Colo. Mine office: Reno, Washoe Co., Nev. Alleged property was claims in the Grapevine district of Nevada, and O'Hara, the promoter, is a professional bunco-steerer, masquerading as a mine promoter. He was arrested, tried and found guilty of swindling operations in connection with the promotion of this company, and for punishment was given a light fine and a sentence of one day in jail, which leads to the inevitable conclusion that there is a very strong sentiment in Denver in favor of fake mining promoters. Denver is one of the most beautiful towns in the United States, but its population includes some of the greatest scoundrels in existence, and it has an unenviable reputation among investors as the hatching place of a multitude of fraudulent mining companies. So notorious is this fact that legitimate mining companies with offices in Denver are seriously handicapped.

OHIO & ARIZONA COPPER MINING & SMELTING CO. **ARIZONA.**

Dead. Corporation dissolved, 1903. Formerly had an office in Covington, Ky.

OHIO & COLORADO SMELTING & REFINING CO. **COLORADO.**

Office and works: Salida, Chaffee Co., Colo. John M. Thomas, general manager; Geo. B. Griswold, superintendent. Smelter, rated at 1,000 tons daily capacity, is equipped with steam and electric power and has a refinery, doing a general custom smelting business in gold, silver, lead and copper ores, from the San Juan district and elsewhere in Colorado.

OHIO COPPER CO. **UTAH.**

Office: 42 Broadway, New York, N. Y. Mine office: Bingham Canyon, Salt Lake Co., Utah. Jas. MacFarlane, president; Russell Hopkins, first vice-president; Carlos Warfield, second vice-president; George Baglin, secretary and treasurer; preceding officers, David Keith, Thos. Weir, N. J. Catrow, J. P. Hutchinson, F. August Heinze and Philip Carroll, directors; Duncan McVichie, general manager; Colin MacIntosh, superintendent; W. A. Kidney, mill superintendent.

Organized Nov. 1, 1903, under laws of Maine, with capitalization $1,000,000, and reorganized, 1907, under laws of Maine, with capitalization $10,000,000, shares $10 par, and an increase in capitalization to $15,000,000, shares $10 par, was authorized February, 1908. Is controlled by United Copper Co., through ownership of about two-thirds of stock issue.

Bonds authorized, $2,000,000 ten-year 6% gold bonds, in denominations of $1,000, dated Sept. 1, 1907, convertible into stock at $10 per share, at any time before maturity. Previous to new bond issue of 1908 company was said to owe circa $350,000. Company plans a sinking fund, calling for $120,000 yearly, beginning Sept. 1, 1910.

Lands, 14 claims, patented, area 120 acres, surrounded by holdings of the Utah Copper Co., Boston Consolidated, United States, Fortuna and Copper Glance. Property was bought of the Columbia Copper Mining Co. for $245,000. Principal ore body formerly was a vein carrying disseminated chalcopyrite, having a width of 30' on the 400' level, but the principal ore, as developed recently, is cupriferous monzonite, similar to that of the Utah Copper Co. and Boston Consolidated, but said to concentrate somewhat better. Late 1907 the company had developed ore under about 5 acres, the porphyritic ore body being estimated at 400' in width, 1,000' in length and 600' in depth, latter

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figure being considered excessive, and company estimated, September, 1908, having ore reserves of 13,484,855 tons, averaging 1.606% in copper tenor.

Development is by several shallow shafts, one showing a 3′ vein carrying an 8″ paystreak of malachite averaging circa 25% copper, balance of vein being disseminated cuprite, estimated to average 5.12% copper. The 3-compartment 580′ main shaft, begun circa October, 1906, sunk at an angle of 45°, is to be connected, at depth of 1,100′, early 1909, with the Mascotte tunnel of the Dalton & Lark, circa 2½ miles in length. The Mascotte tunnel has been enlarged, retimbered and double-tracked, and ore extraction will be by electric haulage, with 5-ton cars. In addition to the Mascotte tunnel, the property has an 800′ main crosscut tunnel, which intercepts the What Cheer and All's Well veins, lying 400′ apart and parallel. The All's Well shows a 6′ vein assaying up to 5% copper, with small gold values, and a winze on the What Cheer vein is said to show 11′ of rich sulphides. Ores shipped by the old management were said to average 12% copper.

The property includes an old gravity mill with 5 stamps, and a 20-ton concentrator, both remains of former ownership, and both idle.

The Winnimuck mill, bought 1904, and enlarged to circa 150 tons daily capacity, has 1 crusher, 3 sets of rolls, 1 Chilean mill, 4 three-compartment jigs, 50 Wilfley tables and 1 Wilfley slime table.

The new mill, at Lark, near the mouth of the Mascotte tunnel, is of steel construction, built, 1907, by the Minnesota Steel Co., at a cost of circa $200,000. This mill, variously rated at 4,000 to 4,500 tons capacity, when completely equipped, is in eight 500-ton units, of which 4 were practically completed at the end of 1908, when the mill was expected to be in operation during the first quarter of 1909. Water is supplied from wells in the valley.

The company had financial troubles, in common with many other developing copper mines, during 1907 and 1908, and considerable property was attached for debt, but the debts were adjusted with money secured from the new bond issue.

On test the old Winnimuck mill is said to have given extraction up to 85% of assay values, and the company estimates that the new mill should save 75% of the gross values, or circa 24 lbs. fine copper per ton, from the porphyry ores. The ore is said to concentrate as high as 15 into 1, making a 20% copper concentrate, at a cost under 50 cents per ton for milling, and the company estimates that the ore can be mined at a cost of 75 cents per ton. Probable copper costs from the porphyry ores are variously estimated, by different authorities, at 6 to 9 cents per pound, but it is probable that finished copper, laid down at the seaboard, will cost much nearer to 10 cents than to 6. The property is considered one of exceptional promise.

OHIO LEAD MINING & SMELTING CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Sprucemont, Elko Co., Nev. Lands, 8 claims, area 160 acres, showing 7 fissure veins, said to give average assay values of 7% copper and 7 oz. silver per ton, also a silver-lead vein opened by a 400′ shaft and tunnels of 700′ and 900′, with circa 3,000′ of workings. Has a 50-ton concentrator, and a smelter with 3 small water-jacket blast-furnaces. Presumably idle.

OHIO-MEXICAN MINING CO. **MEXICO.**

Office: 1703 First National Bank Bldg., Cincinnati, Ohio. Mine office: Caborca, Altar, Sonora, Mex. J. H. McKibben, president; John Henderson, vice-president and general manager; W. K. McKibben, secretary and treasurer; preceding officers, O. E. Peters, B. B. Tuttle and Hon. J. A. Runyon, directors; I. R. Henderson, mine superintendent; Oscar A. Neminger, smelter superintendent. Organized August, 1904, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Lands, 47 acres, also a 25-acre millsite and

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6,500 acres ranch lands, showing country-rocks of limestone and granite, with porphyritic intrusions, carrying several ore bodies, of which 3, under development, have estimated average widths of 16′, 20′ and 40′, opened by shafts of 400′, 156′, 156′, 210′ and 100′ and by a tunnel of 380′, with total openings of circa 4,000′, estimated to show 30,000 to 60,000 tons of ore, with 20,000 tons blocked out for stoping, giving average assays of 9.3% copper, 4 to 10 oz. silver and $2 to $5 gold per ton, from carbonate ores and chalcocite. Mine was worked 1857-1860, and reopened, 1904, by present company. Property has a 125-h. p. steam plant at the mine, and a 100-h. p. steam plant at the smelter. Equipment includes 3 hoists, good for 400′ to 600′ depth, and a 2-drill Rand air-compressor, with 15 shops and mine buildings, of wood, sheathed with iron.

The smelter, at Calera, receiving ore by wagon from the mine, has a 60-ton water-jacket blast-furnace, turning out black copper of 90 to 95% tenor, with included gold and silver values, shipped to the Nichols Copper Co. for electrolytic refining. Presumably idle.

OHIO MINES DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Dead. Succeeded, 1907, by True Fissure Mining & Milling Co. Formerly at Trout Lake, Kootenay district, B. C.

OHIO MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. Is controlled by Bisbee-Sonora Development Co., through ownership of 60% of stock issue. Lands, circa one mile southeast of the Warren Development Co., are variously reported as 1,495 acres, and as 18 claims, area 340 acres, said to show 2 low grade copper outcrops. Company is said to plan a smelter, erection of which would be highly ridiculous, until ore is found. Lands considered poorly located.

OHIO MINING & MILLING CO. **COLORADO.**

Mine office: Montezuma, Summit Co., Colo. Ores carry gold, silver and copper. Has a small concentrator. Presumably idle.

OHIO & TENNESSEE MINING CO. **ARIZONA.**

Office: care of W. D. Clymer, president and superintendent, Delaware, Ohio. Mine office: Wickenburg, Maricopa Co., Ariz. Lands, 10 miles south of Wickenburg, have a 115′ shaft, showing a 2′ vein.

OHIO-YAQUI MINING CO. **MEXICO.**

Office: Columbus, Ohio. Mine office: San Javier, Soyopa, Hermosillo, Sonora, Mex. Lands include the Sierra mines, said to be antiguas, having an 800′ tunnel cutting a 2′ vein carrying ore assaying up to 2% copper and 75 oz. silver per ton.

OJANCOS MINING CO. **CHILE.**

Dead. Lands sold to Copiapó Mining Co., Ltd. Formerly at Copiapó, Atacama, Chile.

COMPAÑIA MINERA DE OJANCOS NUEVOS. **CHILE.**

Office: Valparaiso, Chile. Mine office: Tierra Amarilla, Antofagasta, Chile. Thos. C. Peddar, manager. Organized Apr. 30, 1903, under laws of Chile, with capitalization £150,000, shares £1 par. Property is the Transito mine.

OJIBWAY MINING CO. **MICHIGAN.**

Office: Lyceum Bldg., Duluth, Minn. Operating office: Houghton, Mich. Mine office: Phœnix, Keweenaw Co., Mich. Dr. L. L. Hubbard, president and general manager; Chas. A. Duncan, first vice-president and treasurer; Gustav Huggart, second vice-president; preceding officers, Thos. F. Cole, Capt. Jas. Hoatson, Capt. Thos. Hoatson, Chas. d'Autremont, Jr., Chester A. Congdon, John D. Ryan and Oscar J. Larson, directors; Frederick Kennedy, secretary; Andre Formis, superintendent; Capt. Richard Trevarthen, chief mining cap-

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tain; Henry Roberts, assistant superintendent; Wm. H. Charlton, clerk; Jas. Stephens, master mechanic.

Organized June 8, 1907, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,100,000. Company began business with circa $500,000 cash, and June 1, 1908, had cash resources of $227,342, and will not need to call for further funds until about the middle of 1909.

Lands, circa 1,600 acres, bounded on the north by the Cliff and on the south by the Seneca. Property includes the old Manhattan tract, Bacon & Jacobs lands, property bought of the Union Copper Land & Mining Co., and the Miskwabik tract of 1,224 acres, in Section 5, Town 57, and Sections 32 and 33, Town 58, North, all in Range 31 West.

The Kearsarge lode was located, circa 1904, on the Miskawabik tract, about 4 miles northeast of No. 1 shaft of the Mohawk. The Kearsarge bed was proven by 5 diamond drill holes, crossing the formation at intervals of 1,200′, of which 4 holes gave good cores, predicating the making of a rich mine, the cores being especially rich well toward the northern limits of the tract. The drill cores showed the Kearsarge amygdaloidal bed to be divided into 4 sections, separated by narrow layers of trap, and underground work has verified this peculiar condition.

Development is by 2 shafts, both sunk at an average depth of circa 40′ in the footwall, which shows some heavy copper, indicating strong mineralization. Work was begun July, 1907, and good progress has been made. Both shafts are concreted from their collars into the rock ledge, and both have permanent concrete roadbeds.

No. 1 shaft, circa 1,500′ from the northern boundary of the property, was sinking for the 650′ level at the end of 1908. A crosscut to the westward, on the 500′ level, late 1908, penetrated a 30′ amygdaloidal bed, thought to be the lower footwall bed of the Kearsarge lode, with principal ore values expected in the upper bed, and the second bed from the base of the series was opened November, 1908, this being about 20′ in width.

No. 2 shaft, about 1,100′ southwest of No. 1, was circa 500′ deep at the end of 1908, opening a well mineralized bed of about 15′ width.

The power plant is unusually complete for a new property. The 32x48′ central power-house, between the two shafthouses, has 2 duplicate Nordberg duplex-cylinder hoists, good for about 2,000′ depth, the cables from the engines passing over idlers and turn-sheaves at each shaft. Steam is furnished by 150-h. p. Burt locomotive-firebox boilers, the steam plant having a 100-h. p. condenser. Buildings are heated by the Webster reheating system, charged by exhaust from the air-compressor, which also heats water for boiler feed. The power plant includes an air-compressor and a 140-h. p. Russell high-speed engine, belt-connected to a 100-kw. generator. Power is furnished the various shops by individual motors, and the mine has an electric pump, with capacity of 85 gallons per minute working against a 500′ head. There also is an electric light plant.

Near the central power plant are a carpenter-shop, smithy and machine-shop, each 24x48′ in size, and a warehouse with an office in front. The machine-shop has a hardwood floor, laid with 2x4″ stringers, bedded in concrete. There also is a 28x48′ bunk-house and 24 dwellings for employes, at a townsite about one-half mile from the shafts, the mine and townsite having hydrants and a complete water system, with ample fire protection.

The mine is served by the Keweenaw Central railway, a short spur from the main line reaching the shafts and buildings.

The Ojibway has an exceptionally strong and experienced management, and is being developed along systematic and well considered lines, with every prospect of making an excellent mine.

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O. K. BLOCKS, LTD. **AUSTRALIA.**

Office: Cairns, Queensland, Australia. Mine office: Mungana, Queensland, Australia. A. J. Draper, secretary; A. F. Martyn, mine manager. Has a 7′ vein of sulphide copper ore. Decided, June, 1908, to liquidate.

O. K. COPPER MINES DEVELOPMENT SYNDICATE, N. L. **AUSTRALIA.**

Office: Cairns, Queensland, Australia. Mine office: Chillagoe, Queensland, Australia. John Newell, chairman; preceding officer, E. B. Torpey, W. J. Munroe and A. Overend, directors; Thos. Welsby, secretary; Richard Shepherd, general manager; H. Twynam, mine manager. Organized under laws of Queensland, with capitalization £45,000, shares 2s. par. Dividends, 1906, were £50,617 10s., and for first half of 1907 proceeds were £88,637 and profits £44,228. Paid a 1s. dividend Oct. 31, 1907.

Main shaft, early 1907, was 300′ deep, with 4 levels opened, at 80′, 115′, 150′ and 200′, levels being much too close together, with a plat cut at 250′. Little development work was done during the era of high prices, 1906-1907, until late 1907, when sinking was resumed. This should have been done several years earlier, as company was badly cramped after the fall in copper. A new ore body has been opened to the east of the old lode, on the second and third levels. Lower levels make considerable water. Mine had reserves of 23,400 tons blocked out, at end of 1907, ore as smelted running 9 to 10% copper. Diamond drill borings, 1907, show the main lode to carry 12% copper at depth of 480′, indicating that the mine will hold values to good depth. Property also has a northern ore body, cut by drill holes, giving cores assaying 7.5% copper.

Surface equipment was overhauled and amplified, 1906, now including a new steam plant, air-compressor, etc. District is arid, causing occasional shortage of water, but with frequent excess of water in the rainy season, causing bad roads and rendering transportation difficult. Camels, formerly used, have been replaced by traction engines. A railroad, which would greatly reduce cost of operation, is needed badly.

The smelter has a converter, added 1906, and a new stack was built, 1907, to carry off troublesome fumes. For first half of 1907 actual cost of blister copper at the mine was £40 12s. 6d. per long ton, and for last half of 1907 ore treated yielded 8.1% copper, showing a decline in values. Production, 1906, was 13,867 long tons of ore smelted, giving an average return of 10.8% copper and making 3,351,197 lbs. fine copper. Mine is valuable, but company apparently was overly anxious for dividends, when it would have been much better to have accumulated a surplus for emergencies. With a continuance of the more vigorous policy of development, begun 1907, the property should increase in importance and production. Employs circa 250 men.

O. K. EXTENSION MINING & REDUCTION CO. **UTAH.**

Office: 222 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. A. J. McMullen, president and general manager; T. M. Farrel, vice-president; C. C. Gott, secretary and treasurer. Organized November, 1899, under laws of Utah, with capitalization $150,000, shares 50 cents par. Annual meeting, second Tuesday in October.

Lands, 21 claims, 3 patented, area 420 acres, near the Majestic, in the Beaver Lake district, showing 2 fissure veins, of 5′ to 24′ estimated average width, traceable circa 2,000′, opened by 7 pits and shafts, of 15′ to 510′ depth, and by a 150′ tunnel, with 1,045′ of workings, showing chalcopyrite estimated to average 2% copper, without the gold and silver values formerly claimed. Idle for several years, except for annual assessment work.

VERWALTUNG DER KÖNIGLICHE PREUSSISCHEN- UND HERZOGLICHE BRAUNSCHWEIGSCHE KOMMUNION HÜTTEN-STAATSWERKE OKER. **GERMANY.**

Is the smelting plant of the Rammelsberg mine.

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O. K. GOLD & COPPER MINING CO. **ARIZONA.**

Office: Lyndon, Kansas. Letter returned unclaimed from former mine office, Florence, Pinal Co., Ariz. W. L. Newcomer, president; S. B. Johnson, secretary; J. Banning, treasurer and general manager. Organized 1902, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 15 claims, area 300 acres, in the Picacho district, showing numerous veins, of which two, of 3′ average width, are opened by 6 shallow shafts, deepest 120′, and by 4 tunnels, longest 125′, showing oxide, carbonate and sulphide ores, giving assays up to 20% copper, with traces of gold and silver. Idle several years and apparently moribund.

OKLAHOMA COPPER CO. **ARIZONA.**

Office: Shawnee, Okla. English office: Worcester House, Walbrook, London, E. C., Eng. Mine office: Florence, Pinal Co., Ariz. Idle. H. G. Beard, president and general manager; S. T. Pierson, vice-president; H. A. Pierson, secretary and treasurer; preceding officers and W. M. Longmire, directors; Roy Troxel, superintendent. Organized March 29, 1906, under laws of Oklahoma, with capitalization $2,000,000, shares $1 par; issued, $1,120,000.

Lands, 25 claims, unpatented, area circa 500 acres, next south of the Alta Central Copper Co., in the Mineral Hill district, said to show 5 ore bodies, of which one, under development, of 10′ claimed width, said to be traceable 2½ miles, is estimated by company to average 3% copper and $2 gold per ton, from oxidized ores and chalcopyrite. Development is by 8 pits and shafts, of 20′ to 200′ depth, and by a 50′ tunnel. The advertising of Joseph & Wilson, the fiscal agents, was not altogether correct. Idle.

O. K. SOUTH BLOCK CO. **AUSTRALIA.**

Mine office: Mungana, Queensland, Australia. Lands, adjoining the O. K. Copper Mines Development Syndicate, N. L., have a 100′ shaft, with steam power.

OKUZU MINE. **JAPAN.**

Mine office: Okuzu-mura, Kita-Akita-gori, Ugo, Japan. Property shows numerous fissure veins, of about 1′ average and 3′ maximum width, traversing Tertiary tuff and augite-andesite, carrying argentiferous chalcopyrite, associated with pyrite and occasional sphalerite. Mine, near Hanawa, discovered 1604, was worked for 2 centuries for silver, making but a trivial amount of copper as a by-product, but in the past few years the copper output has increased, production having been 143,597 lbs. fine copper in 1906, and 131,465 lbs. copper, 6,404 momme silver and 2,739 momme gold in 1907.

OLALLA COPPER MINING & SMELTING CO. **BRITISH COLUMBIA.**

Office: Second National Bank Bldg., Paterson, N. J. Mine office: Olalla, East Yale district, B. C. Robert Gaede, president; Joseph Bamford, Jr., vice-president; John E. Tylee, secretary and treasurer; A. A. Watson, general manager. Organized October, 1901, under laws of Maine, with capitalization $8,000,000, shares $25 par. Company controls the Similkameen & Keremos Ry. Co., capitalized at $3,000,000. Annual meeting, second Tuesday in November.

Lands, about 50 crown-granted claims, area circa 2,500 acres, also a 100-acre mill and smelter-site, in the lower Similkameen and Keremos camps, Osoyoos division, East Yale district, showing contact veins between diorite and felsite, ore bodies occurring in both, but mainly in the felsite. Veins, about a dozen in number, were claimed, by a former management, to range in width from 3′ to 500′ and were estimated to average about 5% copper, 2 to 5 oz. silver and $1 to $40 gold per ton, but this estimate, which was utterly unwarranted, has been revised to reasonable dimensions by the present management, which claims to be developing a vein averaging 7′ width, carrying auriferous chalcopyrite averaging 1% copper and $4 gold per ton. Gangue is spar, garnetite and magnetite. Development includes a 70′ shaft and tunnels of

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176', 200', 200' and 600'. Property has hand power only, and is 87 miles from a railroad, 60 miles of which has steamer transportation. Presumable idle.

OLD AMERICAN MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jesse Knight, president; J. William Knight, vice-president; R. E. Allen, secretary and treasurer; preceding officers, Hon. O. W. Powers and Fred Schmidt, directors. Capitalization $125,000, shares 25 cents par. Property is the American mine.

OLD BALDY GOLD MINING & TUNNEL CO. **NEW MEXICO.**

Mine office: Elizabethtown, Colfax Co., N. M. Has auriferous copper ores, with gasoline and electric power. Idle some years.

OLD COLONY COPPER CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Employs 15 men. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; preceding officers, John C. Watson, Stephen R. Dow, Rogers L. Barstow and Wm. Howell Reed, directors. Organized 1898, under laws of Michigan, with capitalization $2,500,000, shares $25 par; $12 paid in. Old Colony Trust Co., Boston, registrar. Annual meeting, second Wednesday in December. Company sold, circa 1906, its share of the Centennial mill, the proceeds therefrom obviating an assessment. Operating expenses for year ending Oct. 1, 1908, were $22,237.40, leaving a cash balance on hand of $18,550.78.

Lands were circa 1,200 acres, in Sections 17 and 18, T. 56 N., R. 32 W., east of and adjoining the Calumet & Hecla, from which 40 acres of surface rights, in Section 18, were sold, 1905, to the Centennial, and the NE ¼ of the SE ¼ of Lot 3, Section 5, T. 56, were sold, 1907.

A complete geological cross-section was secured, 1899-1901, by a tunnel driven from the Eastern Sandstone, 57° W. of N., for about 3,000', at right angles to the strike of the formation, N. 33° E., and by diamond drill borings, from the Kearsarge amygdaloid eastward to the western end of the tunnel. This cross-section shows upwards of 75 amygdaloidal and conglomerate beds, a number of which carried a little copper in the drill cores, and where cut in the tunnel.

There are 5 shafts, of the following depths: No. 1 is 700'; No. 2 is 250'; No. 3 is 650'; No. 4 is 400'; No. 5 is 200'. In July, 1906, a little chute of copper was found in the crosscut west from No. 1 shaft, on the 700' level, the rock carrying calcite and epidote in considerable quantities. Late in 1908 an amygdaloidal bed, discovered by the Mayflower several years previous, was showing bunchy values on the ninth level. The Old Colony has secured indifferent results from a decade of underground development, all beds carrying copper proving, so far, both narrow and bunchy.

OLD DOMINION CO. **ARIZONA.**

Office: 99 John St., New York, N. Y. Mine office: Globe, Gila Co., Ariz. Jas. Douglas, president; Chas. Sumner Smith, vice-president; Chas. H. Altmiller, secretary and treasurer; preceding officers, Cleveland H. Dodge, Jas. McLean, Copley Amory, Chas. S. Lund and J. Waldo Smith, directors. Organized Jan. 15, 1904, under laws of Maine, with capitalization $8,750,000, shares $25 par; issued, $7,313,025. Company issued 12,000 shares circa April, 1907, at $50. First dividend, of 50 cents per share, was paid Dec. 15, 1905, and a dividend of $1 per share was paid Aug. 1, 1907.

The company is a securities holding corporation only, organized to promote the operation of the mines of the Old Dominion Copper Mining & Smelting Co. and United Globe Mines under a joint management, while technically complying with injunctions restraining the merging of these two corporations. Property of the Old Dominion Co. is exclusively shares in the two subsidiary cor-

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porations named, and the Old Dominion Co. is controlled by the United Globe Mines, owned by Phelps, Dodge & Co., the United Globe having given 138,000 shares of its stock, and $250,000 cash, for 138,000 shares of the Old Dominion Co. The Old Dominion Co. has exchanged its stock for shares of the Old Dominion Copper Mining & Smelting Co., and owns nearly 95% of the stock of the Old Dominion Copper Mining & Smelting Co. The balance sheet, on Dec. 31, 1907, showed stock holdings, in subsidiary companies, of $6,981,125, with cash and accounts receivable $564,066, with $200,000 floating indebtedness and $11,073 accounts payable, with cash and accounts receivable of $453,920.

The Old Dominion and United Globe mines are operated by the Old Dominion Co. as entities, but with a free interchange, upon an equitable basis, of ores for smelting and fluxing. The Old Dominion Co. financed the floating indebtedness of the Old Dominion Mining & Smelting Co., by means of a loan. The properties are described under the titles of their respective owners.

OLD DOMINION COPPER MINING & SMELTING CO. ARIZONA.

Office: 852-50 Congress St., Boston, Mass. Mine and works office: Globe, Gila Co., Ariz. Employs circa 2,500 men. Chas. Sumner Smith, president; preceding officer, Geo. Napier Towle and Dr. Joseph T. Herrick, executive committee; preceding officers, Chas. T. Lund, E. F. Newton and G. Waldo Smith, directors; Chas. H. Altmiller, secretary and treasurer; Niles S. Berray, general superintendent; R. B. Hegardt, superintendent; Dr. L. D. Ricketts, consulting engineer.

Organized July, 1895, under laws of New Jersey, with capitalization $5,000,000, shares $25 par; outstanding, $4,050,000. Is controlled, through ownership of all but about 8,000 shares, standing in the name of some 25 minority shareholders, by Old Dominion Co. Annual meeting, first Wednesday in April.

Paid, July, 1907, a dividend of $1.25 per share, amounting to $202,500, this being the first since 1895. Company formerly had a considerable floating debt, which was taken up by the Old Dominion Co., and last of floating debt, $100,000, was paid, October, 1908. Earnings for 1907 were about $4 per share, or circa $600,000. Balance sheet, of Dec. 31, 1907, showed quick assets of $1,696,656, with floating debt and accounts payable of $1,329,848, leaving a net balance of quick assets of $366,808. For 4 years, ending 1907, improvements cost $1,875,647.

The company is engaged in extensive litigation with A. S. Bigelow and the Estate of Leonard Lewisohn, suing for recovery of promotion profits. The litigation is extremely involved, being in the state courts of New Jersey and Massachusetts, and also in the Federal courts, and has been further complicated by efforts of the New Jersey courts to restrain the company from prosecuting suit against the promoters in the Massachusetts courts. On Dec. 1, 1907, the company secured, in the Massachusetts court, a verdict for damages of $1,700,000.

Lands, 9 claims, 3 fractional, and a 10-acre millsite, at Globe, also the Old Dominion and Keystone claims, circa 3½ miles north of Globe, the Continental group, 240 acres, the Chicago & New York group of 60 acres, and the Geneva mine. Principal developments are on the property at Globe.

The principal ore zone occurs along a displacement having a northeast and southwest strike, with sharp dip eastward. The hanging-wall is limestone and quartzite, with footwall of diabase of more recent age, faulting evidently occurring before and after the intrusion of the diabase. The ore favors the hanging-wall, occurring in lenses parallel to the bedding planes of the limestone and quartzite, the largest lense yet developed being circa 60x100x200′ in size. The oxidized ores are mainly cuprite, associated with a little malachite and chrysocolla, in a gangue of iron oxides and quartz. Sulphide ores first appear at a depth of about 350′, the principal sulphide ore in the upper work-

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ings being chalcocite, with gangue of pyrite and quartz, the lower workings showing chalcopyrite of 3 to 4% copper tenor. All ores are more or less argentiferous, and, as a rule, are highly silicious, requiring heavy lime and iron fluxes in smelting. The mine suffered severely from fire and flood, in 1906, and is very wet, making circa 3,000,000 gallons of water daily Underground developments are extensive, and during the greater part of 1908, new drifts were opened at the rate of 2,000′ to 2,500′ monthly.

It was thought, for years, that the ore was cut off in what is known locally as the West Country, by a fault, but the extension has been located, and is of much promise. A dam across Pinal Creek was completed, November, 1908, to obviate the heavy seepage of water that has caused unduly high pumping charges in the past. Principal new developments are on the 10th and 12th levels, in the extreme eastern end of the mine, and on the 10th to 16th levels, inclusive, at the western end. The ore body under Pinal Creek, reopened 1905, shows oxidized ores, up to 20% in copper tenor, on the 8th, 9th and 10th levels, with chalcocite of even better copper tenor on the 11th level. The property has suffered in the past from lack of sulphide ores, which have been bought extensively from small adjoining mines in the Globe district, and also have been imported from other mining fields in Arizona, California and Mexico. The mine shows sulphides, of low average copper tenor, on the 14th, 15th and 16th levels, and these are to be developed extensively, because needed in the smelter.

The mine has a pumping capacity of 6,000,000 gallons daily, with a 1,500-gallon Prescott pump, on the 10th level, which has a 12″ water-column, discharging 30′ above the collar of the shaft, into a launder on a trestle leading to a storage tank, whence water is drawn for use of the mill and smelter.

The old shafts of the mine suffered severely from crushes and creeping, hence new shafts have been sunk, in the footwall. A shaft, on the western side of Pinal Creek, in what is known as the West Country, has 5 compartments, operating two 3-deck cages and one 2-deck cage, and, November, 1908, was 150′ below the 14th level. Crosscuts from A shaft, of about 800′ length, on the 8th, 9th and 10th levels, reach the West Country, and crosscuts will be driven on the 14th and 16th levels also.

B shaft, on the eastern side of Pinal Creek, has 4 compartments, and is bottomed on the 14th level, with a big station on the 6th level.

C shaft is bottomed on the 8th level.

D shaft, on the western side of Pinal Creek, about 2,000′ west of the most westerly workings previously made, is to be sunk to the 14th or 1,000′ level.

The Continental mine shows some high grade sulphide ores, and has considerable ore bodies assaying about 3% only in copper tenor.

Surface equipment includes engine-houses and boiler-house of steel frames, with iron sides and roofs. There is a large and well equipped machine-shop, which is a factor of prime importance, as the mine is located some hundreds of miles from the nearest large custom shops. Equipment includes a 30-drill Nordberg hoist, compound air-compressor with intercooler and water-jacketed air-cylinders, and a complete electric light plant. The management has given consideration to the matter of a new electric power plant. Petroleum is used exclusively for fuel.

The mine, mill and smelter are connected by a private railway having a 14x20″ Porter locomotive and 50-ton ore cars.

Ores are graded and furnace charges prepared at the millsite, a short distance from the mine. The grading plant has 6 steel coarse ore bins, of 85 tons capacity each. Ore is drawn from the various pockets onto trommels of manganese steel, undersize dropping to an 18″ conveying belt, which carries it to railroad storage bins, while oversize goes to a 10x20″ crusher, and thence to

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a 36″ picking-belt, from which smelting ore is hand-picked, and residual ore put through a 10x20″ rock-breaker, and crushed to 2″ size, the material from the last crusher being taken, on an 18″ belt, to the conveyor storage-bins, of 200 tons capacity each. From the storage-bins ore is drawn automatically to a conveying belt that takes it to the top of the mill, where ore is discharged into a mixing-box, and passed to revolving screens for classification.

The mill, of 300 tons daily capacity, is of structural steel, iron-sheathed, standing on concrete foundations. Equipment includes 18 Frue vanners and 9 Wilfley tables. The plant is entirely automatic, and is one of the best in existence, both in theory and in practice.

The smelter includes several buildings of structural steel on stone foundations. There are 8 double storage-bins, holding 1,000 tons of coke, limestone and ore. Mixing, weighing and charging are done automatically, requiring a force of only 4 men. Equipment includes 6 blast-furnaces, each 44x180″ at the tuyeres, set tandem, with common settlers between, charged automatically from side-dumping cars. The 6 furnaces give the smelter a normal capacity of about 2,400 tons daily, but one furnace is held in reserve. The dust-flue chamber is 20x20x250′, connecting with a 200′ smokestack, of 23′ diameter at the bottom and 14′ at the top, set on a base 25′ above the tuyeres. Flue-dust is briquetted for resmelting. Fuel is New Mexican coke, taken from the Dawson Coke Co., under a one-year contract, at $9.65 per ton, which compares with a former cost of $14.75 per ton for eastern coke, this saving reducing cost of finished copper about one-half cent per pound.

The converter department has 3 stands, with shells 84x132″, lined with a mixture of clay and quartzite carrying 4.5% copper, the linings averaging about 75% silica, each lining making an average of 18 tons of blister copper. Shells are handled by a 40-ton electric traveling crane. The converters take 50% matte and turn out blister copper of 99.5% copper tenor carrying small silver values. The converter slag-yard is 18x70′, with a floor of 2″ iron plates, laid on brick bedded in concrete.

The smelter power plant has two 200-h. p. and two 325-h. p. boilers, burning petroleum. Furnace blast is supplied by Connersville blowers, of 45,000 cubic feet aggregate capacity per minute, and converter blast is furnished by a Nordberg air-compressor of 18,000 cubic feet per minute air capacity. An electric generator furnishes energy for the crane, lighting and traction, there being an electric locomotive and three 3,000-lb. tilting cars for charging, and a steam locomotive and dump-cars for handling slags.

The smelter does considerable custom work, and is an extensive purchaser of sulphide ores, which are necessary for fluxing the oxidized ores of the Old Dominion and United Globe mines. The amount of sulphide ore available in the district is increasing rapidly, and the company also is developing large sulphide ore bodies in its own mines.

The old slag-dump is estimated to carry nearly 50,000,000 lbs. fine copper, ranging in tenor from 2 to 4% copper in the more modern slags, made before the present management took charge, up to as high as 8% in the oldest slags. The slag-dump is being resmelted, gradually, with an average recovery of about 2% copper, the slags serving for flux, while their removal will give valuable room that they now occupy.

Production has been as follows: 28,919,217 lbs. fine copper in 1905; 16,602,186 lbs. fine copper, 74,123 oz. silver and 1,798 oz. gold in 1906; 23,294,496 lbs. fine copper, 69,067 oz. silver and 2,407 oz. gold in 1907. Production, October, 1908, was 2,685,891 lbs. blister copper. Production is circa 35,000 tons of ore monthly, in addition to custom ore treated. Copper was being made at a cost of about 11 cents per pound, at the end of 1908, with a prospect of 10-cent copper ultimately.

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The Old Dominion has been well handled, physically and financially, by the present management, despite numerous criticisms from shareholders clamorous for dividends. Much of the criticism has been ill advised, as the property has been managed with a view to permanent rather than temporary advantage, and the mine never was in as good shape physically, or the company financially, as at the end of 1908.

OLD DOMINION DEVELOPMENT SYNDICATE, LTD. **BRITISH COLUMBIA.**

Mine office: Kamloops, Yale district, B. C. Organized 1906, with capitalization $35,000, shares $1 par. Lands, 3 claims, on Coal Hill, 6 miles southwest of Kamloops.

OLD EMMA MINES CO. **UTAH.**

Office: Provo, Utah. Mine office: Alta, Salt Lake Co., Utah. Organized circa July, 1908, under laws of Utah, with capitalization $600,000, shares $1 par. L. R. Martineau, president; Jesse Knight, vice-president; R. E. Miller, secretary; M. M. Miller, treasurer. Property is the Old Emma mine, in the Little Cottonwood district.

OLD EMMA MINING CO. **UTAH**

Office: Provo, Utah. Mine office: Alta, Salt Lake Co., Utah. Jesse Knight, general manager. Company apparently has been succeeded by Old Emma Mines Co. Property is the Old Emma mine, which was a considerable producer in early days.

OLD GLORY COPPER CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. J. Benton Leggat, manager. Organized Jan. 29, 1906, under laws of Maine, with capitalization $1,000,000. Property is a seven-eighths interest in the Old Glory mine, lying west of and adjoining the Mountain Consolidated mine of the Anaconda, and between the Raven and Snoozer claims of the Raven Copper Co., other eighth being owned by Butte Coalition Mining Co. Mine has a 1,200′ shaft, upper levels showing ore carrying small copper values and high gold and silver values, with an increase in copper at depth. Mine, opened 1885, has raised a little ore occasionally, since 1903, through the Buffalo shaft of the Anaconda.

OLD GOVERNORS COPPER MINING & SMELTING CO. **NEW MEXICO.**

Office: 215½ North Main St., Roswell, N. M. Mine office: San Marcial, Socorro Co., N. M. I. B. Rose, president; J. A. Cottingham, vice-president; B. F. Rose, secretary and treasurer; H. Fitzgerald, general manager. Organized September, 1903, under laws of New Mexico, with capitalization $1,000,000, shares $1 par; issued, circa $700,000. Annual meeting, second Tuesday in May.

Lands, 6 claims, area 120 acres, also a 5-acre millsite, in the Dripping Springs district, 25 miles from the Santa Fé railway, with a good wagon road connecting, showing 3 fissure veins in porphyry, of which one, of 18′ estimated width, is opened by a 50′ tunnel and shafts of 30′, 50′ and 100′, showing malachite and sulphide ore formerly said to assay 12% copper, 2 oz. silver and $8 gold per ton, and now claimed by company to average 25% copper and $3 gold per ton, which figures seem excessive. Idle.

OLD HICKORY COPPER MINING CO. **NEW MEXICO.**

Dead. Absorbed, circa 1901, by Copper Chief Mining Co., later Sater, later Ft. Pitt. Formerly at Clayton, Union Co., N. M.

OLD HUNDRED MINING CO. **COLORADO.**

Office: 43 Wall St., New York, N. Y. Mine office: Silverton, San Juan Co., Colo. Howell Hinds, president; Thos. A. Nevins, vice-president; Thos. J. Moloney, secretary and treasurer; preceding officers, Wm. C. Eakins and John Werkheiser, directors; Robt. W. Davis, Jr., general manager; J. M. Elmer, superintendent. Organized June, 1906, under laws of Maine, with capitalization $5,000,000, shares $5 par; issued, $4,500,000. Company was stated, July,

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1908, to have a floating indebtedness of $75,000. Stock was floated by Thos. Nevins & Son, of New York, and then advanced, by manipulation, to $5 per share, which was above any possible actual value.

Lands, 26 claims, patented, area circa 500 acres, on Galena Mountain, in Cunningham Gulch, near the Silverton & Northern railway. Property shows a quartz vein of 5′ to 12′ claimed width, carrying values in gold, silver, lead and copper, with an increase in copper at depth, developed mainly by tunnel, and claimed to have upwards of 4 miles of workings.

Equipment includes a power building of steel and concrete, with steam and electric plants. There also is a tramline, store and numerous buildings.

The mill, of steel frame, of 200 tons rated daily capacity, has a very complete equipment, including 40 stamps, crushers, rolls, jigs, Frue vanners, slime tables and concentrating tables. Company is in bad condition financially, and is not regarded favorably.

OLD IMPERIAL MINING & MILLING CO. **NEVADA.**

Mine office: Cherry Creek, White Pine Co., Nev. P. H. Cannon, superintendent. Has auriferous and argentiferous copper ores, employing circa 10 men at last accounts.

OLD IRONSIDES MINING CO. **BRITISH COLUMBIA.**

Dead. Was merged, March 29, 1901, in Granby Mining, Smelting & Power Co., Ltd. Formerly at Phoenix, Boundary district, B. C.

OLD PUEBLO MINING & MILLING CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Alexander Rossi, president; H. W. Roche, vice-president and general manager; W. P. Haynes, secretary and treasurer. Capitalization $1,000,000, shares $1 par. Lands, 9 claims, circa 5 miles west of Tucson, having about 600′ of workings, with a 70′ shaft that cut, at a depth of 30′, a 15-ton pocket of chalcocite assaying 33% copper, 16 oz. silver and $2.50 gold per ton. Has several mine buildings. Arranged, 1907, with Tucson Consolidated Copper Co., for latter to do $50,000 worth of development work, in exchange for 51% of the stock, to be turned over on completion of work. In October, 1907, made an initial shipment of ore, ranging 10 to 12% copper and $5 to $10 combined gold and silver values per ton. Employs circa 20 men.

OLD RELIABLE MINING CO. **NEW MEXICO.**

Mine office: Golden, Santa Fé Co., N. M. Ores carry gold and copper. Has two 5′ Huntington mills. Presumably idle.

OLD TIEWAUKEE MINING CO. **UTAH.**

Office: care of Lewis A. Jeffs, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capitalization $500,000, shares $5 par. Lands include the old Tiewaukee mine, area 120 acres, adjoining the Winnimuck, supposed to carry the Caledonia vein at a depth of circa 600′. Deepest shaft is less than 100′, development being mainly by tunnel, and the property has produced some good ore in the past. Company said also to own the Yellow Creek property, area 90 acres, near the Hidden Fortune mine, in the Black Hills district of South Dakota. Presumably idle.

OLD TOWN MINING & MILLING CO. **COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. Ores carry gold, silver and copper. Main shaft, 900′. Has steam and electric power. Presumably idle.

OLGA COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Luning, Esmeralda Co., Nev. Property, near Luning, has shafts of 20′ to 60′ for 2,200′ along the outcrop of a vein said to show ore averaging 8% copper, with some assays up to 50% in tenor. Idle and apparently moribund.

OLIVE CAMP MINING CO. **ARIZONA.**

Letter returned unclaimed from former office and mine, Tucson, Pima Co.,

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Ariz. W. W. Wishon, general manager; John Ellis, vice-president; D. H. Collins, superintendent. Lands, circa 12 miles south of Tucson, have a 55′ shaft. Idle and apparently moribund.

JOSEPH OLIVER. **NEW MEXICO.**

Office and mine: Chloride, Sierra Co., N. M. Employs 4 men. Lands, 120 acres, in the Apache district, showing 6 contact deposits, between limestone and porphyry, of which 2, under development, of 40′ reported average width, are said to be traceable 7 miles, carrying oxide, carbonate and sulphide ores of copper, claimed to average 18% copper and 25 oz. silver per ton, which estimates are too high. Mine is opened by shafts of 30′, 50′, 75′, 100′ and 110′, and by a 200′ tunnel.

OLYMPIA MINING CO. OF WYOMING. **WYOMING.**

Office: 187 E. Chicago Ave., Chicago, Ills. Mine office: Encampment, Carbon Co., Wyo. Pehr W. Nillson, president; Herman C. Johnson, secretary; Carl O. Borgquist, treasurer; John Lundgren, general manager. Idle and apparently moribund.

OLYMPIC MINING CO. **WASHINGTON.**

Office: 301 Lumber Exchange, Seattle, Wash. E. R. Butterworth, president; Alfred Jeffery, secretary. Company advertised stock on the installment plan, claiming that its lands contained gold, copper and coal, but secretary states that no copper property is being developed, and manifests a reticence regarding the alleged properties of the company utterly at variance with the clarion-toned advertising done in the press. Location of lands, if any, unknown, and company regarded with suspicion.

OMAHA COPPER MINING CO. **WYOMING.**

Office: 1017 New York Life Bldg., Omaha, Neb. Mine office: Encampment, Carbon Co., Wyo. Jas. H. Kyner, secretary. Is a twin of the Blanche Copper Mining Co. Idle.

OMAHA GOLD & COPPER MINING & SMELTING CO. **MONTANA.**

Dead. Formerly at Bigtimber, Sweetgrass Co., Mont.

OMAKI MINE. **JAPAN.**

Mine office: Nishitate-mura, Kita-Akita-gori, Ugo, Japan. Mine was opened circa A. D. 1750, and reopened 1885. Ore bodies are lenses in Tertiary tuff and andesite. Largest lense is 70′ deep and 130′ long. Ore is argentite, associated with chalcopyrite, sphalerite and galena. Latest reported production, 1896, was 242,690 lbs. fine copper and 858,316 momme fine silver. Idle some years.

OMAR MINING CO. **ALASKA.**

Office: Canterbury Bldg., Portland, Ore. Mine office: Kiam, Prince of Wales Island, Alaska. Chas. E. Ladd, president; W. A. Howe, vice-president; C. E. S. Wood, secretary and treasurer; W. W. Catlin, general manager; H. W. Turner, superintendent. Organized 1904, under laws of Oregon, and is operated as a close corporation.

Lands, 6 claims, area 120 acres, 4 miles from tidewater, on McKenzie Inlet, at an elevation of 3,200′, held, on a long lease, from the Khayyam Copper Co. Property shows Kasaan greenstone and schists, latter in part dioritic, carrying 4 parallel ore zones, having lenticular ore bodies in schist, these ranging 4′ to 20′ in width. Development is by tunnels of 140′, 240′ and 650′, with about a quarter-mile of workings, showing ore giving average assays of about 3% copper, with small gold and silver values, and occasional zinc. Ore is mainly marcasite, carrying small percentages of disseminated chalcopyrite, with more or less pyrite and pyrrhotite.

Equipment includes an aërial tram of 4,186′, and a surface tram of 12,160′, ending at ore-bunkers upon a wharf on McKenzie Inlet. The old management was over-enthusiastic, and built the tramway and wharf before a mine was

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opened, and production, 1907, was only 2 carloads of ore. Property considered promising.

OMEGA COPPER CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Vail, Pima Co., Ariz. L. Zeckendorf, president and treasurer; Capt. T. C. Roberts, vice-president and manager; Frank H. Hereford, secretary. Organized May, 1906, under laws of Arizona, with capitalization $2,500,000, shares $10 par.

Lands, 2 claims and a smelter site, 16 miles from Vail, in the Helvetia district, also sundry lode claims in the Tyndall district of Santa Cruz county, Arizona. The Helvetia property was one of the first copper mines in Pima county, having shipped considerable carbonate ore in the past. Mine is opened by a 150′ upper tunnel, and the 1,100′ Tilly tunnel having a back of circa 600′, with about one mile of workings. Main vein, of about 40′ average width, carries carbonate and sulphide ores averaging 6 to 9% copper, with fair gold and silver values, selected ore running up to 30% copper and 20 oz. silver per ton. Suspended October, 1907, after shipping a little ore.

OMEGA MINING CO. **ARIZONA.**

Dead. Lands sold, May, 1906, to Omega Copper Co. Formerly at Vail, Pima Co., Ariz.

OMODANI MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

OMORI MINE. **JAPAN.**

Mine office: Omori-mura, Nima-gori, Iwami, Japan. Property is an old mine, opened circa A. D. 1300, and reopened 1525. The mine once was highly productive, but output was greatly reduced toward the end of the Nineteenth Century, and is again increasing. The Eikyu group carries mainly auriferous and argentiferous chalcopyrite, and the Hontani group carries malachite and argentite, with some native silver.

Production has been as follows: 80,139 lbs. fine copper, 122,280 momme silver and 2,880 momme gold in 1900; 210,596 lbs. fine copper in 1903; 490,226 lbs. fine copper, 1,564,702 grams silver and 21,427 grams gold in 1906; 511,419 lbs. copper, 556,269 momme silver and 9,068 momme gold in 1907.

ONECO COPPER MINING CO. **MICHIGAN.**

Office: 64-50 State St., Boston, Mass. Mine office: Demmon, Houghton Co., Mich. Wm. F. Fitzgerald, president; S. S. Millet, secretary and treasurer; Jos. Hocking, superintendent. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $1,473,500. Levied an assessment of 50 cents per share, Jan. 15, 1906.

Lands, 800 acres, known originally as the Hungarian mine, and later as the Fitzgerald. First work was done 1862, when a shaft was sunk less than 100′. Property was idle until 1899-1900, and a little work was done again, 1906-1907. The mine has one shaft, of circa 500′ depth. Improvements include several mine buildings and dwellings. Fully described Vol. II.

ONEIDA GOLD & COPPER CO. **ARIZONA.**

Dead. Formerly at Nogales, Santa Cruz Co., Ariz.

ONOKO MINES CO. **COLORADO.**

Office: 203 Kittredge Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Central City, Gilpin Co., Colo. Samuel L. Morris, president; Edgar T. Butler, secretary and treasurer. Organized under laws of Colorado, with capitalization $1,800,000, shares $1 par. Lands, 5 claims, opened by a 229′ vertical shaft, showing a vein with a 12″ paystreak, giving assay values up to 11.95% copper, 3.91 oz. silver and 0.17 oz. gold. Idle and apparently moribund.

ONTARIO & CŒUR D'ALENE MINING CO. **IDAHO.**

Office: care of Fred Baier, agent, Saltese, Mont. Mine office: Mullan,

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Shoshone Co., Idaho. Geo. Isle, president; M. N. Stratton, secretary and treasurer; preceding officers, Geo. M. Reasoner, J. A. Reinhart and Henry Billberg, directors. Lands, 15 claims, near the East Snowstorm, on which work was begun circa 1906. Development is by a tunnel, planned to cut the vein at about 800′ depth.

ONTARIO & COLORADO GOLD & COPPER MINING CO. **COLORADO, ONTARIO & YUKON.**

Dead. Formerly at Central City, Gilpin Co., Colo. Described Vol. VI.

ONTARIO COPPER CO. **ONTARIO.**

Office: 520 University Blk., Syracuse, N. Y. Mine office: El Dorado, Hastings Co., Ont. Jas. B. Cook, president; Arthur Coe, mine manager; G. H. Hambly, superintendent. Property formerly was under lease to the Medina Gold Mining Co., which seems to have gone under, and is the only copper mine in Eastern Ontario. Ore occurs in a contact deposit between limestone and granite, showing hematite outcrops, succeeded at depth of circa 75′, by chalcopyrite and a little high grade chalcocite, in a vein of 7′ to 8′ width, estimated by Ontario Geological Survey to carry 4 to 10% copper, and estimated by company to average 7% copper, which probably is too high. Property originally was an iron mine, from which considerable hematite was shipped, but iron ore proved to be merely a gossan. Mine, opened to depth of about 300′, has a 140′ main shaft. Equipment includes an air-compressor and electric light plant.

Smelter is at the mine, a derrick hoisting ore from the mine dumps into the furnace building. Smelter, blown in June 25, 1906, and since run at intervals, mine not being sufficiently developed to supply ore steadily, has a 48″ circular water-jacket blast-furnace, of 50 tons rated capacity, making a 45% matte in 2 fusions. Was said, 1907, to be producing 30 to 35 tons of ore daily, and to have shipped some matte to the DeLamar works in New Jersey. Apparently company has same officers as the Medina Gold Mining Co., which paid dividends while peddling stock, and which came to grief. Property considered promising, but company not regarded favorably.

ONTARIO DEVELOPMENT CO. **ONTARIO.**

Office: care of Frank Howard, Munising, Mich. M. J. Morrisey, secretary and treasurer. Organized under laws of Ontario, with capitalization $150,000. Lands, 320 acres, 40 miles north of Sault Ste. Marie, Ontario, and just north of Goulais Bay, opened by 14 shallow pits, deepest 24′, showing an 8′ vein of ore, with quartz gangue, giving good assays in copper. Idle.

ONTARIO GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz.

ONTARIO NICKEL CO., LTD. **ONTARIO.**

Mine office: Worthington, Algoma, Ont. G. E. McGinley, president; W. S. Gates, manager. Organized Oct. 5, 1906, under laws of Ontario, with capitalization $1,000,000, succeeding the Canada Nickel Co. Property is the Totten mine, one-half mile west of Worthington, having a 90′ shaft. Is said to use a new process for the recovery of nickel.

ONTARIO SMELTING CO. **ONTARIO.**

Dead. Formerly at Massey Station, Algoma, Ont.

O'OKIEP MINE. **CAPE COLONY.**

Owned by Cape Copper Co., Ltd.

OPAL GOLD MINING & MILLING CO. **WASHINGTON.**

Mine office: Chesaw, Okanogan Co., Wash. Ores carry gold, silver and copper. Has steam power. Idle.

OPEX CONSOLIDATED MINES CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jesse Knight, president; Elmer R. Jones, vice-president; R. E. Allen, secretary; M. H. Walk-

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er, treasurer; Frank P. Swindler, general manager; preceding officers, W. Lester Mangum, Amanda M. Knight, Lafayette Hanchett and Geo. T. Odell, directors. Organized October, 1908, under laws of Utah, with capitalization $1,000,000, shares $1 par.

OPHIR CONSOLIDATED GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Florence, Pinal Co., Ariz. Described Vol. VI.

OPHIR CONSOLIDATED MINES CO. **COLORADO.**

Office: Madison, Wis. Mine office: Ames, San Miguel Co., Colo. W. B. Ladd, general manager; F. E. Trumble, superintendent. Mine, known as the Silver Bell, has gold, silver and copper ores, of importance in the order noted, copper being merely a by-product. Has hydro-electric power, with a 50-stamp mill, employing circa 60 men.

OPHIR COPPER MINING CO. **MONTANA.**

Dead. Lands sold, 1906, to Butte Central & Boston Copper Corporation. Formerly at Butte, Silver Bow Co., Mont. Fully described Vol. VI.

OPHIR GOLD & COPPER MINING CO. **MONTANA.**

Office: Spokane, Wash. Mine office: Helena, Lewis & Clark Co., Mont. Capitalization $1,000,000. Lands, in the Blackfoot district, near Helena, have a fissure vein carrying copper ore of fair assay tenor.

OPHIR HILL CONSOLIDATED MINING CO. **UTAH.**

Mine office: Ophir, Tooele Co., Utah. E. W. Clarke, superintendent. Ores carry gold, silver, lead, copper and zinc, with values mainly in silver and lead. Has water, steam and electric power, and a 150-ton concentrator. Is controlled by Hon. W. A. Clark, and is operated as a close corporation, but mine is supposedly profitable. Litigation over land titles was settled favorably to company, February, 1908. Was producing on leases about half normal output, early 1908.

OPHIR MINING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont.

OPHIR MINING & DEVELOPING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont.

OPHIR QUEEN MINING CO. **UTAH.**

Office: Cedar River, Mich. Letter returned unclaimed from former mine office, Ophir, Tooele Co., Utah. Samuel Crawford, secretary, treasurer and general manager. Organized Apr. 19, 1902, under laws of Utah, with capitalization $250,000, shares 25 cents par. Lands, 4 claims, area 53 acres, in the Ophir district, showing a 25′ vein, giving assays up to 12% copper, 10% lead, 15% zinc, 16 oz. silver and 40 cents gold per ton, opened by a 335′ shaft with two 5x8′ compartments, and 3 tunnels, longest 220′ and 225′. Has a 40-h. p. gasoline hoist, 3-drill Rand air-compressor and power drills. Idle and presumably moribund.

OPTIMO GOLD & COPPER MINING CO. **MONTANA.**

Office: Missoula, Mont. Mine office; Saltese, Missoula Co., Mont. C. J. Heidenreich, manager. Organized 1904, under laws of Montana, with capitalization $1,500,000, shares $1 par. Idle several years.

OQUIRRH-BINGHAM COPPER CO. **UTAH & WYOMING.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah. Described Vol. VI.

ORANGE BLOSSOM MINING & MILLING CO. **CALIFORNIA.**

Office: San Diego, Cal. Mine office: Bagdad, San Bernardino Co., Cal. Jas. A. Hodgson, president; J. M. Dodge, vice-president; Will H. Holcomb, secretary; R. V. Dodge, treasurer. Organized circa January, 1908, with capitalization $2,000,000, shares $1 par. Lands, 25 claims, including the Bengal mine, and a millsite, circa 10 miles north of Bagdad, having a tunnel and a 650′ shaft showing auriferous copper ore. Has 8 miles of 4″ and 5″ pipe-line,

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bringing water from springs having a flow of about 60,000 gallons daily. Has necessary mine buildings, and was building a 20-stamp mill, at last accounts. Is said to plan an electric power installation for mine and mill. Employs circa 30 men.

ORANGE PLAINS COPPER MINING CO. **AUSTRALIA.**

Mine office: Dandaloo, N. S. W., Australia. Property, in the vicinity of the Bogan River mine, shows ore of good assay tenor.

ORANGE RIVER SYNDICATE. **ORANGE RIVER COLONY.**

Mine office: Upington, Orange River Colony. Is said to have developed copper ore, early 1908.

ORDENAURA MINING CO. **MEXICO.**

Mine office: Valardeña, Cuencamé, Durango, Mex. Has auriferous and argentiferous copper ores, with steam power and a 25-ton mill, employing circa 30 men.

OREGON-ARIZONA COPPER CO. **ARIZONA.**

Mine office: Superior, Pinal Co., Ariz. Lands are 2 miles south of Superior. Has steam power.

OREGON & ARIZONA MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Old Glory, Santa Cruz Co., Ariz. Lands, known as the Black Diamond group, 2 miles from the Mexican line, are said to carry a vein up to 30′ in width. Idle and presumably moribund.

OREGON COPPER CO. **OREGON.**

Dead. Formerly had an office in Spokane, Wash., and presumably was located in Josephine county, Oregon.

OREGON GOLD & COPPER CO. **OREGON.**

Dead. Formerly at Sumpter, Baker Co., Ore.

OREGON HOMESTEAD MINING & REDUCTION CO. **OREGON.**

Office: care of C. J. Allen, president, Portland, Ore. Mine office: Galice, Josephine Co., Ore. Frank B. Roberts, vice-president and general manager; W. T. Perry, secretary and treasurer. Organized, 1904, to take over the Allen copper-gold mine, on Rogue river, 3½ miles south of Galice creek, Josephine county, Oregon, at a reported consideration of $750,000. Apparently no work done.

OREGON-IDAHO INVESTMENT CO. **OREGON.**

Mine office: Sparta, Baker Co., Ore. Jas. A. Howard, manager. Lands include the Poorman and Iron Mask claims, showing a heavy gossan. A 120′ crosscut tunnel is said to be entirely in ore, giving average assays of about 6% copper, with small gold and silver values.

OREGON ORE REDUCTION WORKS. **OREGON.**

Dead. Was a fake. Formerly at Portland, Multnomah Co., Ore.

OREGON SHORT LINE MINING CO **NEVADA.**

Dead. Sold lands to Bristol Consolidated Mines Co. Formerly at Pioche, Lincoln Co., Nev.

OREGON SMELTING & REFINING CO. **OREGON.**

Office: Postal Telegraph Bldg., New York, N. Y. Works office: Sumpter, Baker Co., Ore. Walter E. Lindsay, president; G. F. Holmes, vice-president; Wm. S. Nichols, secretary; E. J. Lindsey, treasurer; Fred D. Fuller, general manager; preceding officers, Scott German and Jas. H. Caldwell, directors; R. B. Green, superintendent. Organized March 16, 1902, under laws of Arizona, with capitalization $600,000, shares $10 par.

Lands include a 200-acre smelter site, a 640-acre timber tract and 40 acres of miscellaneous lands. Company was said, 1905, to have taken a bond and lease on a sulphide copper property in the Seven Devils district, circa 20 miles from Weiser, Washington Co., Idaho.

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The smelter, at Sumpter, of 150 tons nominal daily capacity, has a 33x37' sampling mill, 16x86' ore-bins, 46x88' furnace building, 32x66' briquetting plant, 46x77' boiler-house and 32x52' laboratory. The cupola building has a 38x144" Allis-Chalmers blast-furnace, making matte, formerly estimated by company to average 40% copper, 300 oz. silver and $150 gold per ton, but actually averaging only about 15 to 40% copper, with an average of 60 oz. silver and $200 gold per ton, sent for refining to the Tacoma smelter. Fuel is wood, costing $2.50 per cord; soft coal, costing $8 per ton, and coke, costing $8 per ton. In 1905 the smelter treated 8,798 tons of custom ore, making therefrom 174,758 lbs. fine copper, with considerable gold and silver values. The supply of custom ore available is insufficient to keep the plant running at its full capacity. The company was in financial difficulties, February, 1908, but these are said to have been settled April, 1908, and at last accounts resumption was planned.

ORE KNOB COPPER CO. **CAROLINA.**

Dead. Property was sold, circa 1885. Formerly at Jefferson, Ashe Co., N. C.

ORE KNOB MINE. **NORTH CAROLINA.**

Office: Ellicott Square Bldg., Buffalo, N. Y. Mine office: Jefferson, Ashe Co., N. C. Capt. John Bent, superintendent. Mine, opened previous to 1850 and closed 1885, is said to have yielded, 1874, net profits of $60,302. Property shows a fissure vein of 6' to 20' width, of nearly vertical dip, in micaceous granite and mica-schist, carrying mainly high grade sulphides, claimed to average 12 to 20% copper, which is an overestimate. Development is by 11 shafts, deepest 400'. The smelter, built 1902, has a 150-ton Garretson pyritic furnace. Idle since 1905.

ORE KNOB MINING CO. **NORTH CAROLINA.**

Dead. Formerly at Jefferson, Ashe Co., N. C. Described Vol. V.

ORFORD COPPER CO. **NEW JERSEY.**

Office: 43 Exchange Pl., New York, N. Y. Works office: Bayonne, Hudson Co., N. J. Robert R. Moffett, superintendent; E. Franki, chief engineer. Is controlled by the International Nickel Co. and refines nickel mattes and ores from New Caledonia and nickel-copper matte from Canada, in addition to treating copper ores and mattes from the United States, Canada, Mexico and elsewhere. Capacity of plant is about 8,000,000 lbs. copper and 1,000,000 lbs. metallic nickel, monthly. Works are exceptionally well equipped, and company enjoys a deservedly high reputation for metallurgical ability, and the fine quality of its metallic products.

ORIENTAL COPPER CO. **ARIZONA.**

Office: 303 Security Bldg., St. Louis, Mo. Mine office: Cave Creek, Maricopa Co., Ariz. W. F. McDonald, president; John B. Cabanne, vice-president; F. W. Irland, secretary and treasurer; preceding officers, H. C. Townsend, W. C. Stith, S. B. Schuyler, C. A. Deane, E. B. Lane and H. F. Berkley, directors; A. S. Mills, superintendent. Organized, 1904, under laws of Arizona, with capitalization $2,000,000, shares $1 par.

Lands, 19 claims and a 5-acre millsite, area 385 acres, having a 475' tunnel, said to crosscut a number of veins showing ores that have given assays of 8.9% copper and 6.8 oz. silver per ton, with occasional small gold values. Management claims many carloads could be shipped, but that such shipments would be inadvisable. Tunnel is in schist, and ore found must have been from small stringers. Property poorly developed and not regarded favorably.

ORIENTAL MINING & MILLING CO. **ARIZONA.**

Office: Jamestown, N. Y. Mine office: Providence, Yavapai Co., Ariz. A. F. Kent, president; W. A. Keeler, secretary; Wm. A. Kent, assistant treasurer; L. B. Kent, superintendent. Is primarily a gold and silver mine, carrying a small percentage of copper. Has a 20-stamp mill, employing circa 25 men.

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ORIENT GOLD MINING CO. **WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. Ores carry gold and copper. Has steam power. Idle several years.

ORIGINAL BLUE BIRD COPPER MINING CO. **CALIFORNIA.**

Mine office: Oasis, Mono Co., Cal. Capitalization $1,500,000, shares $1 par. Mine, circa 2 miles south of Oasis, having shafts of 80′ and 130′, made shipments, circa 1865, of high grade ore, ranging up to 250 oz. silver per ton, and is claimed to have, on an old dump, several hundred tons of ore averaging 10% copper, 35 oz. silver and $2 to $12 gold per ton. Formerly had a mill.

ORIGINAL CONSOLIDATED MINING CO. **MONTANA.**

Office and mine: Miner Bldg., Butte, Silver Bow Co., Mont. Employs 750 men. Hon. Wm. A. Clark, president; Arthur H. Wethey, vice-president and general manager; W. M. Bickford, secretary; Thos. Bryant, superintendent; Geo. Mennie, assistant superintendent. Organized Feb. 20, 1904, under laws of Washington, with capitalization $10,000,000, shares $100 par, as successor of Original Mining Co.

Lands include the Original, West Stewart, East Stewart, Dives, Home, Woolman and other adjoining properties, the Original and West Stewart, both small fractional claims, being the principal producers. The mines are connected underground with adjoining properties.

The Original mine has a 2,200′ two-compartment shaft, which was straightened and retimbered, early 1908, this shaft having a 126′ steel gallows-frame and a 36x72″ first-motion duplex hoist, good for circa 2,600′ depth.

The West Stewart mine has a 1,900′ vertical shaft, showing, at the bottom, a 30′ vein yielding considerable ore assaying up to 10% copper, with fair silver values, with ore of better grade in the bottom levels than above. The West Stewart has a 120′ steel gallows-frame, with a hoist duplicating that at the Original.

Equipment includes 4 steam air-compressors and 2 Ingersoll-Sergeant electric air-compressors, each of latter being driven by a 200-h. p. induction motor.

The ore of the Original company is treated at the Butte Reduction Works, under the same ownership, located circa 1½ miles south of the mine, ore being transported, at night, over the line of the Butte Electric Railway Co.

Production normally is circa 18,000,000 lbs. fine copper yearly, but, for 1907, was only 12,500,000 lbs., owing to depression in the metal market during the latter half of year. For year ending June 1, 1907, ore extracted was 264,231 tons, yielding $9.31 per ton gross, with cost of extraction $4.08 per ton, and net earnings were $663,259. The property, despite its small area, is highly productive and valuable, and is well managed in all departments.

ORIGINAL MINING CO. **MONTANA.**

Dead. Succeeded, Feb. 20, 1904, by Original Consolidated Mining Co. Formerly at Butte, Silver Bow Co., Mont.

ORIGINAL YERINGTON COPPER CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Organized, 1907, under laws of Arizona, with capitalization $1,000,000.

ORIOLE COPPER MINING CO. **WYOMING.**

Office: Douglas, Wyo. Mine office: Clarence, Converse Co., Wyo. Hon. C. D. Clark, president; T. H. Howard, vice-president; E. J. Wells, secretary, treasurer and general manager; Chas. J. Wells, superintendent. Organized 1902, under laws of Wyoming, with capitalization $750,000, shares $1 par.

Lands, 4 claims, area 80 acres, in the War Bonnet district, carrying an 8′ fissure vein in granite, opened by shafts of 75′ and 255′, showing carbonate ore assaying about 6% copper, with traces of gold and silver. Has a 40-h. p. steam plant, with hoist and 2-drill Leyner air-compressor. Presumably idle.

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ORIOLE MINING & MILLING CO. **WASHINGTON.**

Mine office: Metaline, Stevens Co., Wash. Has secured ores assaying well in lead, copper and silver.

ORION MINING CO. **NEW MEXICO.**

Office: P. O. Box 12, El Paso, Tex. Mine office: Lordsburg, Grant Co., N. M. A. W. Gifford, manager. Organized 1898, under laws of New Mexico, with capitalization $200,000, shares $1 par. Property is the Dundee mine, in the Shakespeare district, Grant county, New Mexico, having about 1,000′ of underground openings, claimed to show 10,000 tons of ore, with quartz gangue, carrying $12 to $14 per ton in gold, silver and copper, which must be concentrated to afford a profit. Company also owns claims in the Jarilla district of Otero county, New Mexico. Apparently idle for some years.

COMPAÑIA DE MINAS EL ORITO. **CHILE.**

Office: Valparaiso, Chile. Mine office: Vallenar, Atacama, Chile. Organized July 19, 1904, under laws of Chile, with capitalization £50,000, shares £5 par. Property is Las Breas mines, opened 1888. Preceding company was a considerable producer, making upwards of 1,000,000 lbs. fine copper yearly.

SOCIEDAD MINERA EL ORITO. **CHILE.**

Dead. Was succeeded, July 19, 1904, by Compañía de Minas El Orito. Formerly at Vallenar, Atacama, Chile. Described Vol. V.

ORKLA GRUBE AKTIEBOLOG. **NORWAY.**

Norwegian incorporation of Orkla Mining Co., Ltd.

ORKLA MINING CO., LTD. **NORWAY.**

Office: 61 Gracechurch St., London, E. C., Eng. Norwegian office: Thamshavn, Trondhjem, Norway. Mine office: Lökken Vaerk, Meldalen, Trondhjem, Norway. Thos. Fearnley, chairman; Consul-General Christian Thams, general manager; preceding officers, P. M. Wikström, Thv. Olrog, Marc. Wallenberg, Consul-General Jacob Finne and J. M. Berner, directors. Organized Dec. 7, 1904, under laws of Norway, with title Orkla Grube Aktiebolog, with capitalization kr. 4,140,000, shares 180 kr. par. Controls a subsidiary railway and power company.

Lands, 120 claims, including mining, timber and miscellaneous lands, area 2,500 acres, in the Meldal and Orkedal valleys, Sondre Trondhjem. Principal properties are the Lökken, Höidal and Dragset mines, carrying 2 main ore zones, the southern running from the Dragset, through the Lökken and Höidal, to the Aamot mines, in the southeast, a distance of about 9 miles. The southern zone runs from the Holum mine to various ore deposits in the Grefstadfjeld, in the east, a distance of about 6 miles. Ore occurs in veins and lenses in a brecciated schistose diorite country rock of Silurian age, ore being disseminated chalcopyrite and cupriferous pyrite.

The Lökken mine, opened A. D. 1657, has a 200′ upper shaft and 750′ incline shaft, with double hoist for ore and double hoist for men, and a 900′ tunnel, showing considerable ore bodies.

The Höidal, opened A. D. 1680, includes the Nya Höidal and Gamla Höidal mines, principal openings being tunnels of 200′ and 500′.

The Dragset mine has shafts of 200′ and 300′, and a 100′ tunnel.

The Aamot and Kong Karl mines have 100′ tunnels each, and the Victoria mine, opened circa 1870, also has comparatively slight development. The Holum mine, recently opened, consists of 3 parallel ore bodies, of 3′ to 5′ width, traced for distance of about 160′.

The main dressing plant is at the Lökken mine, where the mining equipment includes two 20-h. p. Ingersoll-Rand compressors. There is a 50-ton Elmore experimental mill, and a large mill with 11 Elmore units, rated at 800 tons daily capacity, being the largest copper concentrating plant in Scandinavia. Ore is brought to this mill by aerial trams of 8.4 kilometers from

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the Dragset mine, and 2.7 kilometers from the Höidal mine. Electric power is brought 30 kilometers from the Skjaenaldfos waterfall station, at 15,000 volts, in a 3-phase alternating current, about 2,000 h. p. being utilized.

Buildings at the property include 6 dwellings for officers, 40 dwellings for workmen, compressor house, machine shop, transformer station, administration building, warehouses, stores, hotel, etc., with a total of about 20 miscellaneous buildings. Company has its own postoffice and telegraph office, by arrangement with the Norwegian government.

A subsidiary company, organized for the purpose, has installed a fine power plant at the Skjaenaldfos waterfall, and has built an electric railroad line of 26 kilometers for transporting ore from the Lökken mill to Thamshavn, at the mouth of the river Orkla, in the Orkedalsfjord, where the company has large wharves for goods and passenger traffic, and automatic loading devices for the dispatch of ore. The transportation company, which has the official title of Chr. Saldeson & Chr. Tham's Communication Aktieselskab, has a steamer, making 2 round trips daily between Thamshavn and Trondhjem.

The plans of the company, which has a strong and ambitious management, call for the export of circa 100,000 tons of pyrite and cupriferous pyrite, beginning with 1909.

ORO COBRA MINING CO. **ARIZONA.**

Office: 715 High St., Burlington, Iowa. Mine office: Wendendale, Yuma Co., Ariz. Thos. Wilkinson, president and general manager; Hon. John J. Hocking, vice-president; S. M. Wilkinson, secretary. Organized October, 1901, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, $900,000.

Lands, 10 claims, area 200 acres, adjoining the Harcuvar Copper Co., in the Ellsworth district, 12 miles west of Wendendale, showing country rocks of diorite, granite, and porphyry, carrying several fissure veins in diorite and porphyry, these ranging from a few inches to 20′ in width, showing oxide and carbonate surface ores giving assays of 12 to 15% copper and $1.50 to $80 combined gold and silver values per ton. Development is by shafts of 40′, 40′ and 100′, and by a tunnel of 175′. Presumably idle.

ORO COBRE MINING CO. **ARIZONA.**

Office: care of Geo. Duffy, Globe, Ariz. Organized Oct. 12, 1906, under laws of Arizona, with capitalization $300,000, shares $1 par. Presumably idle.

ORO CONSOLIDATED MINING CO. **ARIZONA.**

Office: care of R. M. Reid, secretary, Colorado Springs, Colo. Mine office: Prescott, Yavapai Co., Ariz. H. I. Read, president; O. P. Hopkins, treasurer. Lands, 5 claims, patented, area 100 acres, in the Mineral Point district, 2 to 4 miles from two railroads. Ore values apparently are mainly in gold, and company claims to have developed 7,000 tons of ore, worth $9 to $100 per ton, which is doubted. Idle.

ORO DENORO MINES, LTD. **BRITISH COLUMBIA.**

Dead. Succeeded by Denoro Mines, Ltd. Formerly at Rossland, Trail district, B. C. Fully described Vol. V.

ORO GRANDE MINES CO. **ARIZONA.**

Letter returned unclaimed from former office, 1034 Park Row Bldg., New York, N. Y. Mine office: Wickenburg, Maricopa Co., Ariz. Geo. B. Upton, superintendent. Mine has upwards of 3,300′ of openings, showing a large ore body, considerably mixed with country rock. Has gasoline power and a 10-stamp mill. Property well regarded, but management not.

ORO GRANDE MINING CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Lands, on Upper Mineral Creek, have a 110′ shaft, showing a 5′ vein giving ore assaying up to 5% copper, 30 oz. silver and 1.5 oz. gold per ton. Presumably idle.

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OROGRANDE SMELTER. **NEW MEXICO.**

Owned by Southwest Smelting & Refining Co.

ORO MAXIMO MINING CO. **MEXICO.**

Office: Detroit, Mich. Mine office: Bacoachi, Arizpe, Sonora, Mex. N. L. Clancey, secretary and superintendent. Has 600,000 shares.

Lands, circa 1,000 acres, about 40 miles from La Cananea, the nearest railroad point. The mine is opened by a 275′ two-compartment shaft and a 300′ three-compartment shaft, with considerable development. Equipment includes 2 hoists and a 12-drill Rand air-compressor. Water is supplied by a 2-mile pipeline. At last accounts company planned a 60-stamp mill. Property, which is considered promising, was attached, circa September, 1908.

COMPAÑIA DE ORO y PLATA, S. A. **MEXICO.**

Is the Mexican incorporation of the Carman Consolidated Copper Co.

ORO PLATA MINING & DEVELOPMENT CO. **MONTANA.**

Dead. G. W. Simpkins was president and general manager; G. H. House, first vice-president; N. M. MacLeod, second vice-president and secretary; C. G. Laurence, treasurer. Lands, near the Copper Chief, were said to show a vein of 4′ to 5′ width, carrying auriferous copper ore. Former office was 630 Hyde Block, Spokane, Wash. Formerly at Dillon, Beaverhead Co., Mont.

ORO QUAY GOLD MINING & REDUCTION CO. **COLORADO.**

Mine office: Ortiz, Conejos Co., Colo. Lands, 12 miles south of Ortiz, show considerable bodies of magnetic iron ore, some of which carries good assay values in copper, silver and gold. Was under development, 1908, by Colorado Fuel and Iron Co., under lease.

FRANCISCO RODRÍGUEZ OROZCO y CA. **MEXICO.**

Office and mine: Mazapil, Zacatecas, Mex. Property is 23 mines, including the Todos Santos and La Nieva, developed by a 175′ main shaft, and a 1,000′ main working tunnel. Ores carry copper, lead, silver and gold values. Equipment includes a 75-ton mill and a 75-ton smelter. Employs circa 200 men.

ORPHAN COPPER CO. **ARIZONA.**

Office: 1 West 34th St., New York, N. Y. Mine office: Globe, Gila Co., Ariz. Melville D. Chapman, president; Chas. M. Clark, vice-president and general manager; preceding officers, P. P. Greer, A. J. Smith, Frank Rockefeller, Ezra B. Hamilton, Chas. T. Martin and G. B. Fox, directors; Walter D. Dunlap, secretary and treasurer. Organized May 15, 1908, under laws of Arizona, with capitalization $3,000,000, shares $5 par.

Lands, 10 claims, 1 fractional, area 190 acres, southeast of the Keystone and near the Miami, 6 miles southwest of Globe, the nearest railway point. Property is said to show 9 main vein systems and a prominent fault, the principal ore body under development occurring at the contact of schist with granite-porphyry, this being estimated by company to average 30″ to 3′ in width, and to be traceable 1,000′, carrying bornite, chalcopyrite and tetrahedrite, estimated to average 5 to 9% in copper tenor. The company planned sinking 500′ shafts on both the Orphan and Iron Lode claims, 600′ apart, and connecting by a crosscut on the 500′ level, but only one shaft, of 230′ depth, has been sunk, this showing a 30″ vein carrying mainly chalcopyrite, assaying up to 20% copper, with gangue of limestone and calcspar. The property shows ore of good assay tenor in shallow workings.

Improvements include a 20x22′ machine shop, carpenter shop, smithy, assay office, warehouse and foreman's dwelling. Connection by Globe is over a good wagon-road. Equipment includes a steam hoist and air-compressor, bought of the Calumet & Globe Development Co.

The company did not finish making its first payment until Aug. 1, 1908, one month after due. The company is in bad odor with careful investors, because of the methods used in booming its shares, and the men connected

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with this work. Mr. Frank Rockefeller, one of the directors, a brother of John D. Rockefeller, was accused of dumping considerable stock, in violation of an agreement, and there was talk of a suit against Mr. Rockefeller, but apparently this was merely a bluff. It has been asserted, in the press, that Mr. Rockefeller's stock was donated, for the use of his name, and that the company refused to transfer his certificates, when presented. The stock was boosted in Boston by Cardenio F. King, a notorious personage who succeeded, by manipulation, in getting the stock to $8 per share, but, late in September, 1908, the stock opened on the Boston curb at 8⅞ on Monday, and closed Thursday at 1½ bid. Mr. King, who is under indictment for larceny, is said by the company to have no official connection therewith, but to have been booming the shares for a few shareholders, which may or may not have been the case. The property is considered as of some promise, but the methods of promotion and financing are much disliked.

ORTEGA MINING CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Southwestern Mining Co.

ORVILLE GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Mine office: Golden, Kootenay district, B. C. Idle for some years.

OSAKA ELECTROLYTIC REFINING CO. **JAPAN.**

Office and works: Osaka, Izumi, Japan.

OSARUZAWA MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

OSBORN CONSOLIDATED MINING & MILLING CO. **UTAH.**

Mine office: American Fork, Utah Co., Utah. S. Osborn, superintendent. Lands, 8 claims, west of the Pacific Mining Co.

OSCEOLA CONSOLIDATED MINING CO. **MICHIGAN.**

Office: 303-199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Opechee, Houghton Co., Mich. Employs 1,500 men. Albert S. Bigelow, president; Hon. Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; preceding officers, J. Henry Brooks, Edw. S. Grew, Edw. R. Hall and Walter A. S. Chrimes, directors. Wm. J. Uren, general superintendent; Frank H. Haller, assistant superintendent; A. L. Burgan, mill superintendent; A. G. Gullberg, superintendent motive power; Chas. D. Hohl, chief engineer; Jas. Rowe, mining captain Osceola branch; Jos. Biscombe, mining captain North Kearsarge branch; Frank Landers, mining captain South Kearsarge branch; John T. Reeder, purchasing agent; Wm. Veale, clerk; Thos. Burgan, assistant clerk.

Organized 1873, under laws of Michigan, and reincorporated, 1903, for period of 30 years, with capitalization $2,500,000, shares $25 par; issued, $2,403,750. Shares are listed on the Boston stock exchange. Annual meeting, second Thursday in March.

Dividends, begun 1878, were $7,612,550 to end of 1908, recent dividends being as follows: $2 in 1904; $6 in 1905; $13 in 1907; $6 in 1908.

Lands, 2,120 acres, in 4 separate tracts, also an extensive millsite, in Houghton county, and considerable holdings of timber and miscellaneous lands in Houghton and Keweenaw counties, Michigan. Company's property includes 4 mines, known as the Osceola, North Kearsarge, South Kearsarge and Tamarack Junior, the latter being idle. The various mines employ about 150 power drills.

New openings, 1907, were as follows: 4,024' in the Osceola branch; 18,532' in the North Kearsarge branch; 635' in the South Kearsarge branch. Cost of all openings is charged direct to operating expenses, which is the correct plan. There is comparatively little rock selection, though discrimination is used, of course, in breaking ground. The amount of rock broken that was rejected

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on surface was 9% in 1904; 12% in 1905, and 9% in 1907. The matter of power haulage has been given tentative consideration.

The Osceola mine proper was opened, 1873, on the southern extension of the Calumet conglomerate, upon which 6 shallow shafts were sunk, but this bed proved unremunerative, except under a few acres, and work was abandoned thereon and development begun on the Osceola amygdaloidal bed, lying parallel with and 730′ east of the Calumet conglomerate, at surface. The Osceola mine proper, area 720 acres, lying next south of the Calumet & Hecla mine, has 6 shafts on the Osceola amygdaloid, which has a strike of approximately N. 39° E., shafts being numbered from north to south. Crosscuts have been sent from the Osceola workings to the Calumet conglomerate, at various depths, without encouragement, and diamond drilling was done, 1904, to locate and test the Kearsarge amygdaloid on the old Osceola tract, but the results presumably were not encouraging. The Osceola mine proper uses 50 power drills.

Nos. 1 and 2 Osceola shafts have been abandoned for some years, owing to exhaustion of mineral ground tributary thereto.

No. 3 Osceola shaft, with 3 compartments, circa 3,000′ deep, has been idle for some years, and is practically abandoned.

No. 4 Osceola shaft, 600′ next south of No. 3, with 3 compartments, is circa 3,700′ deep, and has been idle for several years. There is small likelihood of shafts 3 and 4 being reopened, as the ground tributary to them is nearly exhausted, and the good stopes remaining can be reached from the shaft next south.

No. 5 Osceola shaft, 1,300′ south of No. 3, was 4,360′ deep on Aug. 1, 1908, and was cut down and retimbered throughout, in 1903.

No. 6 Osceola, formerly known as the Opechee shaft, is 1,300′ next south of No. 5, and was 4,423′ deep on Aug. 1, 1908. This shaft shows some excellent stopes, especially in the southern drifts, toward the Tecumseh line, in the lower levels. This shaft was retimbered with concrete between the 43d and 44th levels, and partly retimbered with wood above, in 1907. There is room on the company's lands for one additional shaft south of No. 6, if desired, but it is probable that the ground will be mined through No. 6, instead of by a new shaft.

The shops of the Osceola, formerly scattered along the line of shafts, have been centered between shafts 5 and 6. The new boiler plant at No. 6 has 5 Burt locomotive firebox boilers, with a coal-trestle and bin, and a 125′ brick-lined self-supporting steel smokestack, of 7′ inside diameter, standing on a sandstone base. The old boiler-house at No. 6, with stone walls and steel roof, has been lengthened 30′, and made into a compressor-house, equipped with a 50-drill Nordberg 2-stage cross-compound air-compressor having 26″ and 40″ air cylinders, and steam cylinders of 22″ and 42″, with 48″ stroke. A new boiler-house has been built to the north of the old structure.

A new combination smithy and machine shop, between shafts 5 and 6, is 60x144′, in 2 sections, with brick walls and steel truss roof, covered with corrugated steel. Electric power is used.

A new electric plant, complete 1907, located in the compressor-house, has a 100-kw. 220-volt direct-connected generator, delivering a direct current, and also furnishes electric light for the Osceola mine and location, using direct current enclosed arc lamps.

In addition to the mine buildings, the Osceola location has a large number of dwellings for workmen. Water is secured from Lake Superior through a 6″ pipe line, of 1½ miles length, connecting with the stand-pipe at the Tamarack mine, leading to a 130,000-gallon concrete reservoir between Osceola shafts 5 and 6.

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The Osceola mine proper has a local telephone system, connecting all departments, with an exchange in No. 6 engine-house.

The Kearsarge or North Kearsarge mine, area 1,120 acres, lies north of the Wolverine, with which it has underground connections, and with which land was exchanged, to the extent of 13½ acres, permitting both mines to square their boundaries with the strike and dip of the lode. Extensive diamond drilling, done 1905-1907, has shown considerable good stamp-rock in the foot-wall and hanging-wall, at points where the main lode was impoverished. Diamond drill boring costs $2 to $3 per foot, as against $6 to $8 per foot for drifting. The Kearsarge amygdaloidal bed ranges 16′ to 20′ in width, in this mine, and has proven very bunchy, though with good average values. The southern workings, approaching the Wolverine, are showing improvement, but the mine is richest near the Ahmeek, to the north. The mine is being deepened at the rate of about 400′ yearly. About 60 power drills are used in this property. Shafts are numbered from south to north.

No. 1 North Kearsarge shaft was 3,873′ deep, on Aug. 1, 1908. The former cavities under the shaft, resulting from opening through old workings, have been filled with waste-rock, and capped with cement, concrete stringers being used. No. 1 shaft has a Nordberg hoist, good for 6,500′ depth, operating two 6-ton skips in counterbalance.

No. 2 North Kearsarge shaft is idle, having been abandoned at depth of 2,400′, and the ground formerly tributary thereto is mined from the shafts on either side.

No. 3 North Kearsarge shaft, lying 1,825′ northeast of No. 1, was 3,192′ in depth on Aug. 1, 1908, developing a large area of good ground, especially toward the Ahmeek. The collar of this shaft has been concreted, and the hoist is a duplicate of the Nordberg engine at No. 6 Osceola.

The No. 4 North Kearsarge shaft, started 1907, is sinking 75′ in the foot-wall, and will crosscut to the lode on the 7th level, the ground having been proven previously by diamond drill borings. This shaft should be a producer in 1910. Equipment includes a structural steel boiler-house, with a 150′ brick-lined self-supporting steel smokestack of 7′ internal diameter.

The North Kearsarge surface plant includes a stone compressor-house and a 30-drill compressor at No. 1 shaft, where are located also the combination machine and carpenter shop, warehouse and office, all of wood. At No. 3 shaft there is a 45-drill compressor, with 2-stage air-end and compound steam-end, having 22x48″ and 42x48″ steam cylinders, with 40x48″ and 36x48″ water-jacketed air-cylinders, and vertical intercooler, housed in a 25x55′ stone and brick building with steel truss roof. There is a 75-h. p. electric plant, providing electric energy for both the North and South Kearsarge mines.

The South Kearsarge mine, area 160 acres, lying south of the Wolverine and east of the Centennial, was known formerly as the Iroquois. Development was begun September, 1899, and the best stopes are toward the Centennial line, the Kearsarge bed averaging about the same width as in the North Kearsarge and Wolverine mines, the rock being remarkably uniform in copper values.

No. 1 South Kearsarge shaft, to the north, was 2,604′ deep on Aug. 1, 1908, and can be sunk to depth of circa 3,000′ before reaching the boundary. Two skips are operated, in counterbalance. The shaft-rockhouse is exceptionally large and well equipped, also caring for rock from No. 2 shaft, with which it is connected by a trestle of 1,100′ length.

No. 2 South Kearsarge shaft was 1,787′ deep Aug. 1, 1908, and can be sunk to depth of circa 2,800′, before reaching the boundary. The hoist, taken from No. 2 North Kearsarge shaft, raises 5-ton skips.

Surface equipment of the South Kearsarge is mainly second-hand, taken

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from other branches of the mine, but is sufficient for present requirements. This branch has air-compressors of 55 drills aggregate capacity, and employs 40 rock drills.

The Tamarack Junior mine, area 120 acres, lying between the Centennial and Calumet & Hecla, has 2 vertical shafts, on the Calumet conglomerate, No. 2 being 3,360′ deep, with 12 levels opened. Mining was stopped, 1902, and exploratory work suspended, 1903. A little rock was shipped from the dumps, on a royalty basis, 1906, and the shaft-house at No. 6 was burned, July, 1908. The Tamarack Junior apparently is dead for all time to come, so far at least as the conglomerate openings are concerned, with poor prospects of finding other workable cupriferous beds on the tract.

Rock is transported from the various mines to the mills by the Hancock & Calumet Railroad, a branch of the Duluth, South Shore & Atlantic Railway.

The Osceola has 2 stamp-mills, adjoining those of the Tamarack, on the shore of Torch Lake, the first mill, of wood, built 1886, having been torn down, 1905. The second mill, completed 1899, is 135x215′, having 3 stamps with circular screens having ⅜″ openings, allowing the discharge of coarse copper. The third mill, completed 1902, in line with the second, is 176x213′, of steel frame, having 4 Nordberg steeple-compound heads, with circular mortars having ⅝″ screens and hydraulic separators, about 20% of the copper secured in milling coming from the separators and mortar discharges. The compounding of a stamp by superimposing the low-pressure cylinder upon the high-pressure cylinder was first suggested by A. L. Burgan, mill superintendent of the Osceola, and the idea was carried into execution by Bruno V. Nordberg. The experimental compounded head gave such satisfactory results that the compounded head is now in general use in the Lake Superior district. The wash department of the 2 mills has 110 Hodge jigs, with quick eccentric return motion, each stamp having 6 round tables and one Wilfley table, latter taking headings from the round tables. There also is an Allis-Chalmers Chilean mill for regrinding, and for reducing oversize material from the mortars of the stamps. Crushing rolls with fixed bearings were introduced also by Mr. Burgan. Cost of stamping at the Osceola mills, 1905, was only 16.95 cents per short ton of rock, which then constituted a world's record, and for 1907 was reported by the company as only 11.71 cents per ton.

The 43x150′ steel boiler-house, adjoining the mills and furnishing power for both, has three 72″ 250-h. p. boilers, delivering steam at 150 lbs. pressure, and nine 84″ 250-h. p. boilers operated under 105 lbs. pressure, all of the locomotive firebox type. Coal is brought to a 500-ton bin, over a trestle, in railroad cars, and draft is furnished by a 150′ brick-lined self-supporting steel stack. An automatic ash-discharge washes the ashes through a launder by water flushed from a stand-pipe at intervals of 3 minutes. The power plant includes an Allis-Chalmers Corliss engine, operating a 100-kw. Morgan-Gardner direct-current generator, which furnishes current for 220-volt incandescent enclosed arc lamps.

The joint pump-house of the Osceola and Tamarack mines, of steel, 35x70′ in size, houses two 40,000,000-gallon triple-expansion Nordberg pumps having 22″, 40″ and 60″ cylinders, with three 30″ horizontal plungers of 52″ stroke and 42″ discharge. Water is taken through an 8′ tunnel, running 1,275′ under Torch Lake, drawing water through 3″ intake holes, these guarding against clogging by ice.

Production has been as follows: 924,400 tons rock stamped, yielding 16,059,638 lbs. fine copper, in 1903; 1,095,520 tons rock stamped, yielding 20,472,429 lbs. fine copper, in 1904; 1,007,200 tons rock stamped, yielding 18,938,965 lbs. fine copper, in 1905; 1,016,240 tons rock stamped, yielding 18,588,451 lbs. fine copper, in 1906; 811,603 tons rock stamped, yielding

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14,134,753 lbs. fine copper, in 1907. The decreased production of 1907 was caused by following the leadership of the Amalgamated Copper Co., which, as once before, in 1901, resulted disastrously to the Osceola shareholders. Copper production was circa 17 lbs. fine metal per ton of rock stamped, in 1908, rock coming mainly from the North Kearsarge mine. For June, July and August, 1908, rock stamped averaged circa 111,000 tons monthly, materially the largest production in the history of the mine. Total cost of fine copper, per pound of production, has been as follows: 10.29 cents in 1903; 9.96 cents in 1904; 10.68 cents in 1905; 10.89 cents in 1906; 12.44 cents in 1907. The company ended 1907 with liabilities, all in accounts payable, of $433,026.39, with a balance of assets of $1,386,889.21.

The Calumet & Hecla Mining Co. owns 22,061 shares of Osceola stock, and, at the annual meeting, March, 1907, held proxies for about 50,000 shares additional, thus controlling about 75% of the entire stock issue, but, through court proceedings, was restrained from voting its own stock or proxies, and there was no annual meeting in 1907 or 1908, due to court injunctions. The litigation has been protracted and bitter, but indications strongly favor the success of the Calumet & Hecla in securing control of the property, eventually.

OSCEOLA GOLD & COPPER MINING CO. **WYOMING.**

Dead. Property sold, circa 1902, to North American Copper Co. Formerly at Rudefeha, Carbon Co., Wyo.

OSCEOLA JUNIOR MINING CO. **WYOMING.**

Office: Rawlins, Wyo. Mine office: Dillon, Carbon Co., Wyo. J. M. Rumsey, secretary; A. L. Clendennin, superintendent. Lands, near the Ferris-Haggarty mine, have an old 120′ tunnel. Apparently idle since circa 1906.

OSCURO COPPER CO.

Office: care of H. A. Rideout, Wollaston, Mass. Organized March, 1903, under laws of Maine, with capitalization $250,000. Location of lands, if any, unknown.

OSHKOSH-WYOMING MINING CO. **WYOMING.**

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. O. A. Koch, president; E. E. Mullins, vice-president; H. O. Granberg, secretary, treasurer and general manager; Frank Earle, consulting engineer. Organized June 20, 1904, under laws of Wyoming, with capitalization $1,000,000, shares $1 par.

Lands, 11 claims, area 220 acres, in the Battle Lake district, carrying 4 fissure veins in gabbro, of 22′ estimated average width, opened by shafts of 32′ and 72′ and a 22′ tunnel, showing malachite, azurite and chalcopyrite, estimated to carry average values of 18% copper. Idle several years.

ENRIQUE OSORIO i CA. **CHILE.**

Mine office: Mina Grande, La Serena, Coquimbo, Chile. Property is El Misterio mine, which produced, 1903, circa 300 metric tons of 22% ore from a vein of about 40″ average width, opened to about 50 meters depth, and La Purisima mine, which in 1903 produced about 400 tons of 18% ore, equal to an output of circa 300,000 lbs. fine copper.

LOS OSOS MINE. **CALIFORNIA.**

Office: care of J. M. Gleaves Estate, owner, San Francisco, Cal. Mine, near San Luis Obispo, San Luis Obispo county, California, is opened on a fissure vein, carrying copper ores with porphyritic gangue, traversing sandstone and shales. Idle since circa 1865.

OTA MINE. **JAPAN.**

Mine office: Ota-muri, Mine-gori, Nagato, Japan. Production, 1906, was 73,145 lbs. fine copper and, 1907, was 139,125 lbs. fine copper, 10,478 momme silver and 52 momme gold.

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OTATE COPPER CO. **MEXICO.**

Mine office: Llano, Magdalena, Sonora, Mex. L. H. Jansen, president; W. P. Ross, superintendent. Lands, east of Llano, near the Cobre Grande mine of the Sonora Copper Co., are well watered and fairly timbered, and are said to show promising indications of ore.

OTAVI MINEN- UND EISENBAHN-GESELLSCHAFT. **GERMAN SOUTHWEST AFRICA.**

Office: 14 Behrenstrasse, Berlin, W., Germany. Mine office: Tsumeb, Otavi, Ovambaland, German Southwest Africa. Forces, 120 whites and 1,000 blacks. Alex Schoeller, chairman; Dr. P. D. Fischer, vice-chairman; E. Labowsky, chairman executive committee; preceding officers, P. Boettger, Edmund Davis, Dr. Julius Scharlach, Dr. C. Schnabel, Dr. P. von Schwabach and M. Steinthal, directors; K. Hassinger, acting general manager; T. H. Gothmann, mine superintendent; A. Morgenstein, railway superintendent; Dr. P. Gloner and Gustav Gluft, managers. Organized Apr. 6, 1900, and reconstructed, 1903, under laws of Germany, with capitalization increased from 1,000,000 marks to 20,000,000 marks, shares 100 marks par, in 20 series of 10,000 shares each, fully issued. The company's plan of finance calls for carrying a 5% reserve, followed by dividends of 5% on ordinary shares, after which 10% will be allowed the board, as a bonus, out of surplus, and balance will be divided equally between the ordinary and deferred shares. Company is controlled, through ownership of about 55% of stock, by South West Africa Co., Ltd. Annual meeting, in December.

Lands, 500 square miles freehold and 500 additional square miles of mining rights, in strips of 10 kilometers width, along the right of way of the railroad, property including valuable farming lands. Property includes the Otavi and Tsumeb mines, latter having the principal development. The mining properties show blue dolomitic limestone, with ores occurring as replacements, and occasionally as intrusions in dolomite and sandstone.

The Otavi mine has been opened to a depth of 230', and has developed considerable ore, some of which assays up to 30% in copper tenor.

The Tsumeb mine, discovered, 1892, by natives, and taken over, 1901, by present owners, shows a strong gossan, standing above the surface for some distance. The principal ore body, of 40' estimated average width, traceable 400', carries copper oxides and carbonates, succeeded, at shallow depth, by chalcopyrite and galena, with occasional lead carbonates and chalcocite. Development is by the 274' Main shaft, 225' New West shaft, 60' Old West shaft, 160' New East shaft and 66' Old East shaft. Levels are opened at depths of 65', 160' and 225', with connection by three 200' crosscuts between the principal shafts. The mine has about 4,000' of workings, showing about 300,000 metric tons of ore, of which 60,000 tons is of low grade. It is proposed to open and work the entire ore body open-cast, to the present level of 160'.

Equipment includes a 60-h. p. steam plant and a 25-h. p. electric plant at the mine, with a 32-h. p. gasoline plant at the mill and an 80-h. p. plant at the smelter. There are two 60-h. p. hoists, good for depth of 125 meters each. Fuel is coal and wood for the mine and coke and charcoal for the smelter, coke costing 130 marks per metric ton, delivered. The company maintains a general store, and has a sawmill.

The mill has two Bartsch jaw-crushers, and gives the ore merely a rough dressing.

The smelter, at Tsumeb, near the mine and mill, receives ore by rail, and is rated at 40 to 60 tons daily capacity, having been blown in Sept. 10, 1907. Equipment includes 2 small blast-furnaces, one running on copper and the other on lead ores. Local iron ore is used for fluxing, and products are silver-lead bullion and copper matte, latter of 30 to 40% tenor, carrying circa 30 oz.

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silver per ton, shipped to Europe for conversion, though possibly a converter plant may be installed later, at Swakopmund, at the other end of the railroad.

The Otavi Railway, 351 miles long, of 600-mm. gauge, runs from Swakopmund, on the coast, to the interior terminus at Tsumeb, and was opened for general traffic, for its entire length, Nov. 16, 1906. Equipment includes 37 locomotives and 330 cars. This railroad is doing a very satisfactory business, and will be of immense utility in developing a district rich in natural resources.

Production, 1907, was circa 15,000 metric tons of ore shipped, and for 1908 was about 30,000 metric tons of lead and copper ore, estimated at 19% average tenor in copper and 23% in lead, yielding circa 6,000,000 lbs. fine copper, with large quantities of lead and silver.

Average costs are estimated by company at 2 marks per metric ton for mining, and 3 to 5 marks per metric ton for concentrating.

The company plans continuing exploratory and development work, opening the Tsumeb mine below the third level, and developing other mines, including the Little Otavi, elsewhere on the company's lands. The property is one of much promise, with a strong management, and bids fair to make one of the really great copper mines of the world.

OTAVI MINES & RAILWAY CO. **GERMAN SOUTHWEST AFRICA.**

English incorporation of Otavi Minen- und Eisenbahn-Gesellschaft.

OTORI MINE. **JAPAN.**

Owned by Furukawa Mining Co.

OTTUMWA COPPER CO. **WYOMING.**

Letter returned unclaimed from former office, Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. C. B. Richey, president; W. B. Russey, secretary and treasurer. Lands, 9 miles from Holmes, have a 280′ tunnel, not in ore. Idle several years.

OUED-MOUGRAS COPPER & IRON CO., LTD. **ALGERIA.**

Office: 135 Wellington St., Glasgow, Scotland. Mine office: 5 Rue Lemercier, Bône, Constantine, Algeria. T. T. Stewart, chairman; J. A. French, secretary. Organized Oct. 9, 1903, under laws of Great Britain, with capitalization £12,500, increased, July 12, 1907, to £30,000, shares £1 par; issued, £24,243.

OUENZA MINES CO. **ALGERIA.**

Mine office: Clairfontaine, Algeria. Property is the Djebel Ouenza mine, near the Tunisian frontier, circa 25 kilometers from Clairfontaine. Lands show a prominent gossan of cupriferous hematite, the copper being in the form of argentiferous oxidized ores. Ore, as mined, 1905, averaged about 5% copper tenor.

COMPAÑIA MINERA LAS OURAS. **MEXICO.**

Dead. Formerly at Tepezalá, Ocampo, Aguascalientes, Mex.

OURAY CHIEF MINING CO. **COLORADO.**

Office: Youngstown, Ohio. Mine office: Ouray, Ouray Co., Colo. W. D. Euwer, president; John Beil, secretary; David Woods, superintendent. Ores carry gold, silver and copper. Has gasoline power.

OURAY CONSOLIDATED MINING CO. **COLORADO.**

Mine office: Ouray, Ouray Co., Colo. Joseph H. Tumbach, resident manager. Is successor of Colorado Gold-Copper Mining & Tunnel Co. Lands are circa 60 claims, developed by a tunnel of about 5,000′ length.

OVERFLOW MINES, N. L. **AUSTRALIA.**

Office: 18 Bridge St., Sydney, N. S. W., Australia. Mine office: Bobadah, N. S. W., Australia. T. H. Palmer, manager, at last accounts. Ores carry gold, silver, lead and copper, latter being produced merely as a by-product. Has a Ball mill, 40-ton cyanide plant and 50-ton smelter.

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OVERLAND GOLD MINING CO. **OREGON.**

Mine office: Cableville, Baker Co., Ore. Has auriferous and argentiferous copper, lead and zinc sulphides. Presumably idle.

OVERLAND MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Willcox, Cochise Co., Ariz. Lands are just north of the Mascot Copper Co. At last accounts, circa March, 1908, property was undergoing development.

OVERLOCK COPPER CO. **MEXICO.**

Letter returned unclaimed from former mine office, Moctezuma, Sonora, Mex. Idle and apparently moribund.

OVERSIGHT MINING & MILLING CO. **WASHINGTON.**

Office: Seattle, Wash. Mine office: Republic, Ferry Co., Wash. Harold Preston, president; Chas. E. Murphy, vice-president; S. E. Dewsnap, secretary; C. A. Wallace, treasurer; E. J. Delbridge, general manager. Capitalization, $1,500,000, shares $1 par.

Lands, 11 claims, adjoining the Copper Ke[illegible], in the Lambert Creek or Eureka district, north and west of the Turtle river, circa 10 miles northeast of Republic, showing 4 veins. Mine has a quarter-mile of workings, with a 60′ shaft, but principal development is by the Pinmoney tunnel. The wide Pinmoney vein is mainly auriferous mispickel, carrying small silver and copper values. Has gasoline power, air-compressor and 300-ton shipping bins, and plans an aërial tram.

OVOCA COPPER SYNDICATE, LTD. **IRELAND.**

Office: 10 Austin Friars, London, E. C., Eng. Mine office: Ovoca, County Wicklow, Ireland. Maj. Ralph P. Cobbold, chairman; W. Smith, secretary. Organized Nov. 27, 1901, under laws of Great Britain, with capitalization £12,000, shares £1 par.

Property is the old Cronnebane mines, in the Vale of Ovoca, which were making about 1,250,000 lbs. refined copper yearly, at the end of the Eighteenth Century. Mines were closed, circa 1875, and reopened, 1902, on the advice of Mr. Philip Argall. High grade oxidized ores were mined out in past operations, but the vein, about 50′ in average width, shows immense bodies of low grade disseminated chalcopyrite, with quartz gangue, averaging a scant 3% copper, 1.5% zinc, 1.5 oz. silver and 1 dwt. 6 grains gold per long ton. A new shaft has been sunk and some ore was shipped, 1907. Property considered promising.

OWL COPPER MINING CO. **CALIFORNIA.**

Office: 777 Bacon Blk., Oakland, Cal. Mine office: Indian Gulch, Mariposa Co., Cal. A. A. Leonard, president; J. T. Victor, vice-president; F. G. Thomes, secretary; Asa B. Mendenhall, treasurer; preceding officers and A. J. Hartung, directors. Organized June 17, 1907, under laws of Arizona, with capitalization $1,250,000, shares $1 par.

Lands are one copper claim and two gold claims, latter being near Shingle Springs, El Dorado Co., Cal. The John Dias mine, in Section 12, Town 6 South, Range 16 East, near Indian Gulch, has a 168′ shaft on a 3′ vein in schistose diabase, carrying mainly cuprite, azurite, chalcopyrite and chrysocolla, from which ore has been smelted returning 2 to 30% copper and 26 cents to $1.78 combined gold and silver values per ton. Company has secured ore assaying 27.18% copper and $2.70 gold per ton. There also are several shallow pits, showing ore. Equipment includes gasoline power.

OWL HEAD MINING CO. **ARIZONA.**

Office and mine: care of Ferris S. Fitch, Tucson, Pima Co., Ariz. Organized 1904, to take over sundry claims in the Owl Head Mountains, 32 miles from Tucson, carrying auriferous and argentiferous copper ores, also claims 10 miles west of Tucson. Idle, apparently since birth.

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OXFJORDALEN COPPER CO., LTD. **NORWAY.**

Dead. Liquidated Sept. 27, 1906. Formerly in Norway. Described Vol. V.

OXFORD COPPER MINING CO. **IDAHO.**

Mine office: Pierce, Nez Perce Co., Idaho. Was developing, with a small force, November, 1908, and planned installing a power hoist and pump.

OXIDE COPPER CO. **ARIZONA.**

Office: 85 Ames Bldg., Boston, Mass. Mine office: Red Rock, Pinal Co., Ariz. Frank Higgins, superintendent. Is controlled, through stock ownership, by Arimex Consolidated Copper Co. Lands are the Copper Prince group, variously reported as 30, 50 and 140 claims, in the Silver Bell district, circa 7 miles south of the Imperial mine. Apparently landed holdings are about 60 claims, area 1,200 acres, showing contact veins carrying copper sulphides with limestone gangue. Property has been opened to depth of 50′ to 150′, and is said to have a half-mile of workings. Production, 1907, was 319,591 lbs. fine copper and 3,338 oz. silver.

PACIFIC COAST COPPER CO. **ALASKA.**

Dead. Reorganized as Pacific Coast Mining, Milling & Developing Co., also dead. Formerly at Ketchikan, Alaska.

PACIFIC COAST OF MEXICO EXPLORATION CO. **MEXICO.**

Mine office: Magdalena, Sonora, Mex.

PACIFIC COAST MINING, MILLING & DEVELOPING CO. **ALASKA.**

Dead. Formerly at Ketchikan, Alaska. Described Vol. VII.

PACIFIC COAST SMELTER. **CALIFORNIA.**

Office and works: Bay Point, Contra Costa Co., Cal. Was built by the Copper King, Ltd. Plant includes a 100-ton furnace, with steam and electric power. Presumably idle.

PACIFIC CONSOLIDATED MINING CO. **NEVADA.**

Office: 131-32 Broadway, New York, N. Y. Mine office: Reno, Washoe Co., Nev. Chas. B. Hill, president; Franklin Leonard, vice-president; Loomis A. Newton, secretary; Clinton E. Brain, treasurer; H. L. Cowles, general manager; preceding officers, F. P. Knott, J. A. Alexander and Frank N. Waterman, directors; Robert W. Perry, superintendent; Dr. Jos. Hyde Pratt, consulting engineer. Organized October, 1901, under laws of South Dakota, with capitalization $3,000,000, shares $1 par; issued, $2,500,000, of which originally $1,000,000 was common and $2,000,000 cumulative 6% preferred stock, but all preferred shares have been retired.

Lands, 32 claims and a 50-acre millsite, area circa 650 acres, in the Pyramid district, showing 4 parallel ledges, of which 2, of 30′ to 60′ estimated average widths, give assays of 2 to 40% copper, 6 to 100 oz. silver and $1.50 gold per ton. The oxidized zone, extending to depths of 200′ to 350′, carries good gold and silver values, succeeded by base ores having small gold values and fair silver values. Principal ore is chalcopyrite, associated with pyrite, in a silicious gangue. Mine has circa 30 shafts, of 30′ to 75′ depth, and a main shaft of 522′, also tunnels of 250′, 1,000′ and 2,400′, with about 19,000′ of underground workings, estimated to show 500,000 tons of ore. Mine was opened, circa 1876, for gold and silver, ore turning to copper at depth. Surface improvements include a smithy, carpenter-shop and various other mine buildings. Nearest railroad, is 28 miles, but company has franchise for a railway to connect with Southern Pacific, estimated to cost $300,000. Property considered promising. Presumably idle.

PACIFIC COPPER CO. **MICHIGAN.**

Office: 709-199 Washington St., Boston, Mass. Mine office: Leopold Bldg., Houghton, Houghton Co., Mich. Nathaniel Thayer, president; Chas. J. Paine, Jr., secretary; Fred. W. Nichols, agent. Organized August, 1890, under laws of Michigan, with capitalization $1,000,000, shares $25 par; paid in, $2.

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Ended 1907 with $35,715 out at interest, with income exceeding expenditures.

Lands, 960 acres, just northwest of the Atlantic mine, and supposed to carry the northern extension of the Atlantic ashbed, on which a little exploratory work was done, circa 1880, previous to the organization of the company. Idle since circa 1890, but lands considered promising.

PACIFIC COPPER CO., LTD. **MEXICO.**

Office: 1214 Monadnock Blk., Chicago, Ills. Operating office: Ap. 2146, Mexico, D. F. Mine office: Zihuatanejo, Montes de Oca, Guerrero, Mex. W. S. Cockrell, president; Thos. Milan, vice-president; J. P. Taylor, secretary; Addison H. McKay, treasurer; preceding officers and Col. Epes Randolph, directors; W. H. Austin, general manager; H. L. Swain, superintendent. Organized June, 1906, under laws of Mexico, with capitalization 10,000,000 pesos, shares 100 pesos par.

Lands, circa 30 miles from Zihuatanejo, near the Murga river, include the Copper King group, area 1,000 hectares, carrying copper and supposedly placer gold, having a vein of 30′ to 200′ width, traceable about 3 miles, and reported by company as tested, for about 1½ miles, to depth of 60′, at a point 900′ below highest outcrop by erosion of streams at 2 points. Vein carries a gossan, mainly covered by soil, occasional exposures showing chalcopyrite disseminated in pyrrhotite, without appreciable gold or silver values. At slight depth, the pyrrhotite is replaced by argentiferous and auriferous bornite, estimated by company to average 4% copper, with considerable gold and silver values, and which has assayed up to 16% copper, 90 oz. silver and $26 gold per ton. Company estimates that gold and silver will cover a large part and probably all of the cost of making copper, but this estimate is practically certain of failure. Property also is reported to carry 47 other veins, of 1′ to 90′ width. Development is by 2 shallow shafts and 3 short tunnels. Trails have been built to and on the property, and company plans eventually building a railroad line from Zihuatanejo, which will be necessary for the economical working of the property on a large scale.

Equipment includes a fair outfit of machinery, installed 1907, with necessary mine buildings and about 25 dwellings for workmen. Property bids fair to make a large low grade mine with careful development and economical management, and is considered promising. Officers include men of financial strength and good standing. Was said to employ circa 350 men, but presumably is idle.

PACIFIC COPPER EXPLORATION CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Geo. Roper, general manager. Lands, 15 claims, including a water right, in Spruce Cañon, circa 10 miles west of Prescott, opened by a 220′ tunnel.

PACIFIC GOLD & COPPER MINING CO. **MEXICO.**

Office: 308 East Ninth St., Kansas City, Mo. J. J. Myers, president; D. C. Rhodes, secretary. Organized under laws of South Dakota, to develop extensive mineral holdings in the Taviche district of Oaxaca, Mexico. No traces of operations found, and apparently moribund.

PACIFIC MINING & DEVELOPMENT CO. **OREGON.**

Dead. Lands sold, circa 1903. Formerly at Galice, Josephine Co., Ore.

PACIFIC MINING & METALS CO. **ARIZONA.**

Dead. Formerly at Globe, Gila Co., Ariz. Described Vol. VI.

COMPAÑIA DE COBRE DEL PACIFICO, S. A. **MEXICO.**

Is the Mexican incorporation of the Pacific Copper Co., Ltd.

COMPAÑIA METALURGICA y REFINADORA DEL PACIFICO. **MEXICO.**

Is the Mexican incorporation of the Pacific Smelting & Refining Co., Ltd.

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PACIFIC SMELTING CO., LTD. **CHILE.**

Dead. Property sold, 1907, to Taltal Railway Co. Formerly at Taltal, Antofagasta, Chile. Described Vol. VI.

PACIFIC SMELTING & REFINING CO. **MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: Fundición, Alamos, Sonora, Mex. Theo. Douglas, president and general manager; E. Kneeland, superintendent; Jas. F. Berry, metallurgical superintendent. Is controlled, through ownership of entire stock issue, by Douglas Copper Co., and holds direct title to property through a Mexican corporation, the Compañía Metalurgica y Refinadora del Pacifico. Smelter is located circa 30 miles south of the Anita mine of the Douglas Copper Co., and 153 kilometers northeast of Guaymas, on the line of the Cananea, Rio Yaqui y Pacifico railroad. The smelter is planned to do a general custom business, in addition to treating Douglas ores.

Ore is received from the Anita mine by trains of traction engines, each train consisting of an engine and 5 trucks, each of the latter carrying three 4-ton steel ore buckets, which are dumped by overhead electric traveling crane. Equipment of the transportation service includes 4 Holt traction engines, one having a derrick, and each drawing one trainload daily of circa 50 tons of ore. A train crew consists of an engineer, fireman and brakeman, wood being used for fuel.

The works have a 36" gauge railway equipped with 2 Davenport locomotives.

The works, designed throughout by Mr. Douglas, are designed to have an ultimate capacity of 600 tons daily, having a present capacity of 300 tons only, with a single furnace.

The plant includes a small sampling mill, with a Vezin automatic sampler, mounted on trucks, of 30 tons hourly capacity, taking a cut of one-tenth, which goes to the sampling mill.

The smelter has one 44x160" water-jacket blast-furnace, of circa 300 tons daily capacity, and is planned for a second furnace of the same size, with room for a third. Charging is by Jeffrey roller-bearing conveyors, two per furnace, which elevate the weighed charge to the feed floor, discharging into steel bins at each side of the furnace. The side-dumping feed cars have 4 transverse compartments, for coke, limestone, iron ore and copper ore, charges, which are measured by gauges in each compartment, instead of weighed, being dumped into a hopper forming the boot of an incline Jeffrey elevator, which leads to buggies on the feed-floor, there being 2 elevators, of 30 tons hourly capacity. The furnace has a sheet-steel settler, 5' in diameter and 5' deep, lined with magnesia brick laid in magnesia clay.

The steel dust-flue, of the balloon type, with cars running underneath to draw off flue-dust, is 11x14x172' in size, connecting with a 177' self-supporting steel stack, 14' in diameter at the bottom and 8' at the top, standing on a 27' stone foundation. Flue-dust and fines go to a pug-mill, and are pugged to a stiff sludge, which is fed direct to the furnaces, without drying or briquetting.

The power plant has two 150-h. p. Morrison boilers, and an electric plant, for which current is furnished by a 75-kw. Westinghouse generator, direct-connected to a Bates-Corliss vertical compound engine, having 13" and 20" cylinders, and a Western Electric 25-kw. generator, direct-connected to a 9x10" engine. Blast is furnished by a Connersville blower, direct-connected to a Bates-Corliss tandem engine with 12x24x36" cylinders.

Water is secured from an artesian well having an estimated flow of 2,000 gallons daily.

The furnace was blown in circa June, 1908, when the first shipment of

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matte was made. Copper is sold to the American Metal Co., Ltd. At end of 1908 smelter was idle.

PACIFIC STEEL CO. **BRITISH COLUMBIA.**

Dead. Formerly at Alberni, Vancouver Island, B. C.

PAGOEAT COPPER CO. **CELEBES.**

Office: Amsterdam, Holland. Mine office: Pagoeat, Celebes, Dutch East Indies. Company is composed of men connected with a prominent steamship line of Amsterdam, Holland. Property is the Bwool mine, showing numerous veins, ranging 4′ to 5′ in width, carrying copper carbonates, chalcocite and chalcopyrite, with quartz gangue, formerly estimated at 10% average copper tenor, but said locally to carry 4 to 5% copper, with small gold and silver values. Property is but slightly developed, and the management, which is composed of good men, lacking mining experience, is desirous of selling the property.

PAHAQUARRY COPPER CO. **NEW JERSEY.**

Office and mine: Belvidere, Warren Co., N. J. O. R. Deshler, president; H. D. Deshler, secretary; Elias H. Utt, treasurer. Organized under laws of New Jersey, with capitalization $500,000, shares $1 par.

Lands, 1,642 acres, freehold, well timbered, in Pahaquarry township, on the northwestern slope of the Blue Ridge Mountains. Mine is said to have been worked by the Dutch as early as 1660, and was worked, 1847-1862, by the Allegheny Mining Co., which secured an average copper extraction of better than 3%. Vein, of 287′ claimed width, is traceable circa 3½ miles on the company's lands by strong outcrops, and carries chutes and local enrichments of high grade ore. The entire ore body is said by company to average 3 to 4% copper, which doubtless is an overestimate, and to carry an average of about $1.80 combined gold and silver values, assays of present company showing from a trace to 17 oz. silver per ton.

A 200-ton concentrator has 2 sets of 16x30″ Standard rolls, 4 sets of 10x30″ Standard rolls and 32 impact screens. Concentrator was being doubled in size at last accounts. Property, though low in grade, is considered promising, but will require large capital and careful handling to make a successful mine.

PALACE GOLD & COPPER CO. **ARIZONA.**

Office: 1104 D. S. Morgan Bldg., Buffalo, N. Y. Mine office: Wickenburg, Maricopa Co., Ariz. Geo. A. Sanborn, president; C. M. Clark, vice-president and general manager; M. W. Fuller, secretary; Dr. C. H. W. Auel, treasurer; D. Ainsworth, engineer. Organized Nov. 10, 1902, under laws of Arizona, with capitalization $3,000,000, shares $1 par.

Lands, 23 claims, in 3 groups. The Union mine, apparently one claim only, in the Winifred district, has a 400′ main shaft, with about 2,200′ of underground openings, claimed to show good values in gold, silver and copper. The Ainsworth group, 8 miles southeast of Wickenburg, has 4 prospect shafts, deepest 40′. A third group, known as the Tip Top, is in the Bradshaw Mountains.

The plan and methods of promotion employed by this company were utterly indefensible. The company offered to sell stock, all common, at 25 cents, 50 cents or $1 per share, the purchaser of 25-cent stock getting merely shares, the purchaser of 50-cent stock getting a partial guarantee, and the purchaser of $1 stock getting a guarantee of 3½% annually, for 20 years, aggregating 70 cents on the dollar, leaving him out the use of 75 cents for an average term of 10 years, while paying 5 cents per share more than his neighbor, at the outset. The company states that it issued none of the guaranteed stock, as intending shareholders preferred the plain variety. The acting secretary writes that it has suffered strange contingencies, through the treasonable and felonious conduct of some of its trusted trustees, directors,

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officials, representatives, etc., but certainly these mishaps were through no fault of the management, directly or indirectly. Company is regarded with deep suspicion.

PALLANT & STOFFEL. **MEXICO.**

Mine office: Charcas, Moctezuma, San Luis Potosí, Mex. Arthur Pallant, manager. Mine is Los Morelos, carrying auriferous and argentiferous copper and lead ores. Has steam power and a 50-ton mill, employing circa 100 men, at last accounts.

PALM DEVELOPMENT CO. **CALIFORNIA.**

Dead. Formerly at Acton, Los Angeles Co., Cal. Described Vol. VI.

PALMER MOUNTAIN COPPER MINING & MILLING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Loomis, Okanogan Co., Wash. Organized under laws of Washington, with capitalization $1,500,000. Lands are on Palmer Mountain. Idle since circa 1903.

PALMER MOUNTAIN GOLD & COPPER CO. **WASHINGTON.**

Dead. Formerly at Loomis, Okanogan Co., Wash.

PALMER MOUNTAIN GOLD MINING & TUNNEL CO. **WASHINGTON.**

Dead. Reorganized, circa 1905, as Palmer Mountain Tunnel & Power Co. Formerly at Loomis, Okanogan Co., Wash.

PALMER MOUNTAIN TUNNEL & POWER CO. **WASHINGTON.**

Office: 303-56 Wall St., New York, N. Y. Mine office: Loomis, Okanogan Co., Wash. John Tilley, president; F. G. Burnham and E. Burr, vice-presidents; Samuel Porter, treasurer; Lee H. Porter, secretary; John Boyd, general manager. Organized circa 1905, under laws of Arizona, with capitalization $5,000,000, shares $1 par, as successor of Palmer Mountain Gold Mining Co.

Lands, 65 claims, on Palmer Mountain, said to show 28 veins, carrying mainly gold values, opened by a 4,000′ tunnel, planned to be driven 8,600′ to give a back of 4,000′. Has opened, to depth of circa 200′, a copper vein giving ores assaying up to 28.8% copper. Mine has an electric haulage system.

Equipment includes necessary mine buildings, 100-stamp mill and a 750-h. p. hydro-electric plant, with estimated energy of 3,000 h. p. available from Tout Coulee Creek.

PALOMA MINING CO. **MEXICO.**

Dead. Formerly at Ayutla, Autlán, Jalisco, Mex. Described Vol. VI.

PALO VERDE COPPER MINING CO. **ARIZONA.**

Mine office: Vail, Pima Co., Ariz. W. H. Martin, president; W. T. Payne, secretary. Capitalization, $3,000,000, shares $1 par. Lands, 10 claims, 9 miles northeast of Vail, opened by tunnels of circa 200′ and 500′, showing auriferous and argentiferous copper ore. Presumably idle.

PALO VERDE MINING CO. **ARIZONA.**

Mine office: Yucca, Mohave Co., Ariz. J. L. Whitney, manager.

COMPAÑIA MINERA EL PALQUI. **CHILE.**

Mine office: El Palqui, La Ligua, Aconcagua, Chile. Mine, circa 20 kilometers from Cabildo, has a manto, or blanket vein, of about 5 meters thickness, showing an abundance of ore of 5 to 6% average copper tenor, but is handicapped by transportation charges averaging 6.65 pesos per metric ton to the Cabildo smelter. Production, 1903, was circa 300 metric tons of ore averaging 7.5% copper tenor.

PAN-AMERICAN DEVELOPMENT CO. **MEXICO.**

Office: 83 Dexter Bldg., Chicago, Ills. Mine office: Aguacaliente de Baca, Fuerte, Sinaloa, Mex. Harry Austin Clapp, president and general manager; Paul H. Seymour, secretary; F. B. Grubb, treasurer; Daniel H. Livingston, general superintendent. Apparently has some connection with Las Tablas Copper Co.

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PAN-AMERICAN EXPLORATION CO. **MEXICO.**

Office: 711 Missouri Trust Bldg., St. Louis, Mo. Mine office: Manzanillo, Medellin, Colima, Mex. A. K. Vickers, president; Col. Kent E. Keller, secretary; Schuyler S. Gates, general manager. Organized March 8, 1901, under laws of Missouri, with capitalization $1,000,000, shares $10 par.

Property is the Camotlán mine, 10 hours' ride by horseback from Manzanillo, carrying gold, silver and copper ores. Company formerly owned 159 hectares, including the Cacoma mine, sold to Cacoma Mines & Smelter Co.

PAN-AMERICAN FEDERAL SMELTING & REFINING CO. NEW MEXICO.

Office: El Paso, Tex. Works office: Socorro, Socorro Co., N. M. J. V. Smith, president; W. P. Stewart, vice-president; J. A. Lowe, general manager. Organized April, 1908, under laws of Arizona, with capitalization $5,000,000.

The company was claimed, August, 1908, to be building small custom smelters at Lordsburg, Grant Co., N. M., Nogales, Santa Cruz Co., Ariz., and Van Horn, El Paso Co., Tex. Apparently the smelters outside of Socorro remain in the air, and apparently the company expects citizens to donate sites, and subscribe for stock. The Socorro plant is said to be planned to have small lead and copper stacks, of 100 tons daily capacity, with a 5-ton concentrator in connection. Company is not regarded favorably.

PAN-AMERICAN MINES CO. **MEXICO.**

Dead. Formerly at Etzatlán, Ahualulco, Jalisco, Mex.

PAN-AMERICAN MINING & SMELTING CO. **ARIZONA & MEXICO.**

Office: 905-11 Broadway, New York, N. Y. Mine office: Prescott, Yavapai Co., Ariz. A. Howard Skinner, president; Harry F. Lindsley, secretary and treasurer. Organized under laws of Arizona, with capitalization $15,000,000, shares $5 par, in $3,000,000 preferred 7% stock and $12,000,000 common stock.

This company was promoted by the notorious Dr. R. C. Flower, who was successful in swindling many unsuspecting American investors, and who, at last accounts, was supposed to be traveling in Mexico, in various disguises, and hitting the high spots only. The company was also assisted in securing the Quebradillas mine, of Parral, by Grant G. Gillett, the cattle plunger, who left Kansas City—and many creditors—between two suns. That preëminent firm of mining swindlers, L. E. Pike & Co., of Boston, also aided in the promotion. The company succeeded the Lone Pine Mining Co., alias the Arizona, Eastern & Montana Smelting & Ore Purchasing Co., of most unsavory memory, succeeding the Buenos Aires Mining Co., Urique Gold Mining Co., Sunset Mining Co. and La Paz Mining Co., all dubious propositions. Several mines were abandoned, without taking final titles. The Quebradillas mine, of Parral, was optioned, but bond was allowed to lapse. The various Mexican holdings of the Pan-American company, some of which may or may not still be held, included the Recompensa group, at Maguarachic, the Hernandez group at Miñaca, and La Liga and Santa Camilla mines, at Concepción, all of Chihuahua, Mexico, also the Ambidexter group, in Arizona, located circa 1900, on which no ore was found. Idle and moribund.

PANAMINT GREENWATER GOLD & COPPER MINING CO. CALIFORNIA.

Office: 234 Empire Bldg., Denver, Colo. Mine office: Greenwater, Inyo Co., Cal. Frank H. Ober, president and general manager; R. H. Biegel, vice-president; F. H. Martin, treasurer; Geo. F. Ober, secretary. Organized 1906, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 7 claims, area 140 acres, including 3 claims at Greenwater and 4 in the Wild Rose district of Nevada and Skidoo district of California. Apparently assessment work not done, and claims at Greenwater subject to relocation, but nobody wants them. Advertised, 1906, that it would ship ore within 90 days,

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but of course did not. Bears ever yindication of being a mere bit of Denver stock-jobbery.

PANDORA COPPER MINING CO., LTD **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. John C. Weatherhead, manager. Lands, adjoining the Illinois claim of the Snowstorm on the east, are supposed to carry the extension of the Snowstorm vein. Has a 500′ crosscut tunnel, expected to cut ore at about 1,000′, giving a back of 800′.

PANHANDLE SMELTER. **IDAHO.**

Owned by Idaho Smelting & Refining Co.

PANHANDLE SMELTLING CO., LTD. **IDAHO.**

Dead. Capitalization was $5,000,000, shares $1 par. Officers were J. Herbert Anderson, president; S. B. Phillips, secretary and treasurer; Theo. L. Lammers, general manager; C. C. Titus, superintendent. Company fell into financial difficulties, October, 1907, and was reorganized, circa January, 1908, as Idaho Smelting & Refining Co. Formerly at Ponderay, Bonner Co., Idaho.

PANTEIDAL COPPER CO., LTD. **WALES.**

Office: 21 Lawrence Lane, London, E. C., Eng. Geo. Thompson, secretary. Organized Nov. 15, 1898, under laws of Great Britain, with capitalization £25,000, shares £1 par; issued, £16,007. Property is mineral rights to two farms, in Merionethshire, Wales. Inactive for some years and apparently moribund.

COMPAÑIA DE COBRE DEL PÁNUCO. **MEXICO.**

Mine office: Pánuco, Monclova, Coahuila, Mex. Chas. May, manager.

PÁNUCO COPPER CO., LTD. **MEXICO.**

Dead. Lands sold, circa 1905, to Continental Copper Co. Formerly at Pánuco de Monclova, Coahuila, Mex. Described Vol. V.

PANULCILLO COPPER CO. **CHILE.**

Dead. Succeeded, 1898, by Central Chili Copper Co., Ltd. Formerly at Panulcillo, Ovalle, Coquimbo, Chile.

PAPAGO COPPER CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. H. C. Abbott, president; W. T. Simmons, vice-president; E. S. Garrett, secretary. Capitalization $1,000,000, shares $1 par. Lands, 50 claims, in the Comobabi Mountains, circa 65 miles southwest of Tucson, nearest railroad point, having about 1,000′ of openings, showing azurite, malachite and chalcopyrite. Has a hoist and air-compressor.

PAPAGO MINING CO. **ARIZONA.**

Dead. Formerly at Aztec, Yuma Co., Ariz.

PAPOVSKI MINE. **SIBERIA.**

Office, mine and works: Semipalatinsk, Siberia. Is owned and operated by Papov's Successors, securing an annual production of circa 150,000 lbs. fine copper, at last accounts.

PARADISE DEVELOPMENT CO. **ARIZONA.**

Dead. Succeeded, 1907, by Bisbee Sonora Development Co. Formerly at Paradise, Cochise Co., Ariz. Described Vol. VI.

PARADISE MINING CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. Is controlled, through ownership of 60% of stock, by Bisbee-Sonora Development Co. Lands, near the Badger-Hall Mining Co., have a 245′ shaft, with crosscuts showing sulphide ore of good grade.

PARADOX COPPER-GOLD MINING CO. **COLORADO.**

Dead. Absorbed, 1903, by San Juan Smelting & Refining Co. Formerly at Silverton, San Juan Co., Colo.

PARADOX MINING & MILLING CO. **COLORADO.**

Office: Grand Junction, Colo. Mine office: Paradox, Montrose Co., Colo.

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J. A. McCulloch, president; T. W. James, vice-president; A. A. Miller, secretary and general manager; D. T. Stone, treasurer. Organized Jan. 25, 1905, under laws of Colorado, with capitalization $1,500,000, shares $1 par.

Lands, 12 claims, area circa 110 acres, also a 5-acre millsite, in the La Sal and Paradox districts, 65 miles from a railroad, showing limestone, sandstone, shales and quartzite, with intrusive porphyry, carrying 3 fissure and contact veins of 2′ to 7′ width, opened by tunnels of 85′, 100′, 200′ and 400′, showing melaconite and argentite, giving assay values of 3 to 75% copper, and 1 to 1,000 oz. silver per ton, with a trace of gold.

PARAMATTA COPPER MINES, LTD. **AUSTRALIA.**

Offices: 22 Chancery Lane, London, E. C., Eng., and 29 bis, Rue Nationale, Lille, France. Mine offices: Wallaroo, Daly Co., and North Yelta, Daly Co., South Australia. Eugene Dervaux, chairman; G. de Venancourt, mine manager; Henri Duquesne, secretary. Organized May 18, 1899, under laws of Great Britain, with capitalization £200,000, shares £1 par. Debentures, £20,000 authorized, £9,300 issued, at 5%. Shareholders are mainly French. In 1904 netted £13,165 and in 1905 netted £7,353.

Lands, 1,340 acres, held from the South Australian government on a 99-year lease expiring June 30, 1988, at annual rental of 1s. per acre, plus 2.5% royalty on net profits. Lands include the Paramatta, Yelta, Wheal Hughes and Wheal James mines.

The Paramatta, which is the principal mine, is an old and important producer, adjoining the Wallaroo mine of the Wallaroo & Moonta, reopened, 1900, by present company. Deepest shaft is 500′, bottomed in a vein ranging up to 8′ width, with richer portions carrying up to 25% copper, and formerly had about 50,000 tons of ore reserves, which have been nearly exhausted by present management. A new shaft was sunk crosswise, and is practically worthless. Water supply is scant, causing trouble at times. Equipment includes a modern machinery plant. The Yelta mine, taken over 1903, has been reopened and equipped with modern machinery.

The reduction plant includes a 200-ton concentrator and a 400-ton smelter, latter having blast-furnaces turning out matte which formerly was converted at the adjoining plant of the Wallaroo & Moonta, but is now shipped to Europe for reduction, at considerably increased cost. Production, for year ending June 30, 1905, was 2,069,760 lbs. fine copper. Local management was changed, circa 1906. Under former direction of L. G. Hancock, money was earned for dividends with copper at £57 per long ton, company paying 25% dividends in 1903 and 5% dividends in 1904. Under present management the company has lost money with copper at £85 per ton. With adequate expenditures for opening of new reserves, and under good management, the property is believed to be capable of making a good mine, but the present management is poor. Operations were suspended, 1907, on account of the depression in copper.

PARCIONERA CONSOLIDATED MINING CO. **MEXICO.**

Office: 29 Broadway, New York, N. Y. Mine office: Santa Eulalia, Iturbide, Chihuahua, Mex. Jos. S. Qualey, president; Ernest Henderson, secretary. Is a close corporation, shares $100 par. Lands, under development at last accounts, are said to give an encouraging copper showing.

PARINGA COPPER MINES, LTD. **AUSTRALIA.**

Dead. Formerly at Callington, Adelaide Co., South Australia. Described Vol. V.

PARINGA MINING SYNDICATE. **AUSTRALIA.**

Mine office: Callington, Adelaide Co., South Australia. Lands, 172 acres. Presumably idle.

PARIS BOULDER MINING CO. **IDAHO.**

Office and mine: Paris, Bear Lake Co., Idaho. Andrew Madsen, presi-

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dent; J. H. Eversoll, secretary and treasurer; preceding officers, W. D. Passey, A. C. Candland, J. H. Grimmett, J. Russell Shepherd, Chas. Innes and B. F. Woodward, directors; L. W. Johnson, superintendent. Organized 1908, under laws of Idaho, with capitalization $50,000, shares 5 cents par. Lands, 23 claims, showing ores carrying copper, lead and silver.

PARK CITY MAJESTIC MINING CO. **UTAH.**

Dead. The promoter, S. T. Rolph, disappeared. Formerly at Park City, Summit Co., Utah. Described Vol. IV.

PARK CITY MINING CO. **WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. W. T. Connell, manager. Lands include the Mountain Boy and Hercules mines, latter having a 331′ tunnel showing ore assaying up to 6.5% copper and 140 oz. silver per ton, with small gold values and traces of lead.

PARK COPPER CO. **MONTANA.**

Office: 33 West Granite St., Butte, Mont Letter returned unclaimed from former mine office, Dillon, Beaverhead Co., Mont. Wm. O. Climo, president; John H. Judge, vice-president; R. M. Cobban, treasurer and manager; preceding officers, E. B. Howell and W. M. Bickford, directors; Forbes F. Irbine, secretary. Organized Oct. 6, 1906, under laws of Montana, with capitalization $1,000,000, shares $1 par.

Lands, 6 claims, on the Wise River, said to show a 60′ vein, outcropping for 2,000′. Has 2 shafts, known as the Park and Williams, latter, 200′ deep, with 2 compartments, showing argentiferous copper ore assaying up to 12% copper. Has an air-compressor.

PARK COPPER & GOLD MINING CO., LTD. **IDAHO.**

Office and mine: Mullan, Shoshone Co., Idaho. Patrick Burke, manager. Lands, 6 claims, on the southern side of Stevens Peak, having tunnels of 550′ and 1,000′, showing a vein of 3′ to 50′ width, with average of circa 20′, capped by a gossan, of about 40′ average width, of mixed hematite and siderite, carrying kidneys of high grade copper carbonates and chalcopyrite, with some native copper. Veins apparently should carry chalcopyrite of fair grade at greater depth.

PARKS MINING CO. **MONTANA.**

Mine office: Polaris, Beaverhead Co., Mont. Has copper-gold ores.

COMPAÑIA ESPLOTADORA DE PARRAL. **MEXICO.**

Mine office: San Bartolo, San Juan de Guadalupe, Durango, Mex. Property includes El Lentisco mine, carrying auriferous copper ores. Idle.

PARRAL SMELTING CO. **MEXICO.**

Office: care of Samuel Garrison, president, Pittsburg, Pa. Works office: Parral, Hidalgo, Chihuahua, Mex. D. M. Evans, general manager. Capitalization, $1,000,000. Property is a smelting concession, from the State of Chihuahua, and it was planned to build a 250-ton smelter, with both lead and copper stacks. Apparently abortive.

PARROT MINING & MILLING CO. **COLORADO.**

Letter returned unclaimed from former mine office, Leadville, Lake Co., Colo. Property includes the Golden Fleece mine, said to show auriferous and argentiferous copper ore assaying 5.5 to 22% copper.

PARROT SILVER & COPPER CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Employs circa 350 men. A. H. Melin, secretary; John D. Ryan, managing director; H. A. Gallwey, superintendent; preceding officers, Sidney Chase, F. P. Addicks, John E. Judson and A. B. Grafius, directors. Organized 1880, under laws of Montana, with capitalization $2,300,000, shares $10 par; issued, $2,298,500. Is controlled, through ownership of slightly more than a majority of stock, by Amalgamated Copper Co. Paid dividends, to end of

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1907, of $6,807,260. Recent dividends have been as follows: 50 cents in 1902; nothing in 1903; $1 in 1904; $2 in 1905; $1.25 in 1906; 75 cents in 1907. A quarterly dividend of 25 cents, due November, 1907, was passed.

Lands, 19 claims, mainly fractional, area 40.6 acres, well located, in the central portion of the Butte district, including the Parrot, Little Minah, Bellona and Original No. 6 mines. The Parrot mine, opened 1884, is one of the pioneer mines of the camp. The property shows a barren zone, at depth of circa 1,000', succeeded by fair ore bodies below. Ore of the mine, as a whole, averages about 3% copper, and carries fair silver and small gold values.

The Parrot mine is opened by a 2,300' shaft, having 3 compartments to the fourth level, and 4 compartments below, retimbered, 1904. The mine is timbered with 10x10" square sets and round timbers, having electric call bells, and is connected underground with the Colusa-Parrot, Neversweat, Nipper and Original No. 6 mines. The lower workings show an ore body up to 30' in width, apparently a continuation of the Anaconda vein, carrying some high grade chalcocite and bornite, but the Blue Vein fault cuts the Anaconda vein in such a manner that the Parrot loses about 100' in length of workable ground with each 100' in depth. The Parrot also is mining the Nipper vein, which shows ore up to 10% copper and 15 oz. silver per ton, but the Parrot owns only a 5/36 interest in the Nipper vein, balance belonging to Butte Coalition. The Parrot shaft has a 112' steel gallows-frame, with maximum load capacity of 50 tons, and a Union Iron Works hoist with 28x96" cylinders, capable of raising 10-ton loads from a depth of 3,000', hoisting 2 double-deck cages with 10-ton skips swung under, using a flat steel rope ⅝" thick and 8" wide.

The Little Minah mine has a 1,000' two-compartment shaft, with levels opened at 600', 800' and 1,000', the bottom level showing to the west a 4' ore body assaying 3.5% copper and 6 oz. silver per ton, and to the eastward an ore body averaging 18' width for 100' length, giving assays of 4% copper and 6 oz. silver per ton. The Blue Vein fault carries some concentrating ore on this property. The temporary equipment at the Little Minah is to be replaced by a hoist good for 2,000' depth.

The Original No. 6 mine, having a shaft of circa 1,000' depth, and connected underground with the Parrot and adjoining mines, is a comparatively small producer.

Equipment includes an 80-drill Ingersoll-Sergeant air-compressor and a 22-drill Rand air-compressor. Mine buildings, mainly of steel, stone and brick, include an engine-house, boiler-house, compressor-house and a model two-story change-house, with cement floors, 24 shower-baths and lockers for 350 men.

There is an antiquated smelter, idle since 1900, which is an asset of no particular value, though some copper is secured by precipitation from the old dumps and slag-piles.

The company owns copper refining works at Bridgeport, Conn., which also are antiquated, and have been idle for some years.

Production, for year ending June 1, 1908, was only 57,964 tons of ore, or about one-third as much as two years previously, and smelter returns averaged about 2.5% copper only, with fair silver values. In August, 1908, the Parrot was yielding about 300 tons and the Little Minah 100 to 150 tons daily. Normal production is circa 8,000,000 lbs. fine copper yearly, but, for 1907, was about 5,000,000 lbs. only. For year ending June 1, 1907, there was a profit of $141,730, and for year ending June 1, 1908, there was a deficit of $189,372. The property apparently has seen its best days, though under normal conditions it is capable of yielding small profits, with possibilities of opening new ore bodies of larger size and better average grade.

PARRY SOUND COPPER MINING CO., LTD. **ONTARIO.**

Office: 500 Germania Life Bldg., St. Paul, Minn. Mine office: Parry

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Sound, Parry Sound district, Ont. Employs 10 men. Frank Johnson, president; Stanford B. Lewis, vice-president; Otto Monson, secretary and treasurer; preceding officers, John Ogren and Chas. Burton, directors; Chas. Anderson, mine superintendent. Organized March 23, 1899, under laws of Ontario, with capitalization $5,000,000, shares $1 par; issued, $2,500,000. Liabilities are given at $25,000 floating indebtedness, and a $5,000 mortgage at 6% on 200 acres of land. Annual meeting, second Tuesday in August.

Lands, 10 claims, area 2,000 acres, one-half freehold and one-half held under a contract requiring $2,000 to perfect title. Property, on the eastern shore of Georgian Bay, includes the McGowan and Wilcox mines.

The Wilcox mine has indications of 4 parallel veins in a cross-section of about one-quarter mile, with a 145′ shaft on a 20′ ore body in granite, traceable 1,000′, carrying auriferous and argentiferous bornite assaying 2.8 to 11% copper. There also is an open-cut of 20x150′, 18′ deep, showing 3% chalcopyrite.

The McGowan mine has shafts of 100′, 100′ and 250′, and a 150′ crosscut tunnel, showing bornite and tetrahedrite, and occasional chalcopyrite, with quartz gangue. A smelter shipment of 240 tons of selected ore returned 17% copper and $5 in combined gold and silver values.

Equipment includes a 10-stamp mill, hoisting machinery and several buildings.

PAR VALUE CONSOLIDATED GOLD & COPPER CO. **COLORADO.**

Dead. Lost Colorado lands, now held by Redoubtable Gold & Copper Mining & Milling Co., through forfeiture of bonds. Formerly at Turret, Chaffee Co., Colo.

PAR VALUE GOLD MINING CO. **COLORADO.**

Dead. Succeeded, 1900, by Par Value Consolidated Gold & Copper Co., also dead. Formerly at Turret, Chaffee Co., Colo.

GEWERKSCHAFT PASCHA. **GERMANY.**

Office: Düsseldorf, Rheinprovinz, Germany. Paul Müller, president. Has ores of iron, copper, zinc and lead, employing circa 25 men.

PASO GOLD & COPPER PRODUCING CO. **UTAH.**

Office: care of J. W. Guthrie, secretary, Salt Lake City, Utah. A. H. Meredith, president; Leonard Hilpert, treasurer. Organized, 1907, with capitalization $500,000, shares $1 par. Lands are said to be 12 claims, in Salt Lake county, Utah.

PASS CITY COPPER CO. **MEXICO.**

Office: care of H. E. Runkle, El Paso, Texas. Lands, sundry claims, in the Sierra de Las Arradas, district of Bravos, Chihuahua, Mexico, developed by two shafts, one tunnel and an open-cut, with a total of about 350′ of openings, showing stringers of oxide and carbonate copper ores, in limestone. Idle and apparently moribund.

C. PASS & SON, LTD. **ENGLAND.**

Office and works: Bristol, Somersetshire, Eng. Property is the Bedminster Smelting Works, treating ores imported from a great variety of sources.

PATAGONIA MINING CO. **ARIZONA.**

Office: care of Francis J. Heney, San Francisco, Cal. Mine office: Patagonia, Santa Cruz Co., Ariz. Benj. Heney, president; R. R. Richardson, secretary and treasurer; Fredk. John Zebert, consulting engineer. Capitalization $200,000, shares $1 par. Lands, 31 claims, unpatented, area 620 acres, in 2 groups, known as the Hardshell and Flux, in the Patagonia Mountains, having a 505′ incline shaft with circa 2,000′ of workings. The Hardshell group shows auriferous silver-lead ore, slightly zinciferous in the bottom workings, with copper ores on the Flux group.

PATHFINDER CONSOLIDATED MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Grand Forks, Boundary district, B. C. John Rogers, presi-

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dent. Lands, on Pathfinder Mountain, circa 14 miles from Grand Forks, show 4 parallel veins of 8′ to 20′ width, carrying auriferous and slightly argentiferous chalcopyrite, disseminated in pyrrhotite, with quartz gangue, assaying 2.5 to 4% copper and circa $2 gold per ton. Has 3 shafts, with aggregate depth of 337′, and about 800′ of tunnels. Has steam power, hoist, 7-drill Rand air-compressor and necessary mine buildings. Property considered promising, but idle for several years.

PATHFINDER GOLD & COPPER CO. **IDAHO.**

Dead. Lands were 8 claims, on the Queen River, worked in a small way, many years ago, having a 500′ crosscut tunnel, showing a vein of about 3′ width, carrying auriferous and argentiferous copper ores, with values mainly in the precious metals. Former office was Canton, Ohio. Formerly at Atlanta, Elmore Co., Idaho.

PAUDORNE COPPER MINING CO. **VIRGINIA.**

Mine office: Houston, Halifax Co., Va. Organized December, 1902, under laws of South Dakota. Apparently idle since birth and presumably moribund.

PAULL'S CONSOLIDATED COPPER PROPRIETARY, N. L. **AUSTRALIA.**

Mine office: Burr Well, South Australia. Presumably idle.

PAY COPPER CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. Lands, 4 claims, adjoining the Greenwater-Black Jack Mining Co. Idle and apparently moribund.

PAYMASTER CONSOLIDATED MINES CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. J. Edw. Owen, vice-president and treasurer; John P. Owen, president; R. W. Langworthy, secretary. Capitalization $5,000,000, shares $1 par. Is said to have authorized, November, 1907, a $300,000 bond issue.

Lands, 52 claims, circa 25 miles southeast of Tucson, in the Pima district of the Sierrita Mountains, including the paymaster group of 17 claims; Olive group of 2 claims; North Prosperity group of 7 claims; Schumaker group of 2 claims, and Keystone group of 24 claims. The Keystone group has 3 tunnels, showing gold and lead values. The Paymaster mine, opened 1887, and said to have produced upwards of $500,000 worth of ore, under former ownership, has shafts of 90′ to 325′, with circa 4,000′ of workings, on a vein of 15′ to 20′ width, carrying argentiferous lead and copper ores, said to average 6% copper, 40% lead and 65 oz. silver per ton, with 100,000 tons of ore in sight, which estimates are considered excessive. Shipped some ore, 1907.

PAYMASTER COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

PAYMASTER MINE. **IDAHO.**

Mine office: Wardner, Shoshone Co., Idaho. Lands, one mile east of Wardner, are said to have a 4′ vein carrying lead and copper values. The mine has a 280′ upper tunnel and a 100′ lower tunnel, with a 100′ blind shaft, from the lower tunnel, showing good lead and copper ore, former assaying up to 42% in tenor.

PAYMASTER MINING & SMELTING CO. **UTAH.**

Mine office: St. George, Washington Co., Utah. S. L. Adams, Jr., superintendent. Property was said, 1906, to be operated by Samuel Newhouse and associates. Is said have a 20-ton smelter.

PEACH BOTTOM COPPER CO. **NORTH CAROLINA.**

Dead. Formerly at Elk Creek, Ashe Co., N. C.

PEACOCK CONSOLIDATED MINING CO. **UTAH.**

Mine office: Milford, Beaver Co., Utah. Lands show a fissure vein of 2′ to 5′ width, giving ore assaying up to 42% lead, 23 oz. silver and $1.60 gold per ton.

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PEACOCK COPPER CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Ben X. Williams, superintendent. Lands, 7 claims, near the Arizona Consolidated, Johnson Copper Co. and Centurion mine.

PEACOCK COPPER CO. **CALIFORNIA.**

Dead. Formerly at Lavic, San Bernardino Co., Cal. Described Vol. V.

PEACOCK COPPER MINING CO., LTD. **IDAHO.**

Office: care of John H. Nordquist, president, Wallace, Idaho. Mine office: Logan, Idaho Co., Idaho. Organized 1907, under laws of Idaho. Lands, 5 claims, near the Eagle Mining Co., in the St. Joe district.

PEAK COPPER CO. **MICHIGAN.**

Dead. Formerly at Bessemer, Gogebic Co., Mich. Described Vol. III.

PEAK DOWNS COPPER CO. **AUSTRALIA.**

Dead. Was succeeded by Peak Downs Freehold Copper & Coal Co., Ltd. Company had 50,000 paid up shares and 80,000 contributing shares. Formerly at Copperfield, Clermont Co., Queensland, Australia.

PEAK DOWNS FREEHOLD COPPER & COAL CO., LTD. **AUSTRALIA.**

Dead. Was organized April, 1908, under laws of Queensland, as successor of Peak Downs Copper Co., with capitalization £75,000, shares 7s. 6d. par; issued, 130,000 shares, 3s. 6d. paid in. Officers were John Currie, chairman; Currie, Buchanan & Co., secretaries; J. T. Coates, mine manager. Was succeeded, circa May, 1908, by United Peak Downs Copper & Coal Co., Ltd.

PEARL COPPER MINING CO. **COLORADO.**

Dead. Formerly at Pearl, Larimer Co., Colo.

PEARL COPPER MINING & SMELTING CO. **COLORADO.**

Office: care of P. B. Coolidge, manager, Lander, Wyo. Mine office: Pearl, Larimer Co., Colo. W. L. Culbertson, president; R. E. Coburn, secretary; T. J. Riley, superintendent. Lands include the Copper King and Swede groups, opened by a 400′ shaft, showing considerable ore of good average grade, values being in copper, gold and silver. Has steam power. Was under lease, expiring 1906, to Western Mining & Smelting Co. Idle.

PEARL SMELTING CO. **COLORADO.**

Dead. Formerly at Pearl, Larimer Co., Colo. Fully described Vol. VI.

PECK MINING CO. **ARIZONA.**

Dead. Lands passed to Great Peck Mining Co. Formerly at Providence, Yavapai Co., Ariz.

PECOS COPPER CO. **NEW MEXICO.**

Office: 581 Arcade, Cleveland, Ohio. Mine office: Cowles, San Miguel Co., N. M. Alfred H. Cowles, president; I. C. Clifford, vice-president; Frederick H. Swan, secretary and treasurer. Organized 1904, under laws of Michigan, with capitalization $50,000, shares $25 par.

Lands, 260 acres lode claims and 272 acres placer claims, all patented, with total area, including 2 coal claims, of 811 acres, lying in the Hamilton district, circa 12 miles over the mountains from Santa Fé, and about 18 miles from Pecos switch. Lands are well timbered, and a considerable water power is available from the Pecos river, which company controls for 2½ miles.

The property shows granite, slate and quartzite, with underlying strata of lower Carboniferous age, cut through by the valley of the Pecos river. Lands show various contact deposits, having ferruginous quartzite on the south, with granite and slate to the north, of which two, under development, show a mineralized zone up to 225′ in width, with ore bodies of 12′ to 18′ estimated width, carrying massive chalcopyrite and massive sphalerite, formerly reported to give average assays of 3.5% copper, 3.75 oz. silver and $1.60 gold per ton. The ores are slightly argentiferous and auriferous zinc, lead and copper sulphides, of low average tenor, though in large quantities, and will

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require reduction on the ground, in a plant especially adapted to the treatment of complex sulphide ores.

Development is by the Katydid shaft of 60′ and the Evangeline shaft of 310′, with 450′ of tunnels, and about 3,600′ of workings. The management claims to have 168,304 tons of ore blocked out. The property was opened 1882, and closed shortly thereafter, owing to zinc ores near surface proving unworkable.

Equipment includes a 165-h. p. steam plant, with 2 hoists, good for 600′ depth each, and a 3-drill Rand air-compressor, with several mine buildings. The company has been said to consider building a 23-mile branch line, from the mines to Pecos switch, on the Santa Fé Railway. Idle.

PEERLESS COPPER EXTRACTION CO. **ARIZONA.**

Office: 405 Bank Blk., Denver, Colo. Mine office: Florence, Pinal Co., Ariz. J. Bradbury, secretary; A. F. Abbott, manager. Organized circa 1907, with capitalization $1,000,000. Property is the McIntosh experimental leaching plant.

PEERLESS GOLD & COPPER MINING CO. **COLORADO.**

Letter returned unclaimed from former office, 153 La Salle St., Chicago, Ills. Mine office: Silver Cliff, Custer Co., Colo. H. S. Taylor, president and treasurer; C. E. Wilcox and A. G. Gage, vice-presidents; V. N. Brant, secretary. Organized circa 1905, under laws of Colorado. Lands, 29 claims, 3 patented, in the Spruce district, circa 12 miles from Silver Cliff, developed by a 1,655′ tunnel, supposed to be closely approaching an ore body.

PEERLESS MINING & MILLING CO. **COLORADO.**

Office and mine: Salida, Chaffee Co., Colo. Lands, 6 claims, on Cyclone Mountain, 16 miles west of Salida, opened by an 800′ crosscut tunnel, showing ores carrying values in lead, copper, gold and silver, lead predominating. Idle several years and apparently moribund.

PEHOVAZ HERMANOS y CA. **PERÚ.**

Mine office: Uliachiu, Cerro de Pasco, Junín, Perú. Property is a small producer of silver and copper, when worked. Presumably idle.

PEÑA COPPER MINES, LTD. **SPAIN.**

Office: 3 Laurence Pountney Hill, Cannon St., London, E. C., Eng. Mine office: Nerva, Huelva, Spain. Nicol Brown, chairman; Albert Straube, deputy chairman; T. Stephenson Dick, secretary; Enrique Schreck, mine manager; Wm. Neil, auditor. Organized Sept. 19, 1900, under laws of Great Britain, and capitalization increased, January, 1905, to £600,000, shares £1 par; issued, £537,600. Debentures originally were £200,000 authorized, and £193,800 issued, at 5%, reduced, 1907, to £63,500, with sinking fund for redemption amounting to £51,500. Net profits for fiscal years have been as follows: £17,293 in 1905; £45,697 in 1906; £19,522 in 1907. Dividends have been as follows: 5% in 1903; 5% in 1905; 4% in 1906; 7½% in 1907.

Lands, 183 hectares, 2 miles northeast of the Rio Tinto, being the Peña del Hierro group of 17 old mines, taken over from the Sociedad Peninsular de Brussels. Extraction is mainly open-cast, and large quantities of overburden are removed, stripping having been 195,430 cubic meters in 1905; 220,869 meters in 1906, and 174,324 meters in 1907. Eventually the capping will be removed almost entirely, and the mine worked open-cast down to the 9th level, there being a very limited amount of underground mining in progress. Ore reserves were estimated, 1907, at 3,000,000 long tons.

Equipment includes hoists, crushing plant, shops and dwellings. A 2½-mile private line, equipped with one locomotive and 14 cars, connects the mines and works with the nearest railway.

Ores produced are divided into cupriferous pyrites, iron pyrites and washed sulphur ore, latter being ore previously leached for copper, and sold thereafter

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for sulphur contents. The leaching plant has settling tanks, boilers and pumps. The cupriferous pyrites of the Sierra Morena lend themselves with special facility to copper extraction by a combination of natural weathering and artificial leaching, and this process, in use by the Peña, gives cheap costs, but entails long waits and heavy investments before profits are returned, a term of 8 to 10 years being required for complete extraction of copper values, which means that the operators must put more in than is taken out, for a long term of years.

Production was 624 long tons fine copper in 1902, and for 1905 was 1,724,800 lbs. fine copper and circa 110,000 long tons of pyrites, sold for sulphur. At the end of 1905 the quantity of ore in the tereros, or leach-heaps, was 480,803 long tons, and Dec. 31, 1907, was 536,476 long tons, estimated to contain 4,119 long tons fine copper. Owing to prolonged drought, production was hampered in 1907, but heavy rains, at the end of the year, gave sufficient reserves of water. Production, 1907, included 15,104 tons of leached sulphur ore, 19,550 tons of ore extracted and 167,236 long tons of ore added to leach-heaps, and production of fine copper has been as follows: 1,724,800 lbs. in 1905; 2,421,440 lbs. in 1906; 2,036,160 lbs. in 1907. Property is considered valuable and well managed.

SOCIEDAD ANONIMA MINERA DE PEÑAFLOR. **SPAIN.**

Office: Bilbao, Vizcaya, Spain. Mine office: Peñaflor, Sevilla, Spain. Don Luis de Salazar, president; Don P. Alzaga, manager; Don Angel Iznarde y Alzate, superintendent. Organized Jan. 1, 1901, under laws of Spain, with capitalization 4,500,000 pesetas. Property includes the Concepción, Descuido and Segunda Preciosa mines, equipped with an electric pumping plant. Is supposed to be working with a small force.

PEND D'OREILLE GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Davenport, Lincoln Co., Wash. Idle several years.

PENINSULA MINING & SMELTING CO. **MEXICO.**

Dead. Lost lands, circa 1904. Formerly at Santa Catarina, Norte, Baja California, Mex. Fully described Vol. V.

SOCIEDAD PENINSULAR DE BRUSSELS. **SPAIN.**

Dead. Was wound up, 1900, and mines sold to Peña Copper Mines, Ltd. Formerly at Nerva, Huelva, Spain.

PENN-ARIZONA COPPER CO. **ARIZONA.**

Office: Greenburg, Pa. Mine office: Prescott, Yavapai Co., Ariz. R. H. Koontz, president; N. J. Baxter, vice-president; Geo. S. Sarver, secretary; Jas. L. Freeble, treasurer; S. J. Gnash, general manager. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 27 claims, in the Copper Basin district.

PENN CHEMICAL WORKS. **CALIFORNIA.**

Office and mine: Campo Seco, Calaveras Co., Cal. J. K. Harmon, president and general manager; Albert C. Harmon, secretary, treasurer and superintendent; A. L. Willie, assistant superintendent; John Cocking, mine foreman; Frank Baird, smelter superintendent. Organized 1880, under laws of California.

Lands, 4 claims, area 80 acres, patented, also a 20-acre smelter-site, 640 acres of timber lands and 450 acres miscellaneous lands, giving total holdings of 1,190 acres, in the Campo Seco district. Property includes the Campo Seco, Hecla and Satellite mines, which were considerable producers, circa 1860-1870. Mines are developed by 5 tunnels and 2 shafts, latter of 500′ and 700′, cutting a 30′ ore body, at depth of 400′. Ore is slightly argentiferous and auriferous chalcopyrite, associated with sphalerite and pyrite, with gangue ranging from talcose schist, through clay, to quartz.

Equipment includes steam plants of 150 h. p. at the mine, and 400 h. p.

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at the smelter. Shafts have 44-h. p. and 100-h. p. hoists, good for depths of 1,000′ and 2,000′ respectively, and there is a 14-drill Ingersoll-Sergeant air-compressor. Fuel is petroleum. A little cement copper is produced by leaching old waste burrows.

The property is served by the Southern Pacific Railway, 6 miles distant, and transportation is by wagon between the mine and Valley Springs, the distance being short, allowing one round trip daily.

The smelter, one-fourth mile from the mine, receiving ore by tram, has a 100-ton blast-furnace and two 50-ton reverberatory furnaces. The works have been much improved, and brought to the point of doing economical work. The works produce matte, brought to 60% copper tenor in 3 fusions, shipped to the American Metal Co., Ltd., New York, for refining and marketing. Semi-pyritic smelting formerly was employed in the blast-furnace, but reduction is now mainly by reverberatories, burning petroleum, effecting an estimated reduction of 40% in cost of smelting. Property considered promising and management good.

PENN-MONT MINING & MILLING CO. **MONTANA.**

Office: 102 Trout Bldg., Lancaster, Pa. Mine office: Elliston, Powell Co., Mont. W. H. Guthrie, president; C. V. Lichty, vice-president and fiscal agent; W. J. Merrill, secretary and treasurer; Thos. S. Rogers, superintendent. Organized under laws of Montana, with capitalization $1,000,000, shares $1 par. Lands, 460 acres, including 15 lode claims and one placer claim, circa 3 miles south of Elliston, opened by a 100′ incline shaft and a 125′ vertical shaft, showing a 4′ fissure vein in granite, carrying mainly auriferous and argentiferous lead ore, but it is hoped to develop copper sulphides of good average tenor at greater depth. Is said to plan a concentrator.

PENNSYLVANIA & ARIZONA CONSOLIDATED COPPER CO. **ARIZONA.**

Office: care of Wm. Cunningham, secretary, Phoenix, Ariz. Mine office: Hot Springs, Yavapai Co., Ariz. Jas. H. Bennett, president and manager; Jos. J. Shaw, vice-president. Organized circa January, 1907. Lands, 8 claims, about 10 miles north of Hot Springs, in the Red Picacho district, showing a 47′ vein with prominent gossan opened to depth of 300′, carrying sulphide ore at depth of 285′. Shipped, 1907, ore of 20 to 40% copper tenor, to the Humboldt smelter.

PENNSYLVANIA & CANANEA COPPER CO. **MEXICO.**

Office: 1220-25 Broad St., New York, N. Y. Mine office: Baca Bldg., La Cananea, Arizpe, Sonora, Mex. Robt. Mitchell, president and general manager; Henry J. Stevens, vice-president; E. B. Crary, treasurer; Geo. A. Fitch, secretary; Chas. McHenry, superintendent. Organized under laws of Arizona, with capitalization $5,000,000, shares $10 par; issued, $2,500,000. Direct title to lands is held through South Cananea Copper Co., S. A., organized under laws of Mexico.

Lands, 587 hectares, including the Collins group of 305 pertenencias, Arizpe group of 40 pertenencias, Homestake group of 60 pertenencias, Last Chance group of 22 pertenencias and Gladys group of 150 pertenencias, latter adjoining the Massey mine of the Greene Consolidated, and supposed to carry the extension of the Massey ore body, bulk of lands being circa 2 miles from La Cananea. Considerable development has been secured, the Collins claim having a 250′ shaft. Company was said, 1906, to have bought a tin mine in the state of Jalisco, of which nothing has been heard since, and was said, late 1906, to have sold lands to Cananea & Globe Exploration & Development Co., another Mitchell company.

PENNSYLVANIA, CANANEA & GLOBE MINING CO. **ARIZONA.**

Office: 37 Wall St., New York, N. Y. Mine office: Globe, Gila Co., Ariz. Geo. Mitchell, general manager; John Britt, superintendent. Appar-

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ently is closely connected with Pennsylvania & Cananea Copper Co. Is said to have bought a controlling interest in the Five Points Mining Co., having 22 claims in the Pinto Creek district, also 3 groups of claims near Superior, Pinal Co., Ariz. Idle and apparently moribund.

PENNSYLVANIA CENTRAL GOLD MINING CO. **COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. Property is the Delaware Chief mine, carrying ores of gold, silver and copper. Has steam power.

PENNSYLVANIA COPPER CO. **NEW MEXICO.**

Dead. Formerly at San Pedro, Santa Fé Co., N. M. Described Vol. VI.

PENNSYLVANIA COPPER MINING CO. **PENNSYLVANIA.**

Dead. Delaware charter repealed 1903. Was promoted by Paul Morris & Co. Formerly at Pottstown, Montgomery Co., Pa. Described Vol. VI.

PENNSYLVANIA MINE. **MONTANA.**

Owned by Boston & Montana Consolidated Copper & Silver Mining Co.

PENNSYLVANIA MINING CO. **NEW MEXICO.**

Office: Franklin, Pa. Mine office: Los Cerillos, Santa Fé Co., N. M. Ores carry gold, silver, copper and lead. Idle several years.

PENNSYLVANIA & MONTANA MINING CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Curtiss Denbow, secretary. Lands, circa 100 acres, having a 130′ shaft showing a 2′ vein carrying an 8″ to 18″ paystreak.

PENNSYLVANIA SMELTING CO. **IDAHO.**

Works office: Ponderay, Bonner Co., Idaho. Geo. Faunce, president. Property is a one-third share interest in the Idaho Smelting & Refining Co., owning the Ponderay smelter.

PENN-WYOMING COPPER CO. **WYOMING.**

Office: 731 Monadnock Bldg., Chicago, Ills. Branch offices: 1308-74 Broadway, New York, N. Y., and 14 Great Winchester St., London, E. C., Eng. Mine office: Rudefeha, Carbon Co., Wyo. Works office: Encampment, Carbon Co., Wyo. E. M. Cobb, president; Frank Burke Draper, first vice-president; Earle A. Norton, secretary and general manager; preceding officers constitute the executive board; John F. Mallory, second vice-president; preceding officers, J. R. Leonard, Frederick Davidson, D. H. Lambertson and J. Q. Riddle, directors; L. M. Fishback, treasurer; H. Gulliver, London secretary; Geo. H. Hand, general superintendent; J. B. Barriani, transportation superintendent.

Organized Sept. 13, 1904, under laws of Wyoming, with capitalization $10,000,000, shares $1 par; issued, circa $9,000,000. Succeeded North American Copper Co., organized 1902, under laws of New Jersey, with capitalization $20,000,000, shares $100 par. Of the capitalization of the Penn-Wyoming, half was set aside for the redemption of $1,500,000 worth of bonds of the North American Copper Co., at the rate of 3⅓ for 1. Controls, through ownership of 90% of entire stock issue, the Haggarty Copper Mining Co., Encampment Smelting Co., Encampment Tramway Co., Encampment Pipe Line Ditch Co., Encampment Land & Townsite Lot Co., Carbondale Coal Co., Emerson Electric Light Co., Saratoga & Encampment Railroad Co. and North American Mercantile Co., last named corporation being the purchasing and distributing end of the Penn-Wyoming. Controls the Battle Lake Tunnel Site Mining Co., through ownership of $2,361,400 stock out of total issue of $2,500,000. The Battle Lake company had outstanding, June 15, 1907, bonds aggregating $13,400.

The company paid dividends, at the rate of 6% yearly, for 2 years, until March, 1907, on issued stock, when the dividend rate was increased to 8%, but the dividend of July, 1907, was canceled, on account of the burning of the smelter. Dividends paid to July, 1907, were $531,250, on outstanding share capital of $5,500,000. The company has circa 3,400 shareholders, a large number of whom are residents of Great Britain.

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Lands, including holdings of the Battle Lake Tunnel Site Mining Co., aggregate 1,373 acres, property including 773 acres of patented mineral lands, 80 acres of coal lands, a 24-acre millsite, limestone quarry, 320 acres of timber lands and the entire townsites, less lots sold, of Encampment, Rudefeha and Rambler.

The Ferris-Haggarty mine, 8 claims, one fractional, 5 patented, area 103 acres, discovered 1898, shows an outcrop of decomposed spongy limonite, with carbonate copper stains, under which is a fissured zone of about 20′ average width, having a mica-schist hanging-wall and slightly stratified footwall, with strike of northwest and southeast, and dip of 50° from the horizon to the southwest. At depth of about 40′ the ore is massive bornite, carrying 40 to 45% copper and $2 to $9 combined gold and silver values per ton. The rich zone has been partially worked out, the bornite being replaced, in the lower levels, by disseminated chalcopyrite, estimated to average 10% copper, 1.75 oz. silver and $6 gold per ton, but yielding, in actual production, 4 to 6% copper, about 1 oz. silver and $2 to $4 gold per ton, with mixed charges, including ore from the old mine dump, estimated to average about 4% copper. A promising new ore body, opened, 1907, by crosscuts on the 140′ level, is about 10′ wide, for depth of 75′ and length of 350′, and is estimated, by Superintendent Hand, as averaging better than 20% copper, which probably is an overestimate. The statement by Swasey & Co., of New York, that the Ferris-Haggarty has a vein of 65′ average width averaging 8% copper is a serious exaggeration. A low grade copper vein was located by diamond drill, September, 1908, at a distance of 130′ in the footwall. Development is by a 1,490′ main working tunnel, connecting with a 540′ shaft, and a 180′ winze has been sunk below the tunnel level. The mine has about 6,500′ of workings. Ore is milled down to the tunnel level, through chutes, and hauled to ore-bins at the portal by compressed air locomotives. The mine was estimated, July, 1907, to be capable of producing 500 tons of ore daily, which seems a serious overestimate, in view of the comparatively limited extent of the workings.

The power plant of the Ferris-Haggarty mine, at the mouth of the tunnel, includes three 180-h. p. boilers, a 25-drill air-compressor, and a 3-stage Norwalk air-compressor furnishing air, at 1,250 lbs. pressure per square inch, to a 5x8" Porter locomotive used for underground traction. There also are 4 hoists, and 24 power drills. Buildings include a 30x40′ wooden machine-shop, 20x40′ wooden carpenter-shop, a 35x42′ wooden smithy, office, warehouses, ore-bins, bunkhouse, eating-house and 14 dwellings.

The Osceola mine, adjoining the Ferris-Haggarty, is but slightly developed, and apparently is not a producer.

The Doane-Rambler mine, 30 claims, area 600 acres, with 80 acres of miscellaneous lands, shows country rocks of granite, diorite and quartzite carrying numerous veins, of which 5, under development, of about 4′ average width, show oxidized ores above and sulphides below, latter mainly chalcopyrite, but with considerable chalcocite, covellite and bornite, which have shown an average assay of 40.7% copper from 16 carload shipments. The mine is opened by a 500′ working shaft and 3 tunnels, two longest 900′ and 1,600′, with upwards of one mile of underground workings, and is considered a promising property. Plant includes 3 boilers, an air-compressor and a 70-h. p. hoist.

A 16-mile Leschen aërial tramway, which is the longest installation of the sort ever made, connects the Ferris-Haggarty mine with the smelter. The tram was built in 4 sections, of 4 miles each, but is now operated in two 8-mile sections, by steam power, generated at 2 stations, 8 miles apart, each station having storage-bins. The length of cables is 293,275′; weight of cables, 439,669 lbs.; number of tension stations, 16, four being double; greatest elevation above sea-level, 10,690′, on Bridger Peak; highest tower, 69′; number of

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towers, 170; highest span, 250′ above surface, at Heaning's Gulch; longest span, 2,200′, across Cow Creek Cañon; general rise, 900′; number of buckets, 972, in service; capacity 700 lbs. each; speed, 5½ miles per hour; maximum daily capacity, upwards of 1,000 tons. The plant has automatic filling and discharging devices, and was built so that its capacity can be doubled, if desired. The aërial tramway has given some trouble in operation. A 2-mile branch tramway to the Doane-Rambler mine apparently is not completed.

The reduction plant, located on the banks of the Encampment river, does a custom business, in addition to treating the company's own ores. The first concentrator, burned, March, 1906, was replaced, July, 1907, with a larger and better mill, of 800 tons daily capacity. The concentrator is in 2 parts, terraced throughout, with a drop of about 60′, permitting the handling of material by gravity. The plant has storage-bins and picking-tables, equipment including a 700-ton Blake crusher, 4 roughing and finishing rolls, automatic sampler, revolving trommels, hydraulic classifiers, two 700-ton Hancock jigs, 2 pairs of grinding rolls, two 6′ Calumet regrinding mills, 8 Frue vanners, 12 Wilfley tables and a V-shaped slime tank, 12′ deep, 28′ wide and 70′ long. Tailings from the new mill are reported by the company to assay under 1% of the original metallic values, which seems almost too good to be true. The old smelter was burned May 10, 1907, this being the second bad fire in 3 years, and a new smelter, of steel frame on concrete foundations, rated at 1,000 tons daily capacity, was blown in Aug. 16, 1907. Equipment includes a 100-ton Davies straight-line roaster, a 40-ton mechanical straight-line roaster, and 200-ton and 300-ton water-jacket blast-furnaces. Slag is granulated by a jet of water, and washed through a launder to the dump. Blast for the furnaces is furnished by No. 6 Connersville and No. 7 Greene blowers.

The converter department has a 25-ton electric traveling crane, 3 converter stands, tilted electrically, and 6 shells, of the Copper Queen type. Linings are made of a mixture of clay and quartz, ground in a 7′ silica-mill, replaced every third charge. Blast for the converters is supplied by an electrically driven Riedler air-compressor, with a capacity of 6,000 cubic feet of free air per minute, compressed to 15 lbs. per square inch. There also is a White mineral press, for briquetting fines and flue-dust.

The power plant includes hydraulic and steam installations. Water is brought through a 4-mile pipe-line, of 48″ diameter, from a 23′ dam on the south fork of the Encampment river, driving 6 DeRemer impact wheels, direct-connected with generators furnishing current for a 1,000-h. p. common system. The water-power plant proved somewhat unreliable, varying in energy delivered from 600 to 1,200 h. p., hence was supplemented by a steam plant with three 200-h. p. Babcock & Wilcox boilers, and a 500-kw. Westinghouse-Parsons steam turbine. Fuel for power purposes is wood, costing circa $3.50 per cord, and coke is used for smelting. The company has a mine of lignite, on the line of the aërial tramway, at Carbondale, 12 miles from Encampment.

Buildings at the reduction plant include a machine-shop, pattern-shop, boiler-shop, foundry, sawmill, smithy, office and laboratory. The Encampment Water Works Co., owned by the Penn-Wyoming, has a franchise for supplying water to the town of Encampment, and the Emerson Electric Light Co. has the lighting franchise for the town.

The company's operations were greatly hampered by inadequate transportation facilities, the smelter being 45 miles from Walcott, the nearest railroad station. The Saratoga & Encampment Railway Co., capitalized at $1,000,000, is controlled through ownership of entire stock issue, and, at last accounts, a $750,000 bond issue by the railway company remained in the Penn-Wyoming treasury. The railway, of 45 miles length, of standard gauge, was completed August, 1908, giving greatly reduced operating costs.

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The mine secured more or less production in 1902 and 1903, and the smelter was again blown in June 28, 1905, running continuously until Oct. 20, 1905, making, in that campaign, 2,385,629 lbs. fine copper, 3,549 oz. silver and 226 oz. gold, from 28,039 tons of ore smelted, giving an average extraction of 4.25% copper, said by company to have been made at the cost of slightly under 9 cents per pound. For 1906 production was 2,402,985 lbs. fine copper, secured at a gross cost, for mining, smelting and hauling to railway station at Walcott, of $203,000.57, giving average costs of 8.45 cents per ton, showing a marked gain over the preceding year, gross receipts being $378,786.88. In 1906 smelter costs were $64,213.24, or $2.46 per ton, on 26,145 tons of ore smelted, the cost of $2.46 per ton of ore, or 2.67 cents per pound on finished copper, with an average return of 5.36% copper per ton of ore smelted, showing an increase in average copper tenor of ore and decrease in costs. The smelter was again blown in March 15, 1907, running until May 10, 1907, making 1,580,000 lbs. fine copper from 11,000 tons of ore smelted, giving an average return of 7.2% copper. Production was resumed, September, 1907, and was said to average about 4% copper, from Ferris-Haggarty ore. Production was said, February, 1908, by Swasey & Co., who were selling the company's shares, to be 600,000 lbs. fine copper monthly, but these figures are considered excessive, and apparently production, May, 1908, was circa 125 tons of ore daily. Production, 1908, is estimated at 5,000,000 lbs. fine copper.

Assets of the old North American Copper Co. were bought, at public sale, by the present company. A suit against the Penn-Wyoming, by shareholders of the old North American, has been decided against the plaintiffs, who apparently lack grounds for complaints against the Penn-Wyoming company or management. The statement, in a former edition of the Copper Handbook, that Mr. E. M. Cobb, president of the Penn-Wyoming, formerly was connected with Mr. John S. Carey in the management of the North American, was based on misapprehension, as the only connection of Mr. Cobb with Mr. Carey, or with the old North American company, was that of an unfortunate investor.

In past editions of the Copper Handbook the Penn-Wyoming Copper Co. has been criticized for two shortcomings and one misfortune, the latter being the lack of a railroad, which has been remedied by the completion of the rail line. The principal criticism was based upon the payment of dividends contemporaneously with the raising of additional capital by sale of shares, a policy that is wrong, no matter by whom followed, or how strongly endorsed. The last financial statement obtained from the company, of date August, 1907, gave assets of $76,481.07 accounts receivable, practically all due from subsidiary companies, $3,657.50 bills receivable of the Battle Lake Tunnel Site Mining Co., and $6,695.13 cash on hand. Current liabilities included notes payable of $370,086.76, due on the Ferris-Haggarty mine, and $318,959.62 trustee notes, running to A. F. Richardson, secured to the trustee by underlying notes of the various subsidiary corporations aggregating $1,390,798.62, held by the trustee under an agreement to cancel all notes of the various subsidiary corporations upon payment of the Penn-Wyoming notes for $318,959.62, this amount being the balance due on the underlying notes, on which $1,072,839 had been paid previously. The anomalous arrangement, formerly existing, by which stock of the Penn-Wyoming, while nominally common stock, and on a parity, was, for all practical purposes, divided into three classes, has been terminated, there being now only common stock outstanding, with all shareholders on an equal footing.

Apparently the company has considerable indebtedness, and its inability to sell its $750,000 railroad bond issue is said to have caused financial embarrassment. A stockholders' committee was endeavoring, late 1908, to work out a plan of reconstruction. The cost-sheets of the 1906 and 1907 smelting cam-

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paigns show that copper has been produced, in considerable quantities, at reasonable prices, and, as pointed out by the Copper Handbook two years ago, the ultimate success of the mine would seem to depend upon its ability to furnish large tonnages for steady smelting operations. Apparently the mine has proven unequal to the task, owing to insufficient development. While the management has been censured, in past editions, for its mistaken policy of paying dividends while raising further share capital, it is believed that the management has been doing its best to work out from under an embarrassing load of debt, and it is to be hoped that some plan of financing may be devised by which the company will be given the considerable working capital needed to enable it to develop its mines to a point where they can furnish a steady and assured tonnage to the smelter.

SOCIEDAD ANONIMA MINAS DE PEÑUELAS. **SPAIN.**

Office and mine: Paimogo, Huelva, Spain. José Maria Soto y Rosso, chairman; Miguel Borrero Morón, vice-chairman; Mateo Santos Mora, secretary; Gregorio Peres Diaz, treasurer. Organized July 19, 1898, under laws of Spain, with capitalization 12,600 shares, wholly issued. Annual meeting, in August.

Lands, 139 hectares, with miscellaneous lands giving total holdings of 500 hectares, in the Paimogo district, showing slate and granite, with numerous fissure and contact veins, of which one, under development, of 4′ estimated average width, shows oxidized ores and chalcopyrite, giving average assays of 15.34% copper, developed by shafts of 200′, 30′, 60′ and 50′, and by tunnels of 150′ and 130′.

Equipment includes an 18-h. p. hoist, and there are 17 dwellings and cottages for workmen.

Product is mainly cupriferous pyrites, sold to Thos. Morrison & Co. Mine is served by the Tharsis Railway. Production, to Jan. 1, 1908, was circa 4,000 tons of ore, giving average returns of 15.34% copper. Production, 1907, estimated at 125,000 lbs. fine copper.

PEOPLES MINING CO. **ARIZONA.**

Office and mine: Willcox, Cochise Co., Ariz. S. N. Kemp, superintendent. Organized circa 1905. Has auriferous and argentiferous copper ore, said to be shown in considerable quantities, with steam power.

PERCIVAL MINING CO. **WISCONSIN.**

Dead. Organized 1873, succeeded 1898, by Percival Copper Mining Co. Formerly at Gordon, Douglas Co., Wis.

PERCY-CHESTER CONSOLIDATED MINING CO. **COLORADO.**

Office: Council Bluffs, Iowa. Mine office: Red Cliff, Eagle Co., Colo. F. M. Donald, lessee. Ores carry gold, silver and copper. Has steam power. Presumably idle.

PERCY RIVER SYNDICATE. **AUSTRALIA.**

Office: Irvinebank, Queensland, Australia. Mine office: Ortona, via Georgetown, Queensland, Australia. C. E. Young, secretary; J. F. Puxley, general manager; E. Joyce, superintendent. At last accounts employed 12 men, on exploratory work, in connection with the Ortona.

FRANCISCO DE PAULA PEREZ. **CHILE.**

Mine office: Los Condes, Santiago, Chile. Works office: Ñuñoa, Santiago de Chile. Property is La Central mine, opened 1880, adjoining the property of the Compañía Esplotadora Los Bronces, and the two were driving a long tunnel, jointly, at last accounts. Ores average, after selection for smelting, about 23% copper. La Central smelter has a matting furnace only, and production, 1903, is estimated at 500,000 lbs. fine copper.

PERKIOMEN MINES. **PENNSYLVANIA.**

Mine office: Shannonville, Montgomery Co., Pa. Are old mines, that were

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quite extensively worked, and produced a large variety of copper and lead ores at one time. Long idle.

PERMIAN & TRANS-PECOS COPPER CO. **TEXAS.**

Dead. Texas charter forfeited, 1905, for non-payment of taxes.

PERSON CONSOLIDATED COPPER & GOLD MINES CO. **NORTH CAROLINA.**

Office: 1901-42 Broadway, New York, N. Y. Mine office: Virgilina, Halifax Co., Va. E. D. Beecher, president and general manager. Organized under laws of New York, with capitalization $1,000,000, shares $10 par.

Lands, 1,372 acres, in several neighboring tracts, including the Durgy mine, located in Person county, North Carolina. Main shaft, 330'. Vein averages 4' in width, carrying ores ranging 4 to 20% in copper tenor. Has a 50-ton concentrator. When worked, shipped concentrates averaging 45% copper and 20 oz. silver per ton, with small gold values, sending a limited amount of high-grade ore, averaging 30% copper and 10 oz. silver per ton, direct to smelter. Idle.

PERÚ COPPER SYNDICATE, LTD. **PERÚ.**

Dead. Liquidated July 16, 1906. Formerly in Perú.

PERUVIAN COPPER MINING & SMELTING CORPORATION. **ARGENTINA.**

Dead. Was still-born.

PERUVIAN MINING & MILLING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. B. F. Clays, superintendent. Capitalization was increased, 1908, to 250,000 shares, presumably $1 par. Lands, 5 claims, known as the Hungry Ten group, idle several years until 1908. Development is by a 1,100' tunnel, being driven for the main contact, and cutting several fissure veins giving assays up to 12% copper, 20% lead, 78 oz. silver and $1.60 gold per ton. Property has several mine buildings.

PERUVIAN MINING, SMELTING & REFINING CO. **PERÚ.**

Office: 400-55 Congress St., Boston, Mass. Mine office: Morococha, Junín, Perú. Works office: Rio Blanco, Junín, Perú. A. S. Hight, president; S. E. Farwell, treasurer; Julio L. East, general manager; G. Wagner, mine superintendent; S. C. Hazelton, smelter superintendent; A. A. Abbott, consulting engineer; M. F. Church, constructing engineer. Organized July 16, 1906, under laws of Maine, with capitalization $5,000,000, shares $10 par; issued, $4,000,000. Has outstanding a $950,000 issue of 7% convertible bonds. Is controlled, through ownership of $1,000,000 stock, by United States Smelting, Refining & Mining Co.

Lands include the Churruca mine, in the Morococha district, said to be capable of producing 300 tons daily of ore averaging 9% copper, with silver and gold contents.

The reduction plant, blown in July 5, 1908, of 300 tons daily capacity, has a steel building, terraced, to use gravity throughout, and treats largely custom ores. The smelter is at Rio Blanco, on Lake Huacracocha, near Lake Morococha, 135 kilometers from Callao and 120 kilometers from Lima, on the Ferrocarril Central del Perú.

A railroad track, on a trestle behind and above the sampling mill, runs over ore-bins, which discharge to belt-conveyor carrying ore to the sampler, which is of 60 tons hourly capacity, equipped with Vezin automatic sampling machinery. The ore-bins are of 12,000 tons capacity, and storage is provided for 600 tons of limestone and 300 tons of coke.

The smelter has a 100-ton cintering plant, for concentrating ores before smelting, consisting of 12 one-ton pots.

The cupola building has a 44x186" blast-furnace, with room for a second of the same size, making matte of 50 to 55% copper tenor. The furnace has a

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dust-flue of brick, on steel columns, bottom being hoppered for automatic discharge of accumulated dust, with 2 dust-chambers, of masonry, intervening between the flue and stack, latter being of steel, 150′ high and 12′ in diameter.

There is a hydro-electric power plant, with a 1,200′ pipe-line of 40″ diameter from the Rio Blanco, delivering water to the power-house under a head of 120′, generating approximately 500 h. p. There is a Connersville blower of 20,000 cubic feet capacity, and three 35-kw. direct-current generators, which also actuate an electric light plant. Miscellaneous buildings include a machine-shop, smithy, office and dwelling.

PETOSKEY MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Williams, Coconino Co., Ariz. Organized 1907. Built a leaching plant, which was burned. Since idle and apparently moribund.

PETRO MINING CO. **UTAH.**

Dead. Lands sold, 1905, for $30,000, to Utah-Apex Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

PEWABIC MINING CO. **MICHIGAN.**

Dead. Wound up, 1905. Lands now owned by Quincy Mining Co. Formerly at Hancock, Houghton Co., Mich. Described Vol. II.

PEYTON CHEMICAL CO. **CALIFORNIA.**

Office: 430 Mills Bldg., San Francisco, Cal. Mine office: El Dorado, El Dorado Co., Cal. Works office: Peyton, Contra Costa Co., Cal. Property is the Noonday mine and adjoining claims, in the Diamond Springs district. The Noonday, held under bond and lease, has shipped a little ore to the company's works. Presumably idle.

PFAU GOLD MINING & REFINING CO. **ARIZONA.**

Dead. Merged, 1907, in Verde River Copper Co. Formerly at Jerome, Yavapai Co., Ariz.

PHI DELTA THETA COPPER MINING CO. **WYOMING.**

Dead. Formerly at Dillon, Carbon Co., Wyo.

PHILADELPHIA & ARIZONA MINING CO. **ARIZONA.**

Office: 614 Real Estate & Trust Bldg., Philadelphia, Pa. Mine office: Chloride, Mohave Co., Ariz. H. T. Goodman, president; E. F. Lukins, secretary and treasurer; E. T. Loy, general manager. Organized 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, in the Wallapai district, include the Minnesota, Merrimac, Connor, Manzanita and other mines, carrying sulphide ores, in fissure veins averaging 6′ width, with assay values of 1 to 20% copper, 15 oz. silver and $6 gold per ton, with a little lead. Development is scattered over a number of different mines, including 20 shafts from 20′ to 600′ in depth, and a 3,500′ tunnel. Has steam and electric power, a 10-stamp mill and a 150-ton concentrator. Presumably idle.

PHILADELPHIA COPPER & GOLD MINING, MILLING & SMELTER CO. **MEXICO.**

Office: 507 Drexel Bldg., Philadelphia, Pa. Mine office: Ameca, Jalisco, Mex. Employs circa 50 men. Edwin F. Hall, president; Dr. S. C. Runkel, vice-president; Francis J. Fee, secretary; Josiah G. Williams, treasurer; A. F. Hall, general manager; J. A. Hall, superintendent; Ernest Koch, mill superintendent; Braulio Medina, mining captain. Organized 1900, under laws of New Jersey, with capitalization $3,000,000, shares $1 par.

Lands, 73 hectares, near San Martín Hidalgo, including La Perla, La Fé, La Concha, San Vicente, Ajax and other mines. Property shows veins of 3′ to 25′ width, carrying auriferous and slightly argentiferous chalcopyrite. San Vicente group, 12 miles southeast of Ameca, with circa 600′ of workings, is claimed to have 100,000 tons of ore blocked out, and has a steam hoist and air-compressor,

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installed 1907. La Fé mine is said to show ore up to 30% in copper tenor. The Ajax mine shows a 12′ vein, estimated to average 7% copper, 2 oz. silver and $20 gold per ton, which is considered excessive. La Estrella del Norte mine is opened by a 260′ tunnel. The property as a whole has 8 shafts, of circa 100′ average depth, with a total of about 8,000′ of workings. Equipment includes a 25-ton Elspass mill, 25-ton lixiviation plant and a 30-ton concentrator.

PHILADELPHIA COPPER MINES CO. NEW MEXICO.

Office: 206 Stephenson Bldg., Milwaukee, Wis. Mine office: Hanover, Grant Co., N. M. J. W. McAlpine, president; E. W. F. ReQua, vice-president; A. E. Johnson, secretary and treasurer; preceding officers, Wm. Schrubb, M. F. Keough and G. M. Petty, directors; B. F. Baker, superintendent; Fred Kuehn, auditor. Organized circa January, 1907, under laws of New Mexico, with capitalization $500,000, shares $1 par.

Lands, 5 claims, partly timbered, on the Santa Fé railroad in the Central mining district, near Hanover, carrying a limestone and porphyry contact of 25′ to 75′ width, showing copper carbonates and sulphides, latter mainly chalcopyrite, with some bornite and occasional chalcocite, principal values being in cupriferous pyrite. Mine, opened 1880, shipped some good ore, and is said to have paid its way in the past, under various managements. Mine has numerous opencuts and 4 shafts, deepest 75′, 100′ and 150′, all in ore, and a tunnel showing chalcopyrite up to 6% in copper tenor, with gold and silver values. Selected surface ores assay circa 2% copper, 2 oz. silver and $28.52 gold per ton. Is developing at rate of 75′ to 100′ per month. Has gasoline power, engine house, smithy and sorting shed, and plans a new machinery equipment. A railroad runs 1,500′ from shaft. Made several small shipments, 1907. Employed circa 35 men at last accounts.

PHILADELPHIA MINING & MILLING CO. NEW MEXICO.

Dead. Lands sold to Hillsboro Consolidated Mines Co., a fraud. Formerly at Hillsboro, Sierra Co., N. M.

PHILADELPHIA-SEARCHLIGHT GOLD & COPPER MINING CO. NEVADA.

Office: 810 Witherspoon Bldg., Philadelphia, Pa. Mine office: Searchlight, Lincoln Co., Nev. John C. Groome, president; Jos. W. Shannon, vice-president; J. M. Stewart, secretary and treasurer; preceding officers, Richard M. Popham, E. C. Knight, Jr., Richard W. Meirs and Chas. Wheeler, directors; W. H. Bainbridge, superintendent. Organized under laws of Arizona, with capitalization $5,000,000, shares $1 par; issued, $1,000,000.

Lands, 23 claims, 1 fractional, area 450 acres, in the Sunrise district, 4 miles northeast of Searchlight. Has a 356′ vertical shaft, with crosscuts from bottom showing several veins of 3″ to 4′ width, carrying auriferous and argentiferous copper ore, of fair tenor, with quartz gangue. Has steam and gasoline power, with necessary mine buildings. Employs circa 15 men.

PHILLIPS RIVER GOLD & COPPER CO., LTD. AUSTRALIA.

Office: Salisbury House, London Wall, London, E. C., Eng. Mine and works office: Ravensthorpe, Phillips River Goldfield, Western Australia. Chas. Kaufman, chairman; E. Protheroe Jones, secretary; G. C. Klug, general manager; Fred W. Morgan, mine manager. Organized Jan. 6, 1906, under laws of Great Britain, with capitalization £100,000, shares £1 par. Owns 44,400 shares of Mount Cattlin Copper Mining Co., Ltd.

Lands, 247 acres, apparently held under lease and option, in the Ravensthorpe division of the Phillips River Goldfield, circa 32 miles from Port Hopetoun, including the Mount Benson and Mount Desmond mines, and an ironstone quarry of fluxing ore. The Mount Cattlin mine was sold, November, 1906, for £100,000. The Mount Benson mine has a 200′ shaft, but principal developments are at the Mount Desmond-Elverdton group, having shafts of 263′ and 267′, with development under way on the 250′ level, this property

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showing a cupriferous schist, of 40′ to 50′ width, traceable some distance. A railway is being built from the mines to Port Hopetoun.

Smelter, built by the Western Australian government, was bought on condition of treating ore from prospects of the district upon same terms as in force when smelting was under government control. In November, 1907, closed down the blast-furnace, and planned running only one reverberatory furnace on custom ore, until completion of a railway from Ravensthorpe to Port Hopetoun, work on which was being pushed. Ordered a converter plant, for installation late 1908. Smelting was begun Dec. 4, 1906, and to June 30, 1907, smelter treated 6,106 long tons of ore and 2,575 long tons of slag, yielding 501 long tons copper, 4,846 oz. silver and 1,805 oz. gold. Production, 1907, estimated at 1,250,000 lbs. fine copper. Property is of considerable promise.

PHOENIX AMALGAMATED COPPER MINES, LTD. BRITISH COLUMBIA.

Office: Sherbrooke, Que. Mine office: Phoenix, Boundary district, B. C. F. B. Buck, president; C. H. Fletcher, vice-president; A. F. Fraser, secretary. Organized circa March, 1906, with capitalization, $5,000,000, shares, $10 par. Is controlled, through ownership of majority of stock, by Consolidated Mining & Smelting Co., of Canada, Ltd. Lands, circa 11 claims, including the War Eagle mine. Property considered promising.

PHOENIX CONSOLIDATED COPPER CO. MICHIGAN.

Office: 42 Broadway, New York, N. Y. Mine office: Phoenix, Keweenaw Co., Mich. Chas. A. Wright, president; Chas. A. Wright, Jr., secretary and treasurer; preceding officers, Jas. N. Wright, Capt. Thos. Hoatson and Spencer R. Hill, directors; H. G. Wright, mill superintendent; John Kraemer, wash boss. Organized April, 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $13.50 paid in. Is controlled, through stock ownership, by the Keweenaw Copper Co., and has circa 700 shareholders. For year 1907 receipts were $81,708, from assessments, with expenditures of $4,533, and company ended 1907 with cash assets of $13,454, and notes and accounts payable of $43,847.

Lands, 2,505 acres, carrying 5 different fissure veins, on which more or less mining has been done, at various times. The old Phoenix mine, included in the present consolidation, is famous for having produced the largest mass of native copper ever found, this weighing upwards of 500 short tons. The old Phoenix fissure, on which work was first done 1846, was opened to a depth of about 90′ only, producing considerable mass copper and silver, one mass of native silver weighing 8 lbs. 10 oz. There also are possibilities on the Ashbed lode, which has been slightly developed by an exploratory tunnel. The mine has extensive openings, and a modern equipment, and was worked for 6 years, without success, until closed down, June 15, 1905. The mine of the Phoenix Consolidated was described very fully in Vol. V, and the various old properties merged in the consolidation were fully described in Vol. II.

The shops, under one roof, have the following dimensions: Machine-shop, 30x60′; power-house, 24x42′; carpenter-shop, 30x60′. Buildings include an office, store, warehouse, barns and a number of substantial dwellings. Water is taken from a 3,000-gallon dam, 300x700′ in size and 12′ deep, built across the Eagle river. A large stationary Worthington pump connects with the dam, and has 900′ of hose, for fire protection. The mine and mill are connected by a 2½-mile railway having 1 locomotive, rock-cars and flat-cars, formerly of narrow gauge, but widened, 1908, to standard gauge, and connected with the Keweenaw Central railway.

The stampmill, 50x190′, of wood, on concrete foundations, is located on Eagle river, north of the mine, and is rated at 300 tons daily capacity. Wash-water is secured from a wooden dam, 90′ wide and 10′ high, through a 12x24″ launder, having a drop of 13′ in a distance of 3,000′. Mill equipment in-

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cludes a steam pump, 14 Cleaves jigs and 4 Woodbury jigs. While the mine is idle, the mill is operated, day-shifts only, on rock from the Medora mine of the Keweenaw Copper Co.

PHOENIX & EASTERN SMELTING & REFINING CO. **ARIZONA.**

Works office: Phoenix, Maricopa Co., Ariz. Geo. F. Goerner, general manager. Late 1906 was said to plan building a 300-ton smelter, in vicinity of Phoenix, but no such smelter built, and probably no prospect of building. Ralph Jacoby was one of the organizers, hence the company is regarded with suspicion.

PHOENIX GOLD & COPPER MINING CO. **NEVADA.**

Office: 218 La Salle St., Chicago, Ills. Mine office: Tenabo, Lander Co., Nev. Organized circa 1907. Property is the Howie lease of the Phoenix lode, on lands of the Gold Quartz Mining Co., said to have a shaft showing a 6′ vein with ore assaying up to $100 per ton in combined copper, silver and gold values.

PHOENIX MINING CO. **CHILE.**

Office: Valparaiso, Chile. Mine office: Tocopilla, Antofagasta, Chile. Organized Apr. 18, 1905, under laws of Chile, with capitalization 250,000 pesos, shares 100 pesos par.

PHOENIX MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. H. A. Gebhardt, superintendent. Mine, near the Utah-Apex and Yampa, is opened by 4 tunnels, one, a 2,700′ crosscut adit, showing a vein of 7′ to 14′ width, carrying silver-lead ore. Smelting ore assays 35 to 40% lead and 10 oz. silver per ton, and milling ore, running 10% lead, with small silver values, makes a 40% lead concentrate, after putting 5 into 1. Has a 200-ton mill, on Carr Fork, with electric power, completed 1908. Employs circa 40 men.

PHOENIX MINING, SMELTING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Office and mine: Phoenix, Boundary district, B. C. Julius Carson, president; A. F. Geddes, vice-president; W. S. Longhurst, secretary; Wm. Delahay, treasurer; preceding officers and M. J. Carson, directors. Organized June, 1908, under laws of British Columbia, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, one fractional, in the Wellington camp, circa 3 miles from Phoenix, having a 60′ shaft showing auriferous copper ore. Company plans driving a tunnel.

PHOENIX MINING SYNDICATE. **WASHINGTON.**

Office: Seattle, Wash. Mine office: Berlin, King Co., Wash. Lands include the Mona group, east of Miller river, 2½ miles from a railroad, showing a 60′ vein, carrying a 20′ paystreak of low grade chalcopyrite, opened by a shaft of 50′ and by tunnels of 80′, 230′ and 700′. Presumably idle.

PICACHO BLANCO MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Morristown, Maricopa Co., Ariz. M. E. Waldstein, president; T. O. Otis, secretary and treasurer. Is a consolidation of the San Domingo Gold & Copper Co. and Exposition Mining Co. Capitalization $5,000,000, shares $1 par. Lands, 31 claims, in Maricopa and Yavapai counties, Arizona. Has a 400′ main shaft, with free-milling gold ores claimed to average $22 per ton. Has a 15-stamp mill and a 25-ton cyanide plant. Idle several years and apparently moribund.

MINAS PICACHO y CAMPO RICO. **MEXICO.**

Mine office: Bavispe, Moctezuma, Sonora, Mex. Corella & Hone, owners; B. J. Hone, manager. Ores carry copper, gold, silver and lead. Has water power, arrastras and a small adobe smelter. Employ circa 40 men.

PIC COPPER & GOLD MINING CO. OF LAKE SUPERIOR, LTD. **ONTARIO.**

Dead. Formerly at Port Arthur, Thunder Bay district, Ont.

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PICKET CREEK DEVELOPMENT CO. **OREGON.**

Mine office: Grants Pass, Josephine Co., Ore. Lands, on Picket Creek, are said to show several veins of 3′ to 7′ width, carrying auriferous copper ore of fair grade. Early 1908 planned development by tunnel.

PIEDMONT COPPER MINING & SMELTING CO. **VIRGINIA.**

Office: 320 Broadway, New York, N. Y. Letter returned unclaimed from former mine office, Elkton, Rockingham Co., Va. Morris D. Brown, president; Jas. G. Blauvelt, vice-president; E. Porter Emerson, secretary and treasurer; S. D. Brown, general manager. Organized 1901, under laws of New Jersey, with capitalization $2,000,000, shares $100 par, $30 paid in.

Lands show 3 fissure veins, carrying occasional native copper and sulphide ores, with claimed average values of 6% copper, 10 oz. silver and $15 gold per ton. Veins are said to be persistent and traceable for about a mile, with geological conditions much the same as at the High Top mine, adjoining. Idle some years and apparently moribund.

PIEDRAS HERMANOS. **CHILE.**

Office and mine: Chañaral, Antofagasta, Chile. Property is the Esploradora mine, situated in the northern limits of the department of Chañaral, at the foot of the Cordillera Encantada. Lands show 3 parallel veins, with an aggregate of about 8 meters width. Mine, opened to vertical depth of 160 meters, has produced a large quantity of 8 to 12% ore, and is estimated to show, on surface, 75,000 tons of ore of 7 to 8% copper tenor. Property lacks transportation facilities and is greatly hampered by high carriage charges. Output, 1903, was 2,485 metric tons of ore, averaging 19.72% copper, equivalent to 1,080,346 lbs. fine copper. Apparently if given adequate transportation facilities and good management, this should make one of the best copper mines in Chile.

COMPAÑIA MINERA PIEDRAS VERDES y ANEXAS. **MEXICO.**

Office and mine: Alamos, Sonora, Mex. Angel Almado, president; Joaquin A. Mange, superintendent. Lands, circa 15 miles northwest of Alamos, and 2 miles north of the Rio Mayo, include the Piedras Verdes, Union and Sonora mines, showing a mineralized zone of about one mile width and 4 miles length, with veins outcropping 10′ to 40′ in width, carrying considerable oxidized ore of high grade, and occasional native copper in masses of considerable size. Development is by a 350′ shaft and a 375′ tunnel. Has steam power and a small matting furnace, and shipped, 1902, small quantities of matte carrying circa 40% copper, 20% lead and 200 oz. silver per ton. Presumably idle.

PIEDRAS VERDES MINING CO. **MEXICO.**

Office: Fuerte, Sinaloa, Mex. Has argentiferous copper ores, sligthly developed by tunnel. Idle.

PIEDRAS VERDES MINING CO. **MEXICO.**

Mine office: Suaqui Grande, Hermosillo, Sonora, Mex. Geo. M. Cochrane, superintendent. Presumably idle.

PIEBOR MINING CO. **COLORADO.**

Dead. Formerly at Central City, Gilpin Co., Colo.

PIKEDALE COPPER CO. **AUSTRALIA.**

Mine office: Stanthorpe, Queensland, Australia. Mine has 13 shafts, mainly very shallow, showing self-fluxing argentiferous copper and lead ores. Has a mill, built 1907, with magnetic separation process, giving very clean concentrates. Smelter has a reverberatory furnace, and addition of a blast-furnace is contemplated. Production, November, 1907, was 147 long tons of ore smelted to matte, carrying 18,600 lbs. copper and 2,928 oz. silver. Production, 1907, is estimated at 160,000 lbs. fine copper.

PIKE HILL MINES, INC. **VERMONT.**

Office: 82 Beaver St., New York, N. Y. Mine office: Corinth, Orange Co.,

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Vt. N. M. Macdonald, president; H. H. Knox, vice-president; John H. Allen, secretary and treasurer; Harry G. Hunter, superintendent; preceding officers and D. S. Conant, directors. Organized Jan. 9, 1906, under laws of Vermont, with capitalization $200,000, shares $100 par. Annual meeting, second Tuesday in January.

Lands, 101 acres, freehold, in the Corinth district, 14 miles from Boston & Maine railroad, showing mica-schist carrying lenses of chalcopyrite disseminated in pyrrhotite, of 3.5% estimated average copper tenor. Property is an old mine, worked at intervals during the Nineteenth Century.

Equipment includes a 75-h. p. steam plant, held in reserve, and a power plant with 20-h. p. and 80-h. p. gas engines and a 25-kw. electric generator, 20 h. p. being used at the mine and 80 h. p. at the mill. Fuel is pea-coal and wood. Buildings include necessary mine structures and 4 houses for workmen.

The wooden concentrator, of 6,600 square feet area, has a 9x15" Blake crusher, 3 rolls and 2 magnetic separators, with roaster and dryer.

Production has been as follows: 131,911 lbs. fine copper in 1905; 304,377 lbs. copper and 1,698 oz. silver in 1906; 425,367 lbs. copper and 2,292 oz. silver in 1907. Product of latter year was secured from 5,951 tons of ore milled, yielding an average extraction of 3.21% copper, and from 624 tons of smelting ore shipped. Company contemplates building a 100-ton smelter. Suspended operations November, 1907.

NEGOCIACION MINERA PILARES DE TERAS. **MEXICO.**

Mine office: Pilares de Teras, Sonora, Mex. Francisco H. García, general manager; Alberto C. García, superintendent. Is primarily a silver mine, carrying small values in copper, gold and lead, opened by a 1,400' tunnel and 700' main shaft. Has steam power.

PILOT-BUTTE COPPER MINING CO. **MONTANA.**

Office: 516 Colby-Abbott Bldg., Milwaukee, Wis. Mine office: Butte, Silver Bow Co., Mont. Wm. P. Jahn, president and general manager; Edw. A. Uhrig, vice-president; Geo. P. Meyer, secretary; Geo. F. Brumder, treasurer; Arthur C. Uihlein, assistant secretary. ' Organized 1907, under laws of Arizona, with capitalization $5,000,000, shares $5 par.

Lands, 1 fractional claim, area 10.19 acres, with average width of 320' and length of 1,405', adjoining the Berlin claim of the North Butte, and supposed to be traversed by several veins having an estimated combined width of 135', all said to apex on the Pilot claim, these including extensions of 2 veins of the Berlin. Development is by a 515' three-compartment shaft, with crosscuts east and west on the 500' level, in search of the Elm Orlu vein of argentiferous copper ore. Has a 50-h. p. electric hoist and Ingersoll-Rand air-compressor, actuated by 100-h. p General Electric motor, taking power from the Madison River Power Co. Property, though very small, is well located, and of considerable promise, and the officers and leading shareholders are among the most substantial business men of Milwaukee.

PILOT KNOB COPPER MINING CO. **NEVADA.**

Dead. Formerly in Nevada.

PILOT RANGE MINING CO. **NEVADA.**

Dead. Lands owned, 1908, by Mrs. Fermenia Sarrias. Former office was at 60 State St., Boston, Mass. Lands were 35 claims, circa 7 miles from Luning. Formerly at Luning, Esmeralda Co., Nev.

PILOT RANGE MINE. **NEVADA.**

Mine office: Luning, Esmeralda Co., Nev. Mrs. Fermenia Sarrias, owner and general manager; Fermin Arrega, superintendent. Lands, 57 claims, area 1,140 acres, with 160 acres miscellaneous lands, in the Santa Fé district, showing syenite and limestone, with 57 reported ore bodies, this number marvelously matching the number of claims, with 5 ore bodies under development,

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said to be traceable 7 miles and to give average assays of 10% copper and 2 oz. silver per ton from azurite, malachite, bornite and chalcopyrite, which figures are too high. Development is by tunnels of 60', 100', 150', 150' and 100', with 500' of workings, estimated by management to show 100,000 tons of ore, with 20,000 tons blocked out for stoping, which estimates are excessive.

Equipment includes a small steam plant and 3 mine buildings. The nearest railroad is the Southern Pacific, 8 miles distant. Property considered promising.

LES MINES DE CUIVRE PILOU, LTD. **NEW CALEDONIA.**

Dead. Formerly at Noumea, Diahot district, New Caledonia.

PINAL BUTTE GOLD & COPPER CO. **CALIFORNIA.**

Office: care of Vernon L. Clark, Los Angeles, Cal. Letter returned unclaimed from former mine office, Forbestown, Butte Co., Cal. Organized, 1907, under laws of Arizona, with capitalization $2,500,000. Property is the Hazelton mine, idle since 1905, until bought by this company. Has a mill, which was being enlarged at last accounts. Idle.

PINAL COPPER CO. **ARIZONA.**

Dead. Reorganized, 1905, as Arizona Banner Copper Co. Formerly at Globe, Gila Co., Ariz. Described Vol. III.

PINE HILL CONSOLIDATED MINING CO. **CALIFORNIA.**

Office: 1416-141 Broadway, New York, N. Y. Mine office: Wolf, Nevada Co., Cal. J. Frank Mase, secretary and treasurer. Organized under laws of Delaware. Has a copper ledge, claimed to be 100' feet wide, carrying malachite, azurite, bornite, chrysocolla and native copper, with a gold vein on the footwall and an auriferous gossan, opened by a two-compartment main shaft. Idle several years.

PINE MOUNTAIN COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office and mine, Globe, Gila Co., Ariz. E. J. Cole, Elmer Long, J. H. Lucas, J. F. Hatrick and Wm. Pohl, directors. Organized Apr. 6, 1907, under laws of Arizona, with capitalization $750,000, shares $1 par. Lands are the Ava group, 5 claims. Idle and apparently moribund.

PINE VALE COPPER SYNDICATE, LTD. **AUSTRALIA.**

Office: 24 Copthall Ave., London, E. C., Eng. Mine office: Mirani, Queensland, Australia. E. O. Chudleigh, secretary; G. Lloyd Owen, mine manager. Organized May 1, 1906, with capitalization £17,225, in 11,000 preference and 6,000 ordinary shares of £1 par each, and 4,500 shares of 1s. par, preference shares taking all profits up to 100%, with interest at 6% per annum, after which all shares rank alike.

COMPAÑIA MINERA PINTADOS. **CHILE.**

Office: Santiago de Chile. Mine office: Tarapacá, Tarapacá, Chile. Organized Dec. 23, 1905, under laws of Chile, with capitalization 6,000,000 pesos, shares 50 pesos par.

PINTO COPPER CO. **NEW MEXICO.**

Office: 9 Bartles Bldg., Iola, Kansas. Mine office: Santa Rita, Grant Co., N. M. Geo. A. Bowlus, president; F. S. Bennett, secretary and general manager. Organized July, 1902, under laws of South Dakota, with capitalization $2,500,000, shares $1 par. Lands, 8 claims, area 121 acres, in the Central district, showing 4 veins, said to average 20' width and carry carbonate and sulphide ores assaying 2.5 to 12% copper, 3 to 10 oz. silver and $2 to $400 gold per ton, opened by shafts of 65', 75' and 140'. Idle several years.

PINTO CREEK COPPER CO. **ARIZONA.**

Dead. Title changed, circa 1902, to Arizona & Hancock Mining Co. Formerly at Florence, Pinal Co., Ariz.

PINTO CREEK COPPER MINING CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Thos. P. Kelly, president. Organ-

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ized Nov. 21, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 9 claims, near the Arizona National and Globe Standard, on Pinto Creek, said to have about one-half mile of workings.

PINTO CREEK MINING & SMELTING CO. **ARIZONA.**

Office: 402 German American Bank Bldg., St. Joseph, Mo. Mine office: Globe, Gila Co., Ariz. Employs circa 40 men. Thos. G. Cockrill, president; Chas. Riemenschneider, vice-president; Grant S. Watkins, secretary; J. W. Castle, treasurer; preceding officers, H. E. Bragg, J. Berger and Geo. D. Bright, directors; G. P. Fuller, superintendent. Organized Dec. 11, 1896, under laws of Arizona, and capitalization increased, 1906, to $1,250,000, shares $1 par.

Lands, 36 claims, area circa 700 acres, showing granite and schists, with 6 fissure veins, in granite, of reported average width of 3′ to 6′, of which one gives considerable promise, carrying sulphide ores assaying 4 to 12% copper, circa 5 oz. silver and $2 to $10 gold per ton. The mine has shafts of 70′ and 570′, and 8 tunnels, shortest 100′, and 2 longest 900′ and 1,100′, the lower tunnel being connected with the upper workings. The main tunnel is being driven with air-hammer drills, said by the company to be doing double the work of piston drills at half the cost, which seems almost too good to be true. Main development is on the Yo Tambien claim, where the 570′ shaft shows a promising body of sulphide ore. The Manitou claim has a 70′ shaft, and 3 tunnels of 1,500′ aggregate length.

Mining equipment includes a gasoline hoist and a 6-drill Sullivan air-compressor, and there is an aërial tram between the mine and mill.

There is an old 10-stamp mill, and a concentrator, formerly of 30 tons daily capacity, overhauled and rebuilt, 1907, to 100-ton size, with the addition of $14,000 worth of new machinery, including a Hancock jig. The 100-ton mill requires a force of 3 men only, as against 8 in the old 30-ton mill, and is planned as the first unit of a 600-ton mill.

The management of this company deserves credit for great perseverance. Large sums have been expended, and indications favor the making of a mine. Work was resumed March, 1908.

PIONEER COPPER & SILVER MINING CO. **CALIFORNIA.**

Office: care of J. H. Platner, president and general manager, Reno, Nev. John Holley, treasurer. Organized February, 1907, with capitalization $1,500,000. Lands, 15 claims, 11 said to carry silver and 4 to carry gold, in Inyo county, California. Mine, said to have circa 6,000′ of workings, was a producer for about 15 years, until 1879.

PIONEER WALKER LAKE GOLD & COPPER MINING CO. **NEVADA.**

Office: care of J. F. Maier, president, Los Angeles, Cal. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Col. J. W. Diss, vice-president; Ferdinand K. Rule, Jos. Erzenberger, Samuel P. Davies, H. H. Wallace, O. H. Kiesker, C. E. Killan and H. Hawgwood, directors. Organized 1906, under laws of Arizona, with capitalization $1,000,000. Lands, 4 claims, 4 miles north of Yerington, said to show a gossan of about 25′ average width, carrying copper carbonates.

PISHMINSKO-KLUCHEVSKI WORKS. **RUSSIA.**

Mine office: Upper Issetzk, Perm, Russia. Count Stenbok-Fermor, owner. Production, 1905, was 868,188 lbs. fine copper.

PITKÄRANTA KOPPARBRUK. **FINLAND.**

Office: care Russian Imperial Bank, owner, St. Petersburg, Russia. Mine office: Pitkäranta, Viborg, Finland. Lands, circa 70,000 acres, mainly well wooded, near Lake Ladoga. Mine, opened circa 1820, was operated steadily until about 1903, making an average annual production of circa 750,000 lbs. fine copper during the last decade of operation. Has been under present ownership, which is practically that of the Russian government, since 1894.

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Lands carry several ore bodies, but the one developed is a 15′ bed of "skarn," which is a granular mixture of augite, garnet and other ferromagnesian silicates, impregnated with chalcopyrite, in veinlets. This ore body, which dips to the south, at 40° to 50°, has been opened at intervals for a length of about 1½ miles. To the eastward the ore occurs as bunches, up to several pounds in weight, and at this end of the workings the ore body is separated into 5 sections, the footwall bed of about 70′ width carrying finely disseminated chalcopyrite in "skarn," overlaid by a 2′ to 3′ layer of barren material, followed in turn by 3′ of barren schist, succeeded by a cupriferous bed of about 20″ thickness, carrying somewhat argentiferous copper sulphides. Property also has iron ore, and is said to have indications of tin. The mine has a small smelter. Idle since circa 1903, but said, June, 1907, to have been optioned to a British syndicate.

PIT RIVER GOLD, SILVER & COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Redding, Shasta Co., Cal.

PITTSBURG & ARIZONA MINING CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Lands include the Manila mine, with a double compartment shaft, planned to be sunk 400′, showing a promising vein of high-grade ore. Has a steam plant, with hoist, air-compressor and pumps. Presumably idle.

PITTSBURGH & BOSTON COPPER CO. **MICHIGAN.**

Dead. Property sold to Tamarack Mining Co. Was the first dividend-payer among Lake Superior mines. Formerly at Phœnix, Keweenaw Co., Mich. Fully described, under title Cliff mine, Vol. II.

PITTSBURG & CHIRICAHUA DEVELOPMENT CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. Lands, 16 claims, in the Chiricahua Mountains. Idle some years.

PITTSBURG CONSOLIDATED MINING CO. **UTAH.**

Dead. Formerly at Alta, Salt Lake Co., Utah. Described Vol. VI.

PITTSBURG COPPER CO. **NEW MEXICO**

Mine office: Clayton, Union Co., N. M. Lands, shortly east of the Rohr-Geddes Mining & Development Co., are developed by a 350′ tunnel.

PITTSBURG COPPER MINING & REDUCTION CO. **ARIZONA.**

Office: 300 Heist Bldg., Kansas City, Mo. Capitalization, $150,000,000. Was a swindle, promoted by Theodore Stegner, a notorious crook. Company held 40 acres of alleged copper mining ground in Box Cañon, on the Bill Williams Fork river, about 50 miles from Congress Junction, Arizona, and also claimed to own other lands, none of which can be located. Company's capitalization is preposterous, and the shares are absolutely worthless. Stegner has done time before, and should be locked up permanently.

PITTSBURG & DULUTH DEVELOPMENT CO. **ARIZONA.**

Dead. Succeeded, October, 1904, by Pittsburg & Duluth Mining Co. Formerly at Bisbee, Cochise Co., Ariz.

PITTSBURG & DULUTH MINING CO. **ARIZONA.**

Dead. Was merged, circa 1907, in Superior & Pittsburg Mining Co. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. VI.

PITTSBURG-ELY COPPER CO. **NEVADA.**

Office: 721 Symes Bldg., Denver, Colo. Mine office: Ely, White Pine Co., Nev. B. P. Morse, president; Hon. Harry C. Riddle, vice-president; J. A. Varney, secretary; Frank Straub, treasurer and trustee; preceding officers and Edwin A. Kistler, directors. Organized January, 1907, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands, circa 850 acres, in 2 groups, including the Keyboard group, 6 claims, area 120 acres, near the Keystone claim of the Nevada Consolidated. Another group of 10 claims, area 200 acres, lies to the north, and a third small group is near the Cumberland-

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Ely. The Keyboard group has a 60′ shaft, sunk 1907, claimed by company to be in the ore formation, which may mean much or little. The Keyboard group is considered promising, but apparently company has done more advertising than development. Employed 3 men at last accounts.

PITTSBURG & GREENWATER COPPER CO. **CALIFORNIA.**

Office: care of L. P. McGarry, president and general manager, Rhyolite, Nev. Mine office: Greenwater, Inyo Co., Cal. Organized October, 1906, under laws of Arizona, with capitalization $2,000,000. Lands, 16 claims, known as the Iron Mask group, near Resting Springs, about 35 miles south of Greenwater. Was promoted, for purely stock-jobbing purposes, by the notorious Dr. J. Grant Lyman. Idle and presumably moribund.

PITTSBURG & HECLA DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. V.

PITTSBURG & HECLA MINE. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Thos. Tate, manager. Is idle, except for annual assessment work.

PITTSBURG-IDAHO MINING CO. **IDAHO.**

Dead. Was succeeded by Pittsburg-Idaho Mining & Milling Co. Formerly at Greer, Nez Perce Co., Idaho. Fully described Vol. VI.

PITTSBURG-IDAHO MINING & MILLING CO. **IDAHO.**

Office: Kamiah, Idaho. Mine office: Greer, Nez Perce Co., Idaho. Jas. F. Bridwell, president; Daniel Laverty, vice-president and general manager; Hugh Laverty, secretary and treasurer; E. E. Krengel, engineer; preceding officers, Fred Worrell, Otto Gorke, Jas. Laverty, William S. Pitman and Patrick Laverty, directors. Organized January, 1903, under laws of Idaho, with capitalization $1,000,000, shares $1 par.

Lands, 19 claims, area 380 acres, in the Lo Lo district, said to show 6 contact veins, between gneiss and quartz-porphyry, of which 2, of 50′ to 100′ width, under development, carry cuprite, malachite, bornite and chalcopyrite, giving assays up to 12% copper, 14 oz. silver and $20 gold per ton. Has about 1,700′ of workings, including pits and shafts, deepest 180′, with tunnels of 40′, 290′ and 600′. Has gasoline power and 5 small buildings, and plans a hydro-electric installation, to utilize power from the Clearwater river.

PITTSBURG-JEROME COPPER CO. **ARIZONA.**

Office: 1219 Park Bldg., Pittsburg, Pa. Mine office: Jerome, Yavapai Co., Ariz. Thomas Houlette, president; Jos. Atkins, vice-president; C. S. Cochran, treasurer; T. D. McDonald, secretary; preceding officers, W. E. Crow, Robt. Stewart, A. C. Spindler and D. M. Clemson, directors; W. A. Edeburn, consulting engineer; D. F. Houlette, superintendent. Organized 1904, under laws of Arizona, and capitalization increased, March 9, 1906, to $3,000,000, shares $1 par; issued, $1,482,699. Annual meeting, first Monday in March.

Lands, 26 claims, area circa 520 acres, lying 2 to 3 miles south of Jerome, a short distance northwest of the Black Hills property and about midway between the United Verde and Equator mines. Development is by the Pittsburg shaft, planned to have been sunk 1,000′, which is said to show, at 358′ depth, argentiferous and auriferous sulphide ore, of about 4% copper tenor. Development was hampered by a heavy inflow of extremely acid water.

Equipment includes a 50-h. p. Fairbanks & Morse hoist, good for 1,800′ depth, and an Ingersoll-Rand 2-stage air-compressor. Property was closed down June, 1907, ostensibly on account of differences in the directorate, but perhaps from lack of cash as well.

PITTSBURG-JEROME COPPER & GOLD MINING CO. **ARIZONA.**

Dead. Succeeded, circa 1904, by Pittsburg-Jerome Copper Co. Formerly at Jerome, Yavapai Co., Ariz.

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PITTSBURG-MAYER MINING CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Ariz. Louis D. Hall, general manager. Idle at last accounts.

PITTSBURG MINING & MILLING CO. **IDAHO.**

Dead. Formerly at White Bird, Idaho Co., Idaho.

PITTSBURG & MONTANA COPPER CO. **MONTANA.**

Office: 1124 Farmers Bank Bldg., Pittsburg, Pa. Mine and works office: Butte, Silver Bow Co., Mont. Employs circa 250 men. J. H. Reed, president; preceding officer, T. H. Given, J. W. Friend, Hay Walker, Jr., and D. C. Noble, directors; R. T. Rossell, secretary and treasurer; Oscar Rohn, manager. Organized July 9, 1902, under laws of West Virginia, with capitalization $30,000,000, shares $100 par. Has authorized a $3,000,000 bond issue, at 6%, secured by trust deed. The company has a considerable floating indebtedness, which apparently is being financed by the Pittsmont Copper Co., organized for the purpose. Annual meeting, first Monday in August.

Lands, 46 claims, area 850 acres, also 634 acres miscellaneous lands, giving total holdings of 1,384 acres, in the Butte, Helena, Elk Horn and Greenhorn districts of Montana. Principal property is the main tract of 260 acres, lying on the flat east of Butte, including the McQueen placer and adjoining claims, formerly owned by Franklin Farrell.

Owing to the great depth of overburden, the solid ledge was not reached until a depth of several hundred feet, and sinking was difficult and costly, owing to the existence of considerable quicksand above the ledge. The property carries 4 veins, of 2' to 12' estimate average width, which presumably are continuations of the veins of the Butte & Boston. Development is by 2 shafts, known as Nos. 2 and 3, each of 1,240' depth, with a 300' winze below the bottom level, the mine having about 8 miles of workings. No. 2 shaft has 500-gallon electric pumps on the 700' and 1,200' levels, and the shafts are connected with a half-mile crosscut on the 1,200' level. The ore bodies are small, compared with the big veins to the eastward, but carry good silver values, ore assaying 3.5 to 10% copper and 5 to 12 oz. silver per ton, with small gold values. The richest ore has been found between the 800' and 1,200' levels, and some ore of 7% copper tenor was stoped on the 180' level. First-class ore ranges 6 to 8% copper and 8 to 12 oz. silver per ton.

The Swissmont mine, near Elkhorn, Jefferson county, Montana, bought for $60,000, shows a large body of low grade sulphide ore, of 1.5 to 3% copper tenor. This is idle.

The Chamounix mine, near Austin, Lewis & Clark county, Montana, includes the Christina group of 6 claims, and the Fannie Parnall group of 33 claims. This property has considerable development, and has shipped some argentiferous copper ore, but was idle at last accounts.

The company also owns mining claims at Pittsburg, 4 miles from Helena, Lewis & Clark county, Montana, which are idle.

Equipment at the Butte property includes a 2,000-h. p. steam plant and a 600-h. p. electric plant, 1,900 h. p. being used at the mine and 700 h. p. at the smelter. There is a 500-h. p. hoist, good for 1,600' depth, and a 600-h. p. hoist, good for 1,300', with a 25-drill Nordberg air-compressor, 40-drill Rand air-compressor, and 20 power drills.

Buildings include a 38x70' brick carpenter shop, frame smithy, 2 engine-houses, 2 boiler-houses, changing-house, office, laboratory and miscellaneous buildings, with a total of about 16 structures. The large office building is equipped with a library, reception room, billiard room and café.

The property has about 3 miles of railroad track, connecting the various shafts and works. The lands, in two tracts, are surrounded by high board fences.

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The reduction plant, known as the Pittsmont works, include a 250-ton concentrator, built 1907, near the smelter.

The Pittsmont smelter does a limited custom business, in addition to treating the company's own ores. The furnace building, with room for 5 cupolas, has a 250-ton blast-furnace, added 1908, and an old 150-ton blast-furnace, which it is planned replacing by a new 250-ton furnace. The small cupola is a Garretson pyritic furnace, remodeled by Mr. Baggaley, the former manager, and gave considerable trouble in operation, on semi-pyritic smelting. The converter department has 2 stands, with 96x156" shells, and there also are 2 experimental Baggaley converters, of smaller size, not in use. Product is blister copper, averaging circa 96% copper, 200 oz. silver and 3.5 oz. gold per ton, sent for electrolytic refining to the Nichols Copper Co.

Production, 1905, was 790,600 lbs. fine copper, 81,911 oz. silver and 1,122 oz. gold, secured from 11,000 tons of ore smelted, giving average returns of 3.6% copper, 7.5 oz. silver and $2.50 gold per ton. The smelter was closed Apr. 14, 1906, but resumed work in 1907, and November, 1908, was said to be smelting circa 250 tons of ore daily, of which about 50 tons was first class and 200 tons was second class ore. Property is considered valuable, though not up to the average of the Butte camp in quantity or quality of ore.

PITTSBURG & MOUNT SHASTA GOLD MINING & MILLING CO. — **CALIFORNIA.**

Office: 424 Fifth Ave., Pittsburg, Pa. Letter returned unclaimed from former mine office, Redding, Shasta Co., Cal. B. H. Scott, president; Dr. J. H. Phillips, vice-president; J. S. Parish, secretary; T. V. Scott, treasurer. Organized 1903, under laws of West Virginia, with capitalization $500,000, increased later to $1,000,000, shares $1 par.

Lands, 9 claims, partly patented, area 170 acres, known as the Bennington group, in the Flat Creek district, north of Redding, said to have been bought for $18,000 cash and $60,000 shares. Company claims to have expended about $50,000 in development and equipment. Property mortgaged, previous to 1907, for $13,300. Mine has a 280' crosscut tunnel and 2 other tunnels, showing auriferous and argentiferous copper ore of varying tenors. Has a carpenter shop, smithy, boarding house and 3 bunk-houses, with electric power. Shipped, previous to 1907, circa 100 tons of selected ore, running $3 to $30 gold and averaging about 10 oz. silver per ton. Idle.

PITTSBURG-NEW YORK COPPER MINING CO. — **MONTANA.**

Office: care of W. H. Lindsay, secretary and treasurer, Butte, Mont. Mine office: Elkhorn, Jefferson Co., Mont. Alexander Johnson, president; Thos. S. Killgallon, vice-president; W. J. Dawson, superintendent. Organized under laws of Montana, with capitalization $1,250,000, shares $1 par. Lands, 5 claims, adjoining the Park Copper Co.

PITTSBURG-OAXACA MINING CO. — **MEXICO.**

Office: 119 Farmers Bank Bldg., Pittsburg, Pa. Mine office: San Bartolo Coyotepec, Centro, Oaxaca, Mex. W. J. Burke, president; P. J. Kane, vice-president; M. J. Gannon, secretary and treasurer; W. H. Baird, manager. Organized 1904, under laws of Delaware, with capitalization $1,000,000, shares $1 par.

Mine, said to have circa 6,000' of workings, with 50,000 tons of ore blocked out, has a 5' vein, carrying mainly gold values, with some copper ore ranging 5 to 9% in tenor. Property is served by the Mexican Southern railway, and has a 25-ton mill. Was raising money, at last accounts, for alleged purpose of installing a $150,000 machinery equipment. Advertising makes exaggerated claims. Is said to employ circa 50 men.

PITTSBURG & SONORA DEVELOPMENT CO. — **MEXICO.**

Office: care of Hon. W. G. McDonald, Douglas, Ariz. Mine office: Cum-

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pas, Moctezuma, Sonora, Mex. Holds direct title to property through a Mexican corporation known as the Quatro Grande. Lands include the Estrella de la Plata mine, near Cumpas, also claims circa 18 miles south of Douglas. Presumably idle.

PITTSBURG & UTAH GOLD, SILVER, COPPER & LEAD MINING CO. **UTAH.**

Mine office: Ophir, Tooele Co., Utah. Idle.

PITTSMONT COPPER CO. **MONTANA.**

Office: 1124 Farmers Bank Bldg., Pittsburg, Pa. Mine office: Butte, Silver Bow Co., Mont. Was organized, 1908, as a holding company for the Pittsburg & Montana Copper Co., presumably for the purpose of providing needed funds.

PITTSMONT SMELTER. **MONTANA.**

Owned by Pittsburg & Montana Copper Co.

PIZARRO COPPER MINING CO. **NEW MEXICO.**

Dead. Was a swindle, put out by the Financial Security & Trust Co., of Denver, which also promoted the Spanish Lost Bullion Mines, Geronimo Copper Mining Co. and Blanca Copper Mining Co. Formerly at Silver City, Grant Co., N. M.

PLACERVILLE COPPER MINING & REDUCTION CO. **COLORADO.**

Mine office: Placerville, San Miguel Co., Colo. Organized circa May, 1907, under laws of Colorado, with capitalization $500,000, by A. B. Cooper, F. D. Margowski and L. L. Knutson. Presumably is successor of Placerville Gold & Copper Mining Co.

PLACERVILLE GOLD & COPPER MINING CO. **COLORADO.**

Mine office: Placerville, San Miguel Co., Colo. W. K. Johnson, president. Organized circa 1903, with capitalization $1,000,000, shares $1 par. Lands, 8 claims. Presumably succeeded, 1907, by Placerville Mining & Reduction Co.

PLAKALNITZA MEDNA PLANINA. **BULGARIA.**

Office: care of M. Mavrokordato, owner, Constantinople, Turkey. Mine office: Plakalnitza, Vratza, Bulgaria. Lands are sundry claims, held as a concession from the Bulgarian crown, showing bornite and a little chalcopyrite, in dolomite. Copper mines were worked in this vicinity by the Romans. Idle.

PLANET COPPER MINING CO. **ARIZONA.**

Office: 74 Broadway, New York, N. Y. Mine office: Planet, Yuma Co., Ariz. J. Stanley Jones, president and general manager; Chas. S. Barton, vice-president; W. B. Storer, secretary and treasurer; H. L. McCarn, superintendent. Organized Aug. 14, 1902, under laws of Arizona, with capitalization $1,500,000, shares $10 par; issued, $1,120,000. State Street Trust Co., Boston, registrar and transfer agent. Annual meeting, in May.

Lands, 25 claims, area 500 acres, also 40 acres in millsites, in the Harcuvar district, on the south side of Bill Williams Fork river, 12 miles east of the Colorado river. Property shows about 50 exposures of ore, with 2 ore zones, apparently metamorphic contact deposits, having diorite on the footwall, overlaid by sedimentary shales and impure limestone, much altered by intercalated eruptives, the veins carrying a heavy iron capping, mainly of hematite, for a distance of 3,000′, averaging about 30′ in thickness and up to 200′ in width. Apparently the gossan is of workable grade, and it is estimated that the property shows circa 1,000,000 tons of 60% iron ore. The main ore zone, traceable about 2,700′, ranges up to 300′ in width, carrying oxidized and silicate ores of copper, estimated to average 7 to 8% copper and 50 cents gold per ton, with traces of silver, but apparently the workable portion of the vein is 3′ to 20′ in width. The vein is very flat, dipping about 15° only.

Development is by 3 incline shafts, deepest 800′, giving a vertical depth of

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365', showing ore of 5 to 12% copper tenor, and by 12 vertical pits and shafts, of 25' to 325' depth, and by 8 tunnels, longest 225', with total workings of 4,000', estimated to show 100,000 tons of ore, with 75,000 tons blocked out for stoping. The sulphide zone has not been reached, as yet, by any workings, which is an indication of strong and persistent copper values.

Equipment includes a 75-h. p. gasoline plant with two 15x25" hoists and a 5-drill air-compressor. Buildings include a 15x40' frame carpenter-shop, 10x10' smithy, 2 shafthouses and 3 dwellings.

The mine, opened circa 1864, was worked in a small way until 1874, and was reopened 1884, when a 36" blast-furnace was erected. Property was taken over, 1902, by present company, and has been developed steadily, with a small force, since then. The mine produced upwards of $500,000 worth of high grade ore, ranging from 15 to 40% in copper tenor, which was shipped by water to a port on the Gulf of California, presumably Guaymas, and transshipped thence to Swansea for reduction. A little ore was sent to San Francisco also, and production is said to have given fair profits, notwithstanding the heavy expenses for freight and smelting, and the harassing difficulties caused by various Indian uprisings.

The property has been handicapped by lack of rail connections, but the Arizona & California railway is now only 27 miles distant by wagon-road, and the company is negotiating for the construction of a branch line from Bouse to Planet. Property considered promising and management good.

PLANT & CALLAHAN MINING CO. **WASHINGTON.**

Office: care of J. T. Plant, president, Mora, Minn. Letter returned unclaimed from former mine office, Conconully, Okanogan Co., Wash. C. E. Williams, vice-president; H. Rines, secretary and treasurer. Organized 1907, with capitalization $1,500,000. Lands, 4 claims, including the Anaconda mine, in the Ruby camp, having a 600' tunnel, showing a 20" vein carrying about 2% copper, with high silver values.

PLATA COBRE MINING & TRANSPORTATION CO. **ARIZONA.**

Dead. Formerly at Florence, Pinal Co., Ariz. Described Vol. VI.

PLATA COPPER MINING CO.

Dead. Was a swindle, promoted by the notorious Wm. F. Wernse, of St. Louis.

PLATTE CAÑON MINING CO. **WYOMING.**

Mine office: Wheatland, Laramie Co., Wyo. Idle several years.

PLATTE COPPER MINING CO. **WYOMING.**

Office: 20 Broad St., New York, N. Y. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. John R. Dixon, president; Wm. C. Ledbetter, vice-president and general manager; Thos. Delaney, secretary and treasurer; preceding officers, Philip S. Delaney and A. E. Wilson, directors. Organized 1906, under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, area 40 acres, showing a shear zone of about 500' width, carrying ore assaying 5 to 10% in copper tenor.

PLENTY COPPER CO. **ARIZONA.**

Dead. A swindle, promoted by the notorious Wm. F. Wernse, of St. Louis. Formerly at Pima, Graham Co., Ariz.

PLUMAS COPPER MINING & SMELTING CO. **CALIFORNIA.**

Dead. Was still-born. Formerly at Taylorsville, Plumas Co., Cal.

PLUMAS MINING, MILLING & SMELTING CO. **CALIFORNIA.**

Dead. Still-born. Formerly at Taylorsville, Plumas Co., Cal.

PLUTO GOLD & COPPER MINING CO. **WYOMING.**

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. Ole Granberg, president and general manager; H. Thorsgaard, vice-president; H. O. Granberg, secretary and treasurer; E. M. Sanders, superin-

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tendent; Frank Earle, engineer. Organized Dec. 15, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par.

Lands, 11 claims, patented, area 220 acres, also a 40-acre millsite, in the Battle Lake district, near the Ferris-Haggarty mine, showing 2 fissure veins in quartzite, and 2 contact veins between diorite and quartzite, ranging 2′ to 30′ in width, and carrying cuprite, melaconite and copper sulphides, associated with manganese, giving average assays of 1% copper, a trace of silver and $3 gold per ton, developed by numerous pits of 10′ to 20′ depth, 5 shafts of 55′ to 100′ depth, and by a tunnel of 1,004′ with circa 2,000′ of underground workings. Equipment includes a 40-h. p. steam plant and 3-drill air-compressor. Buildings are a 36x40′ machine-shop, 38x20′ carpenter-shop, and 6 other mine structures. Idle except for annual assessment work, but hopes to resume shortly.

POCAHONTAS COPPER MINING CO. **CALIFORNIA.**

Mine office: Lewis, Mariposa Co., Cal. David Ross, general manager; J. G. Roberts, superintendent. Lands, 150 acres, including the Great Northern mine, in the White Rock district, showing several veins of cupriferous iron ore, between diorite, vein matter being mainly diabase, usually altered. The principal ore body, about 100′ wide, occurs in a mineral belt up to 1,000′ in width, the oxidized zone, circa 100′ in depth, having been a limited producer of high grade ores, many years ago. Development is by tunnel and a 200′ shaft, showing ore said to carry 6 to 12% copper and circa $2.50 gold per ton. Has steam power and necessary mine buildings. Ore is shipped, via La Grande, nearest railroad point, 15 miles distant, to Peyton Chemical Works, at Bay Point, California, and some selected ores were shipped, 1907, to the Tacoma smelter. Employs circa 20 men. Property considered promising.

POCAHONTAS COPPER QUEEN MINING CO. **ARIZONA.**

Office: Pocahontas, Ark. Mine office: Mayer, Yavapai Co., Ariz. Jos. W. Voorhees, president; W. H. Skinner, vice-president and treasurer; T. T. Loy, attorney; A. L. Porterfield, general manager. Organized 1906, under laws of Arizona, with capitalization $1,000,000, succeeding the Big Bug Gold & Copper Mining Co.

Lands, 14 claims, 4 miles southeast of Mayer, including the Spar group, bought, 1908, of the Spar Mining Co., having a 200′ shaft, with a vein up to 14′ in width, which, under former ownership, shipped 23 carloads of high grade ore, said to have given sufficient returns to former owner to pay cost of purchase price and development. Has steam power.

POCATELLO GOLD & COPPER MINING CO. **IDAHO.**

Office and mine: Pocatello, Bannock Co., Idaho. E. Craanson, president; J. J. Guheen, secretary; N. M. Eldredge, general manager; Jos. E. Munn, superintendent. Organized Dec. 1, 1902, under laws of Idaho, with capitalization $1,000,000, shares 50 cents par.

Lands, 7 claims, area 140 acres, in the Fort Hall district, 12 miles east of Pocatello, showing a vein of about 3′ average width, reported to give assays of 40% copper and 75% lead (total 115%), with 35 oz. silver and $1 gold per ton, from bornite and chalcopyrite. This evidently is very rich ore, as veins carrying 115% in metallic values are unusual. From another source it is gathered that the ore is mainly of milling grade, with a small paystreak of smelting ore, from which small shipments to the White Knob smelter gave returns of 17 to 30% copper and 15 to 18 oz. silver per ton. Development is mainly by short tunnels, with circa 1,000′ of workings. Presumably idle.

COMPAÑIA MINERA PODEROSA DE COLLAHUASI. **CHILE.**

Office: Valparaiso, Chile. Mine office: Collahuasi, Tarapacá, Chile. Francisco Javier, president; Juan G. Searle, vice-president; Carlos A. L. Dick, secretary; preceding officers, Thompson Matthews, Carlos Gregorio Avalos and

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Gustavo Jullian, directors; Robt. Hawxhurst, Jr., mine manager. Organized Apr. 4, 1905, under laws of Chile, with capitalization £240,000, shares £5 par.

Lands, 37 contiguous claims, area 185 hectares, equal to 457 acres, carrying strike of the ore formation for 4,500'. Lands include the Mina Poderosa, which is the principal property, and the San Carlos, Rosario and Condor mines. Lands, located at an extreme elevation of 15,400', on the Bolivian plateau, lie above the timber-line, and are barren of vegetation, with the exception of a fungus, bearing the botanical name of fungi cordillerensi, which forms the local fuel of the district. There are no high hills in the vicinity, lands being on the top of an elevated plateau, surrounded, at a considerable distance, by high peaks of the Andes. There are no running streams, and potable water is scarce. The climate is extremely bleak, winter prevailing 12 months yearly, with snow or hail falling nearly every day in the year. Copper mines in this district were worked under Spanish domination, and previously by the Indians, as shown by the ancient remains of furnaces, fragments of matte, scoria, and tools left in old workings.

The country rock is feldspar-porphyry, stratified and fissile, there being a slight stratification, with dip of about 70° to the westward, with an amygdaloidal diabase running northwest and southeast, dipping with the country rock to the westward, ore bodies occurring in contact with and in the immediate vicinity of the intrusive dykes. There has been considerable disintegration, and overburden covers the rock formation so that latter gives few outcrops, these usually carrying low grade malachite and chrysocolla, or brochantite, gangue being mainly felsitic rock, much decomposed. The Poderosa lode consists of several parallel bodies of partly or wholly decomposed country rock, with considerable faulting, having a general strike of N. 40° W., crossed, at practically right angles, by a secondary set of loaner veins, the master veins being fissures in a shear-zone. Characteristic ores of the Poderosa system are cuprite, melaconite, malachite, chalcocite, covellite, bornite, chalcopyrite, chrysocolla, brochantite, atacamite and tetrahedrite, latter decidedly argentiferous, the ores, as a whole, averaging about 8 to 12 oz. silver per metric ton.

The Poderosa mine, which is the principal property, has a 433' main shaft, with about 7,000' of workings, carrying oxidized ores on the 400' level. Mine has 2 main veins, known as the Poderosa and Portillo, of 3' to 30' width, carrying paystreaks of high grade ore 1' to 20' wide, with average width of about 4', gangue being decomposed quartzose felsite, very soft, requiring heavy timbering, while, unfortunately, the timbering in place is extremely poor. The hanging-wall is well defined, but the ore shades gradually into the altered country rock of the footwall, there being a fluccan, usually of 3" to 12", and even up to 4' width, on the hanging, with an occasional fluccan on the footwall. Main shaft is only 6x8' inside of timbering, and should be cut down to larger size. The shaft is in the hanging-wall, west of the lode, crossing the vein about the fourth level, with 5 levels opened, at only 22-meter intervals, shaft cutting another vein about midway between the fifth and sixth levels, this vein, averaging circa 30" width and dipping toward the main vein, carrying exceedingly high grade ore. The various levels are connected by winzes, with indications that ore will grow richer until the base zone is reached. The mine is quite wet, making about 90,000 gallons of water per day, in the wet season. Estimated ore reserves of the Poderosa mine alone, March, 1907, were 101,600 long tons, with average tenor of 63.66% copper, and circa 10 oz. silver per long ton. These figures, while appearing very high, seem warranted. Equipment of the Poderosa mine is primitive, consisting only of a wooden head-frame, with a 10x15" single Tangye hoist, raising half-ton buckets.

The Rosario mine, northwest of the Poderosa, has a 166' incline shaft, on a 30" vein dipping at about 80°, ore assaying about 15% copper, shaft being

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bottomed in the top of the base zone, which shows chalcopyrite, arsenopyrite and pyrite. The San Carlos mine, practically an extension of the Poderosa, and to be connected therewith, has a 146′ shaft, showing a 3′ vein carrying ore of about 19% average copper tenor. The Condor mine has a 147′ shaft showing a 2′ vein, carrying ore giving average assays of about 18% copper. The Campanil mine, a new property, is being opened by shaft. Mine timber used is Oregon fir and pine, costing at Antofagasta £9 per thousand feet, with 4d. per square foot transportation charges thence to the mine. During the period of development, supplies and ore were hauled 65 miles, over an extremely rough road, between Carcote station and the mine, one week being required for the round trip, but a branch of the Antofagasta & Bolivian railway, building from Ollagüe to the mine, was practically completed, at last accounts.

Labor is supplied mainly by Bolivian Indians, from the neighboring republic, who work intermittently, putting in about half time, and are dull, drunken and lazy, but, bad as it is, the labor supply is short, though the completion of the railway should give improvement. The manager desires to import Chinese, which would seem a sensible plan. Mine has 9x18″ and 6x20″ crushers, reducing ore to 2″ to 3″ size before shipment. Ore formerly was hand-picked to an average tenor of about 45% copper, for shipment, and ore shipped to end of 1906 was 770,185 kilograms, giving average returns of nearly 40% copper and 17.5 oz. silver per long ton. Production, 1906, is estimated at 500,000 lbs. fine copper.

This is a property of exceptional promise, and has been well handled by Mr. Hawxhurst, under exceedingly trying circumstances. With sufficient outlay, apparently the Poderosa mine alone could be put in condition, in one to two years, to produce 100 to 150 tons daily, of ore of 15 to 20% average copper tenor, giving, on the mean of these figures, an average production of fully 1,000,000 lbs. fine copper monthly.

POLAND-AMERICAN GOLD MINING & MILLING CO. **ARIZONA.**

Mine office: Humboldt, Yavapai Co., Ariz. Organized, circa 1904, as a merger of the American Gold & Copper Co. and the Poland Extension Gold Mining & Milling Co., with capitalization $2,500,000, shares $1 par. Was promoted by Chas. J. George and is not regarded favorably. Idle.

POLAND EXTENSION GOLD MINING & MILLING CO. **ARIZONA.**

Dead. Merged, 1904, in Poland-American Gold Mining & Milling Co. Formerly at Poland, Yavapai Co., Ariz.

POLARIS MINING & MILLING CO. **ARIZONA.**

Office and mine: Clifton, Graham Co., Ariz. Samuel Abraham, president; E. M. Williams, vice-president; D. P. W. Eylar, secretary; E. J. Lehmann, treasurer; L. F. Sweeting, general manager; preceding officers, Geo. Crispin, Nicholas Cole, W. A. Hamilton and Ira Harper, directors. Organized March 15, 1902, under laws of Arizona, with capitalization $2,500,000, shares $1 par. A bond issue, formerly authorized, has been recalled and canceled. Annual meeting, third Wednesday in January.

Lands, 40 claims, area 700 acres, also a 70-acre millsite and 400 acres miscellaneous lands, in the Greenlee district, on the San Francisco river, circa 5 miles from Clifton. Property, lying northeast of the Clifton Consolidated and New England mines, shows granite, with parallel porphyry dykes, and many phonolite and rhyolite dykes, at acute and right angles to the vein system, ore bodies occurring mainly as contact deposits between limestone and igneous rocks, with disseminated ores in porphyry. Lands show 4 ore bodies, of which 2, under development, are of 8′ to 100′ estimated average width, traceable circa 6,000′, carrying oxide, carbonate and sulphide ores, estimated to average 3% copper, 4 to 15 oz. silver and $4 to $15 gold per ton. The copper ores are associated with gold-bearing quartz with argillaceous gangue. The lower work-

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ings show mainly auriferous and argentiferous chalcopyrite. Development is by the 105′ Black Prince shaft, the 100′ Nonesuch shaft, the 140′ Golden Eagle shaft, the 560′ Black Prince tunnel, the 320′ Fraction tunnel, the 307′ Golden Eagle tunnel and the 532′ Phonolite tunnel, with circa 2,500′ of workings, estimated to show 10,000 tons of ore in sight, with 4,000 tons blocked out for stoping.

Improvements include 6 mine buildings. The nearest railroad is the Arizona & New Mexico, 7 miles distant. Property is being operated, under lease, expiring 1912, by the Southwestern Development & Improvement Co., which plans the erection of a concentrator, and, eventually, a smelter.

POLLYTON GOLD MINING CO. **WYOMING.**

Office: Centennial, Wyo. Mine office: Holmes, Albany Co., Wyo. I. W. Emmons, president; R. F. Lawson, vice-president; E. B. Steadman, secretary; M. D. Reed, treasurer; preceding officers and G. C. Mason, directors; Wm. Benton, superintendent. Organized March, 1908, under laws of Wyoming, with capitalization presumably $3,000,000, shares $3 par. Lands, well watered and timbered, near the Maudem mine of the Topeka Copper Co., in the Lake Creek district, are supposed to carry the extension of the Maudem vein. Property has a vein of 4′ to 8′ width, carrying a 12″ paystreak showing ore assaying 20 to 50% copper and $2 to $40 gold per ton, with considerable free gold, opened by a shallow shaft.

PONDERAY SMELTER. **IDAHO.**

Owned by Idaho Smelting & Refining Co.

PONDEROSA COPPER CO. **CALIFORNIA.**

Office: Delta Bldg., Los Angeles, Cal. Mine office: Bagdad, San Bernardino Co., Cal. J. H. Canovan, president; J. W. Green, superintendent. Lands are circa 14 miles from Bagdad.

PONDILLAI & VOLCAN MINES. **NEW CALEDONIA.**

Letter returned unclaimed from former mine office, Diahot, New Caledonia. Properties are said to have rich ores, but are only slightly developed, and have been idle some years.

PONTIAC COPPER MINES, LTD. **BRITISH COLUMBIA.**

Dead. Changed title, 1906, to Keremos-Pontiac Mines, Ltd. Formerly at Olalla, East Yale, B. C.

PONTIAC GOLD & COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Tres Piedras, Taos Co., N. M.

PONTIAC MINING CO. **VIRGINIA & NORTH CAROLINA.**

Office: 19 Liberty St., New York, N. Y. Mine office: Virgilina, Halifax Co., Va. A. A. Sumner, president; Samuel Bryant, secretary; Robt. G. Lassiter, general manager. Organized 1902, under laws of New York, with capitalization $1,600,000, shares $10 par.

Lands, 1,340 acres, in the Virgilina district of Virginia and North Carolina, carrying a fissure vein in schist, opened by the Tuck shaft of 125′ and the Glasscock shaft of 203′, showing cuprite, malachite and azurite to depth of 60′, below which are chalcocite, bornite and chalcopyrite, with quartz and epidote gangue, giving average assays of 4% copper and 1 to 2 oz. silver per ton, with traces of gold. Has gasoline power. Idle several years.

PONTOTOC MINING CO. **ARIZONA.**

Office: care of T. H. Bass, secretary and treasurer, Beaumont, Tex. Mine office: Tucson, Pima Co., Ariz. J. M. Eastham, president; S. Y. Anderson, general manager. Lands, 15 claims and 4 millsites, 7 miles north of Tucson, having a 75′ shaft, showing ore giving assays of 10.3% copper, with an average tenor of circa 5%.

POONA COPPER CO. **SOUTH AUSTRALIA.**

Office: Adelaide, South Australia. Mine office: Moonta, Daly Co., South

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Australia. Organized 1907. Lands, 240 acres, including the Poona and Matta Darra mines, adjacent to the Moonta mine, having shafts of 120′ and 228′, showing considerable ore of good average tenor.

PORCUPINE MOUNTAIN COPPER CO. **MICHIGAN.**

Office: Cleveland, Ohio. Mine office: Ontonagon, Ontonagon Co., Mich. M. G. Watterson, president; E. S. Hough, secretary and treasurer. Was said to have been organized, 1901, under laws of New Jersey, with capitalization $2,500,000, but returns from Mr. Watterson give the ownership as vested in a syndicate, promoted 1890, with 7 shareholders, title being held by trustees.

Lands, 1,100 acres, well timbered, including a portion of the old Carp Lake mine, in the Porcupine Mountains, showing a continuation of the Keweenawan copper belt, with amygdaloidal traps, intercalated conglomerate tuffs, and sandstone, having sundry beds carrying native copper, disseminated as speiss, through sandstone. Property has 2 ore bodies, of 27′ estimated average width, with easterly and westerly strike and dip of 30° to the north, carrying estimated average values of 3% copper, which is too high. Mine has circa 1,700′ of underground workings, estimated to show 150,000 to 200,000 tons of stamp-rock. Idle several years.

PORTAGE LAKE & BISBEE MINING CO. **ARIZONA.**

Office: 12 First National Bank Bldg., Hancock, Mich. Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. W. S. Cleaves, president; John Funkey, vice-president; W. I. McMaster, secretary; Chas. Lewis, treasurer. Organized April, 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par, succeeding the Portage Lake & Calumet Development Co.

Lands, 12 claims, 3 fractional, area 191 acres, owned in fee and partly patented, 3 miles southeast of Bisbee, showing country rock of limestone, with a porphyry contact. Has a 302′ shaft, with 2 compartments, well timbered. Has a small air-compressor, Worthington sinking pump, 75-h. p. hoist, boarding-house, bunkhouse and smithy. Extensive diamond drilling was done, 1903-1904, and considerable leached ore cut, the showing, while not including workable ore bodies, being of an encouraging nature. Idle since 1904.

PORTAGE LAKE & CALUMET DEVELOPMENT CO. **ARIZONA.**

Dead. Reorganized, April, 1903, as Portage Lake & Bisbee Mining Co. Formerly at Bisbee, Cochise Co., Ariz.

PORTLAND COPPER CO. **WASHINGTON.**

Mine office: Berlin, King Co., Wash. Lands are sundry claims 5 miles from Berlin, showing a 17′ vein, with east and west strike, carrying native copper, bornite and chalcopyrite, opened by tunnels of 40′ and 75′. Idle.

PORTLAND COPPER MINING CO. **WYOMING.**

Office: 20 Broad St., New York, N. Y. Mine office: Rambler, Carbon Co., Wyo. P. S. Delaney, vice-president; Hon. J. C. Helm, secretary and treasurer; W. C. Ledbetter, general manager; preceding officers, W. H. D'Esterre, Jr., and T. C. Delaney, directors. Organized under laws of West Virginia, and charter proclaimed forfeited, 1902; reorganized 1903, under laws of Colorado, with capitalization $1,500,000, shares $1 par.

Lands, 5 claims, 3 patented, area 95 acres, known as the Portland mine, in the Battle Lake district, on the line of the Penn-Wyoming aërial tram. Property shows 12 veins, 6″ to 40′ wide, in a mineralized zone of circa 600′ width that averages about 1% copper. Has a sulphide copper vein of 30′ to 40′ width, estimated to carry average values of 11% copper and $4 to $40 gold per ton, which is much too high, the vein actually having a paystreak of 8′ to 10′ width, carrying about 5% copper and $2 to $4.80 gold per ton. Has 13 pits and shafts, deepest 243′, and a 650′ tunnel, latter said to show 35′ of 3% ore. Has steam power, and has been developing steadily for several years, being

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one of the few properties in Carbon county to do so. Planned beginning production, 1908, by shipments to the Penn-Wyoming smelter, but apparently did not do so.

PORTLAND GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 7-127½ First St., Portland, Ore. Mine office: Spirit Lake, Skamania Co., Wash. Harvey Bailey, president and general manager; Conrad Wyss, vice-president; H. W. Bailey, secretary and treasurer; A. B. Burgoyne, general superintendent; preceding officers and Dr. R. D. Wiswall, directors. Organized under laws of Washington, with capitalization $1,250,000, shares $1 par. Lands, 17 claims, area 340 acres, well timbered, on the north fork of the Toutle river, having circa 500′ of workings, showing ore giving good assay values in gold and copper. Idle.

PORTLAND-IMNAHA COPPER MINING CO. **OREGON.**

Dead. Disincorporated, September, 1902, with all debts paid. Formerly at Imnaha, Wallowa Co., Ore.

PORTLAND LUNING COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Luning, Esmeralda Co., Nev. Property is slightly developed by shaft and tunnel. Idle and apparently moribund.

PORTLAND MINING CO. **BRITISH COLUMBIA.**

Office: 19 North Seventh St., Terre Haute, Ind. Mine office: Aspen Grove, Yale district, B. C. Andrew J. Crawford, president; M. T. Hidden, secretary; J. E. Bates, general manager. Organized 1901, under laws of British Columbia, with capitalization $15,000, shares 1 cent par.

Lands, 4 patented claims, area 200 acres, also 160 acres miscellaneous lands, in the Aspen Grove district, showing 10 veins, of which 2, under development, give assays of 15% copper, 3 oz. silver and 80 cents gold per ton, from carbonate and sulphide ores, opened by a 155′ shaft and a 32′ tunnel, said to show a considerable body of low grade ore. Idle several years.

PORTLAND (ROSSLAND) MINE, LTD. **BRITISH COLUMBIA.**

Dead. Merged, 1904, in Velvet-Portland Mine, Ltd. Formerly at Rossland, Trail district, B. C.

PORT LINCOLN COPPER CO., LTD. **AUSTRALIA.**

Offices: 20 Copthall Ave., London, E. C., Eng., and 95 King William St., Adelaide, South Australia. Mine office: Reedy Creek, Robe Co., South Australia. Col. A. G. Pawle, chairman; G. F. B. Hancock, mine manager; R. Gray Orr, secretary. Organized July 13, 1906, under laws of Great Britain, with capitalization £350,000, shares £1 par.

Lands, 400 acres, freehold, on Tumby Bay, north of Port Lincoln, 35 miles northeast of Adelaide, and across Spencer Bay from Wallaroo. Property, known as the Kitticoola, Tungkillo or Reedy Creek mine, opened 1845, is the second oldest copper mine in South Australia, having 2 ore bodies, known as the north and south lodes, ranging up to 11′ width, and giving average assays of about 18% copper and 4 dwts. 6 grains gold per ton, from melaconite, bornite and chalcopyrite. Main shaft, 115′. Has steam power.

SOCIEDAD MINERA PORVENIR DE COLLAHUASI. **CHILE.**

Office: Valparaiso, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized Apr. 10, 1904, under laws of Chile, with capitalization 550,000 pesos, shares 100 pesos par.

PORVENIR DE SONORA CO. **MEXICO.**

Dead. Reorganized, 1902, as Coast Line Copper Co. Formerly at La Calera, Altar, Sonora, Mex.

SINDICATO MINERO DE POSCO. **PERÚ.**

Office: Iquique, Chile. Mine office: Posco, Camaná, Perú. Organized Dec. 9, 1905, under laws of Chile, with capitalization £10,000, shares £1 par.

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POSTAL GOLD, PLATINUM & COPPER MINING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo. Fully described Vol. V.

POSTAL SAVINGS MINING & MILLING CO. **WYOMING.**

Office and mine: Centennial, Albany Co., Wyo. Capitalization $1,000,000, shares $1 par. Richard F. Lawson, manager. Lands, 90 acres, in the Medicine Bow range, including the old Centennial mine, which produced some gold.

POTOSI MINING CO., LTD. **IDAHO.**

Mine office: Silver City, Owyhee Co., Idaho. J. E. Masters, superintendent. Has auriferous and argentiferous lead and copper ores, with electric power.

COMPAÑIA MINERA POTOSINA. **MEXICO.**

Dead. Formerly at Charcas, Moctezuma, San Luis Potosí, Mex.

COMPAÑIA MINERA POTRERILLOS. **CHILE.**

Office: Santiago de Chile. Mine office: Chañaral, Atacama, Chile. Organized Dec. 6, 1906, under laws of Chile, with capitalization 650,000 pesos, shares 50 pesos par.

POWERS GULCH DEVELOPMENT CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Lands, on Pinto Creek, show a 6′ vein of secondary copper sulphides, with a paystreak giving average assays of about 30% copper.

NEGOCIACION MINERA DE POZOS. **MEXICO.**

Mine office: Pozos, Ciudad Porfirio Díaz, Guanajuato, Mex. Property includes Santa Brigida y Anexas, Santa Lucia and La Argentina mines, producing gold, silver and copper, latter as a by-product. Has steam power.

POZOS MINING CO. **MEXICO.**

Mine office: Ahualulco, Jalisco, Mex. Kratz & Carroll, managers. Property has auriferous and argentiferous copper ores.

PRASSENOS COPPER CO. **ARIZONA, CALIFORNIA & MEXICO.**

Mine office: Casa Grande, Pima Co., Ariz. S. C. Palmer, president; C. E. Green, secretary; W. H. Birchfield, treasurer; B. S. Wilson, general manager; Geo. S. Wilson, mine superintendent. Organized under laws of South Dakota, with capitalization $5,000,000, shares $1 par. Lands include a group of claims circa 30 miles south of Casa Grande, held under bond and lease, said to have shipped $75,000 worth of silver-lead ore, under former management. Also holds the Cameron group, circa 11 miles southwest of Casa Grande, and has claims 30 miles south of Arizpe, Sonora, Mexico. Controls, through stock ownership, the Amargosa Copper Co., which has lands in Inyo and San Bernardino counties, California.

PRATT MINE. **GEORGIA.**

Mine office: Dahlonega, Lumpkin Co., Ga. Ores are cupriferous and auriferous pyrite, carrying up to 2% copper and $2 gold per ton. Presumably idle.

PREMIER COPPER & ASBESTOS CO. **CAPE COLONY.**

Mine office: Prieska, Cape Colony. A. M. Reid, consulting engineer. Capitalization: £20,000; issued, £18,000. Lands, 14,000 morgen, or nearly 30,000 acres, known as the Schreuder group, apparently carrying mainly asbestos, having a continuation of the seam developed by the Cape Asbestos Co., Ltd.

PREMIER MINING, MILLING & LEASING CO. **NEW MEXICO.**

Office: care of J. H. K. Martin, secretary, Denver, Colo. Letter returned unclaimed from former mine office, Pinos Altos, Grant Co., N. M. Alfred Martin, superintendent. Property is the Copper Hill mine.

PRESIDENT COPPER & GOLD MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Boulder, Jefferson Co., Mont. Dr. Ferdinand Grattan, president; C. S. Shoemaker, vice-president; Joseph Chauvin,

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secretary; Walter Tallant, treasurer; Geo. Reeves, manager; preceding officers, Wm. Creedon and H. P. Bennett, directors. Organized circa August, 1908, under laws of Montana, with capitalization $1,200,000, shares $1 par.

Lands, 11 claims, 6 held outright and 5 under option, in the Big Foot district, 14 miles southeast of Butte and 11 miles southwest of Boulder, said to carry 1½ miles of a vein of 30′ to 60′ width. Development is by 80′ and 210′ shafts, 3,000′ apart. The 80′ shaft has ore giving average assays of about 7% copper, and the 210′ Roosevelt shaft is said to give ore assaying 2.5 to 13% copper, 11 to 40 oz. silver and $2 to $10 gold per ton.

PRESIDENTIAL MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Lands, 6 claims, circa 4 miles west of Patagonia, having 700′ of workings, showing argentiferous lead and copper ores. Employed 12 men, at last accounts.

PRESTON PEAK COPPER CO. **CALIFORNIA.**

Dead. West Virginia charter forfeited 1902; lands sold, 1907, by sheriff, to Chas. F. Hickey, for $34,750.13. Formerly at Yreka, Siskiyou Co., Cal. Described Vol. V.

PRETORIA COPPER & TIN FIELDS, LTD. **TRANSVAAL.**

Office: P. O. Box 1223, Johannesburg, Transvaal. D. Symons, chairman; J. H. Munnik, manager; G. W. Morrison, secretary. Organized June 20, 1905, under laws of Transvaal, with capitalization £115,000, shares £1 par; issued, £103,333. Lands are the freehold farms Badfontein No. 600, Tweefontein No. 275 and Welgedacht No. 41, total area 10,683 acres, in the Pretoria district, also an option on the farm Elandsfontein No. 1782, area 10,882 acres, in the Waterburg district, Transvaal. Operations are confined to prospecting, on a small scale.

PRICE COPPER MINE. **COLORADO.**

Office: 1313 Fillmore St., Topeka, Kans. Mine office: McCoy, Eagle Co., Colo. Dr. J. C. McClintock, president; Chas. J. Price, vice-president; W. R. Price, general manager; O. D. Mansfield, secretary and treasurer.

PRICKETT LAND CO. **MICHIGAN.**

Office: Marquette, Mich. Walter S. Prickett, chairman; J. E. Ball, secretary; Fred H. Begole, treasurer. Organized Sept. 18, 1905, under laws of Michigan, with capitalization $10,000, shares $10 par, fully issued. Has paid dividends, to Dec. 31, 1907, of $150,300. Lands are 3,694 acres of copper lands, in Keweenaw county, Michigan, including many old copper properties, 440 acres of copper land in Ontonagon county, Michigan, and 520 acres of iron lands in Iron county, Michigan. Company sold circa 4,000 acres in Keweenaw county to the Keweenaw Copper Co., and has a large acreage of well located mineral land on the Keweenawan trap range, carrying considerable timber, with available millsites on both sides of Keweenaw Point, including a good water frontage at the western end of Copper Harbor.

PRIDE MINING CO. **COLORADO.**

Dead. Formerly at Montezuma, Summit Co., Colo.

PRIDE OF ARIZONA COPPER CO. **ARIZONA.**

Dead. Was a swindle, promoted by Douglas, Lacey & Co. See Amalgamated Gold & Copper Co. Formerly in Yavapai county, Arizona.

PRIDE OF THE WEST MINING & MILLING CO. **ARIZONA.**

Office: 1801 Fifteenth St., Denver, Colo. Letter returned unclaimed from former mine office, Washington, Santa Cruz Co., Ariz. Arthur R. Wilfley, president; Herbert E. Fiske, secretary. Organized May 1, 1901, under laws of Colorado, with capitalization $1,500,000, shares $10 par. Paid one dividend of $15,000. Lands, circa 350 acres. Mine was opened 1870, reopened 1897, closed 1902, reopened circa 1906 and presumably closed 1907. Main shaft, about 300′.

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Ores are complex argentiferous copper, lead and zinc sulphides. Has a 200-ton concentrator. Very fully described Vol. II.

PRIESKA COPPER, LTD. **CAPE COLONY.**

Office: Johannesburg, Transvaal. Mine office: Prieska, Cape Colony. Lands, 53,000 morgen, or upwards of 100,000 acres, including three farms, known as the Prieska's Poort, Kalkgat and Dikklipspruit.

PRIEST LAKE MINING CO. **IDAHO.**

Office: Detroit, Mich. Mine office: Priest River, Bonner Co., Idaho. Thos. LePage, secretary; C. George, treasurer. Development is by tunnel, planned to cut the extension of the vein of the Idaho Continental, said to show ore assaying up to 16% copper.

MINA PRIMAVERA. **BRAZIL.**

Mine office: Cacapava, Rio Grande do Sul, Brazil. Lands, near the Santa Barbara river, are in a mountainous district, showing Cambrian stratified beds and granite, having a nearly vertical vein variously reported as lying between granite and mica-schist and as between conglomerate and sandstone. Ores are carbonates, silicates and chalcocite, mainly the latter, occurring disseminated and in small nodules, with average tenor of about 7% copper, with traces of silver, opened by a 100′ main shaft.

PRINCE ALFRED MINE. **AUSTRALIA.**

Mine office: Belton, South Australia. Produced, in first half of 1905, fine copper to amount of 78,400 lbs. Presumably idle.

PRINCE LYELL MINING CO., N. L. **TASMANIA.**

Office: 90 Queen St., Melbourne, Australia. Mine office: Gormanston, Montagu Co., Tasmania. G. A. Lawson, manager. Capitalization £100,000, shares £1 par. Lands, 25 acres, leasehold. Idle and apparently moribund.

PRINCE MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Office and mine: Revelstoke, West Kootenay district, B. C. J. T. Laing, president; J. A. Stone, vice-president; J. M. Scott, secretary, treasurer and manager; C. J. Rumens, superintendent; preceding officers, Dr. C. Smyth, J. M. McCracken and A. M. Smith, directors. Organized 1900, under laws of British Columbia, with capitalization $1,000,000, shares $1 par. Annual meeting, second Wednesday in March.

Lands, 20 claims, area 800 acres, known as the Standard group, also a 480-acre millsite and 640 acres timber lands, giving total holdings of 1,920 acres, in the Standard basin, Big Bend district, circa 33 miles north of Revelstoke. Country rocks are banded schist and diorite, carrying chalcopyrite and bornite, in a vein of 20′ width, with gangue of serpentine and argillaceous schist, ore being estimated to carry average values of 6% copper, 2 oz. silver and $2 gold per ton. Development is by tunnels of 40′, 110′, 480′, 600′, 275′ and 720′, with circa 3,000′ of underground workings, estimated to show 150,000 tons of ore, with 100,000 tons blocked out for stoping. A good water power is available for mining and milling purposes. A tram-line and mill are needed. Property considered promising.

PRINCESS ROYAL GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly on Princess Royal Island, B. C. Described Vol. VII.

PRINCETON COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 171 Broadway, New York, N. Y. Mine office: Ft. Huachuca, Cochise Co., Ariz. Henry Hamburg, president and general manager; Henry C. Adams, vice-president and treasurer; Herbert M. Karner, secretary; preceding officers, J. M. McConnell and L. de Vere Hamburg, directors; C. S. Wright, superintendent. Organized 1901, under laws of South Dakota, with capitalization $2,500,000, shares $1 par.

Lands, 8 claims, well timbered, in Ramsey Cañon, Hartford district, Huachuca Mountains, opened by 4 shafts, deepest 80′, and by tunnels of 60′, 70′,

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115′ and 250′, with a quarter-mile of underground workings, showing malachite, chalcocite and bornite, giving assays of 10% and up in copper, 10 to 50 oz. silver, and small gold values. Mine, discovered 1880, was worked 1901-1905, and work was resumed, circa 1907, after 2 years' idleness, caused by financial entanglements.

PRINCE WILLIAM COPPER CO. **ALASKA.**

Office: 35 Wall St., New York, N. Y. Mine office: Valdez, Alaska. Wm. C. Nichols, president. Organized 1907, under laws of New Jersey, with capitalization $500,000. Lands, 12 claims, area 240 acres, at tidewater, on Knights Island, having a vein claimed in press to be 260′ wide and to cary 30% copper, which is a self-evident exaggeration. Vein is reported otherwise to be 40′ wide, carrying 5 to 9% copper, which is considered an overestimate. First smelter shipment, July, 1907, gave returns of 6.82% copper.

PRINCE WILLIAM SOUND AMALGAMATED COPPER CO. **ALASKA.**

Letter returned unclaimed from former office, 1115 Stock Exchange, Chicago, Ills. Mine office: Ellamar, Prince of Wales Island, Alaska. Was said to have been organized, circa 1907, by H. Curtis Elliott and associates, for the purpose of operating the Ellamar and other properties in the Prince William Sound district. Idle and presumably moribund.

PRINCE WILLIAM SOUND MINING CO. **ALASKA.**

Mine office: Valdez, Alaska. Lands, on Mummy Bay, Knights Island, have a 300′ tunnel, driving to intersect a shear-zone of about 40′ width, carrying bands and scattered grains of chalcopyrite assaying up to 11.5% copper and 1 oz. silver per ton.

PRODUCER MINING & SMELTING CO. **ARIZONA.**

Dead. Lands reverted to Frank Brownell, former owner. Formerly at Casa Grande, Pinal Co., Ariz. Fully described Vol. VI.

PRODUCER GOLD & COPPER MINING & MILLING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Capitalization $3,000,000, shares $1 par. Lands, 12 claims, on Copper Mountain, slightly developed. Has an air-compressor and a mill with 10 gravity stamps. Presumably idle.

COMPAÑIA MINERA PROMONTORIO. **MEXICO.**

Office and mine: Apartado 60, Durango, Durango, Mex. Maximiliano Damm, general manager. Property is the Dulces Nombres mine, carrying large bodies of auriferous and slightly argentiferous copper ore. Has gas power and a 60-ton mill, also a small matting furnace, employing circa 75 men, at last accounts.

PROMONTORIO CONSOLIDATED MINING CO. **MEXICO.**

Office and mine: Nogales, Magdalena, Sonora, Mex. Leopold Ephraim, president; R. D. George, secretary. Lands, circa 30 miles south of Nogales, carry auriferous and argentiferous lead and copper sulphides. Was worked for about 12 years, by Mr. Ephraim, before formation of present company, high grade ores being shipped to El Paso smelters and low grade ores accumulated on dumps. Later developments have not come up to expectations, and concentrator planned was not built. Presumably idle.

PROMONTORIO MINING & SMELTING CO. **MEXICO.**

Dead. Formerly at Lampasos, Moctezuma, Sonora, Mex.

PRO PATRIA MINING & MILLING CO. **COLORADO.**

Mine office: Rico, Dolores Co., Colo. W. J. Scoutt, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator. Presumably idle.

PROSPER COPPER SYNDICATE. **AUSTRALIA.**

Mine office: Essington, N. S. W., Australia. Organized 1907, under laws of New South Wales, with capitalization £1,200, shares £12 par. Lands are in the Rockley district. Presumably idle.

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PROSPER GOLD MINING CO. **NEW MEXICO.**

Mine office: Hillsboro, Sierra Co., N. M. Ores carry gold, silver and copper. Has steam power. Idle.

PROVIDENCE GOLD & COPPER CO. **CALIFORNIA.**

Office: 617 Homer Laughlin Bldg., Los Angeles, Cal. Mine office: Kelso, San Bernardino Co., Cal. P. H. Mathews, president; W. E. Baxter, vice-president; F. H. Messmore, auditor; preceding officers, C. M. Wood and Jas. H. Dewey, directors; C. J. Callahan, consulting engineer. Organized Nov. 2, 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Annual meeting, first Monday in November.

Lands, 15 claims and 8 millsites, area 340 acres, patents applied for, in the unorganized Arrow district, showing 15 fissure veins, carrying sulphide ores, assaying circa 1% copper and $4 to $1,000 gold per ton, with small silver values. Has several shafts, all under 100′, and an 800′ tunnel, with a total of about one-half mile of workings.

PROVIDENCE MINING CO., LTD. **BRITISH COLUMBIA.**

Office: 525-204 Dearborn St., Chicago, Ills. Mine office: Greenwood, Boundary district, B. C. Mark F. Madden, president; Dr. Frank Byrnes, vice-president; M. S. Madden, secretary; John B. Heney, treasurer; P. J. Dermody, superintendent. Capitalization increased, January, 1907, from $200,000 to $2,000,000. Bonds, $50,000 authorized, at 6%. Paid dividends of $38,900, to end of 1906.

Mine has a 600′ shaft, planned to be sunk to 1,000′, showing argentiferous and auriferous copper sulphides, with principal values in gold, and has considerable ore blocked out. Has a 10-drill air-compressor. Production, 1907, given as 700 tons of ore, and, to end of 1907, had produced ore worth $400,000. Apparently paid in dividends money that should have been retained for development.

PROVIDENCIA GOLD, SILVER & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Tucson, Pima Co., Ariz. Described Vol. VI.

PROVIDENCIA MINES CO. **MEXICO.**

Mine office: Cosalá, Sinaloa, Mex. E. A. Stent, manager, at last accounts. Organized circa 1906, with capitalization $500,000, to operate the Campanillas mines. Presumably idle.

PROVINCIAL SMELTING & REFINING CO. **ONTARIO.**

Works office: Parry Sound, Ont. Early 1908 planned building a smelter.

PRUDENTIAL COPPER MINING CO. **ARIZONA.**

Office: care of Shea Smith, president, 18 Custom House Pl., Chicago, Ills. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. Idle and apparently moribund.

PRUDENTIAL MINING CO. **CALIFORNIA.**

Office: care of H. S. Reed, manager, Medford, Ore. Mine office: Crescent City, Del Norte Co., Cal. Lands, near Shelly Creek, are slightly developed by shaft and tunnel, showing 2 veins of 25′ to 30′ width, carrying slightly auriferous and argentiferous chalcopyrite, sphalerite and pyrrhotite. Idle several years and apparently moribund.

PRUDENTIAL MINING & DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Nogales, Santa Cruz Co., Ariz.

SOCIÉTÉ ANONYME FRANÇAISE DES MINES DE CUIVRE DE PRUNELLI (CORSE). **CORSICA.**

Office: 51 Rue Vivienne, Paris, France. Mine office: Marignana, Ajaccio, Corsica. Organized Dec. 29, 1906, under laws of France, with capitalization 1,500,000 francs, shares 100 francs par. Lands include the Argentella group, carrying argentiferous copper ores, associated with sulphides.

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PSYCHE MINING CO. **OREGON.**

Dead. Formerly at Greenhorn, Baker Co., Ore. Described Vol. VII.

PTARMIGAN MINES OF THE SELKIRKS. **BRITISH COLUMBIA.**

Mine office: Wilmer, Northeast Kootenay, B. C. Thos. Starbird, manager. Lands, at the head of McDonald Creek, an affluent of Horse Thief Creek, show highly auriferous and argentiferous copper ores, with about 3,000' of workings. Has steam and water power. Idle at last accounts, awaiting completion of a projected railroad.

PUEBLO COPPER MINING & MILLING CO. **UTAH.**

Letter returned unclaimed from former office and mine, Johnson, Kane Co., Utah. T. G. McCarthy, president; John T. West, vice-president; R. Lee Graham, secretary; J. H. Means, treasurer. Organized circa December, 1907, under laws of Utah, with capitalization $250,000, shares 25 cents par. Lands, 5 claims, in the Rock Spring district.

PUEBLO MINE. **YUKON.**

Owned by Yukon Pueblo Mines.

PUERTECITO COPPER CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Succeeded the Sonora Copper Co. Assets consists of a lawsuit against Col. Wm. C. Greene.

PUGET SOUND COPPER MINES. **BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Has a copper ore body, with heavy gossan capping of fair grade iron ore. Idle several years.

PUGET SOUND INVESTMENT CO. **BRITISH COLUMBIA.**

Dead. Formerly at Van Anda, Texada Island, B. C.

PUGET SOUND IRON CO. **BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. W. H. Lee, superintendent. Has iron ore, also auriferous and argentiferous copper ore.

PUGET SOUND REDUCTION CO. **WASHINGTON.**

Works office: Everett, Snohomish Co., Wash. Is controlled, through stock ownership, by American Smelters Securities Co. Has three 30x180" blast-furnaces, one running on copper ores, making a 50% matte, which is blown up to blister copper in a reverberatory furnace, and shipped east for electrolytic refining. Also has an arsenic plant, formerly making about 5 tons of arsenic daily, from Monte Christo ores.

PUGWASH CONSOLIDATED MINING & SMELTING CO. **NOVA SCOTIA.**

Dead. Formerly at Pugwash, Cumberland Co., N. S. Described Vol. VI.

PUGWASH RIVER COPPER CO. **NOVA SCOTIA.**

Dead. Succeeded, circa 1904, by Pugwash Consolidated Mining & Smelting Co., also dead. Formerly at Pugwash, Cumberland Co., N. S. Described Vol. IV.

PULIDO MINING CO., LTD. **PORTUGAL.**

Office: 20 Bucklesbury, London, E. C., Eng Mine office: Beja, Alemtejo, Portugal. John Silva, chairman; F. E. Webb, secretary. Organized Apr. 26, 1895, under laws of Great Britain, with capitalization £165,000, shares £1 par; issued, £154,500. Lands, 32 copper and gold mining concessions, area 5,312 acres. Idle since circa 1901.

COMPAÑIA DE MINAS y FUNDICIONES DE PÚQUIOS. **CHILE.**

Dead. Was succeeded by Compañía Minera de Púquois. Formerly at Púquios, Rancagua, Atacama, Chile.

COMPAÑIA MINERA DE PÚQUIOS. **CHILE.**

Office: Casilla 178, Valparaiso, Chile. Mine office: Púquios, Rancagua, Atacama, Chile. Employs 60 men. E. J. J. H. Sandiford, chairman; P. H. MacClelland, vice-chairman; H. S. Sydney-Merritt, secretary and treasurer; preceding officers, J. C. Kenrick and Walter Squire, directors; Archibald Stark, general manager; R. Benbow, mine superintendent. Organized Nov. 7, 1905,

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under laws of Chile, with capitalization £100,000, shares £1 par, as successor of Compañía de Minas y Fundiciones de Púquios, and reorganized Jan. 8, 1906, under laws of Chile, with capitalization £80,000, shares £1 par. Annual meeting, fourth Saturday in February.

Lands, 44 claims, area 144 hectares, showing country rock of diorite, with 3 east and west ore bodies, known as the Jefe, Repalon and Estaca lodes, intersected at nearly right angles by the Verde, Sofia and Farellon lodes. The line of junction between the Jefe and Verde lodes gives dykes of 30′ width. The Sofia and Jefe lodes are under development, latter, of circa 4′ average width, traceable 2,500 meters, showing oxidized ores, bornite and chalcopyrite, giving estimated average assays of 12% copper and up to 24 oz. silver per long ton, with traces of gold. Development is by the old Farellon shaft of 693′, the old Estaca shaft of 595′, the new Sofia shaft of 429′, also by the 610′ Sofia south tunnel, 612′ Jefe east tunnel and 500′ Jefe west tunnel, with a total of 3,140′ of new workings, showing 3,000 long tons of ore, with 1,100 tons blocked out for stoping.

The mine dates from 1862, and has been in the hands of various owners, but was closed by two floods in the Sofia mine, caused by storm waters, and by reason of the ore becoming base in the transition zone. Property was held formerly by the Compañía Farellon de Púquios.

Equipment includes 2 hoists, good for 900′ each, and 2 Rand & Walker air-compressors. There are several buildings and ranchos, including administration building, hotel, office, store and foreman's dwellings. Ores are sent to Caldera for reduction, by the Ferrocaril de Copiapó, connected with the mine by a Bleichert aerial tram of 2 kilometers length, completed May, 1908. Fuel is Australian coal, costing 55s. per long ton.

Production, 1907, was 104,000 lbs. fine copper, secured from 295 tons of ore extracted from development work only, giving returns of 14.7% copper. Company plans sinking the main Sofia shaft into the sulphide zone, opening 3 new levels and building a new headgear and ore-bins. Property considered promising and management good.

PURITAN COPPER & GOLD MINING CO. **NEW MEXICO.**

Dead. Was a swindle, promoted by Benj. F. Coburn, of Boston, who "guaranteed" 10% dividends for 5 years. Formerly at Tres Piedras, Taos Co., N. M. Described Vol. II.

COMPAÑIA DE MINAS I FUNDICIONES DE PUTAENDO. **CHILE.**

Office: Santiago de Chile. Mine office: Putaendo, Aconcagua, Chile. Organized Jan. 17, 1907, under laws of Chile, with capitalization 720,000 pesos, shares 36,000 pesos par.

PYNE SMELTING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, 26 First National Bank Bldg., San Francisco, Cal. Works office: West Alameda, Alameda Co., Cal. P. W. Pyne, manager. Works have a daily capacity of 100 tons. Idle since 1903, having been closed by courts, on complaints that fumes injured vegetation, with small prospects of resumption.

PYRAMID COPPER CO. **UTAH.**

Mine office: La Sal, Grand Co., Utah. Organized 1902, under laws of Maine, with capitalization $500,000. Lands, in the Sinbad Valley, have a blanket vein between sandstone strata, carrying ore of about 3% copper tenor. Company claims enough ore in sight to run a mill for 2 years. Has a 50-ton leaching plant, using sulphuric acid made at the works from sulphide ores, claimed to effect an extraction of 98% of assay values, which is not believed. Closed down, late 1907.

PYRAMID COPPER SYNDICATE, LTD. **BRITISH COLUMBIA.**

Dead. Dissolved Aug. 8, 1905. Formerly at Golden, East Kootenay, B. C.

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PYRAMID GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz. Described Vols. V and VI.

PYRAMID PEAK MINING CO. **NEW MEXICO.**

Dead. Lands sold, December, 1905, by sheriff. Formerly at Lordsburg, Grant Co., N. M.

PYRENEES COPPER MINES, LTD. **FRANCE.**

Dead. Dissolved, August, 1904. Formerly in the Basses Pyrenees, France.

PYRENEES MINERALS, LTD. **FRANCE.**

Office: 14 Great Winchester St., London, E. C., Eng. E. Glasse, managing director; H. Gulliver, secretary. Organized May 5, 1902, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £98,207. Debentures, £60,000, at 6%. Lands, 1,818 acres, including the Alzen silver and copper mines, in the department of Ariège, France. Has a 20-ton smelter. At last accounts was in litigation with former owners of the property.

"Q" COPPER SYNDICATE, LTD. **AUSTRALIA.**

Office: Worcester House, Walbrook, London, E. C., Eng. Mine office: Mackay, Queensland, Australia. T. W. Gilbert, secretary; G. Lloyd-Owen, mine manager; Edmund Lloyd-Owen, consulting engineer. Organized Nov. 29, 1905, under laws of Great Britain, with capitalization £10,000, in 5,000 cumulative 6% preference shares of £1 par, and 50,000 ordinary shares of 2s. par. Lands, 160 acres, leasehold, known as the Pine Vale and Ben Mohr mines. Presumably idle.

Q. S. GOLD MINING & SMELTING CO. **WASHINGTON.**

Office: 408 Empire State Bldg., Spokane, Wash. Mine office: Conconully, Okanogan Co., Wash. Col. Adelbert M. Dewey, president and general manager; M. L. Bevis, vice-president; Carl L. Shuff, secretary; E. J. Hyde, treasurer; L. K. Armstrong, consulting engineer. Organized 1897, under laws of Washington, with capitalization $2,000,000, shares $1 par.

Lands, 18 claims, also 60 acres of millsites and water-rights on Sinlahekin Creek, in the Salmon district, circa 12 miles south of Loomis. Property shows diorite, with 6 fissure veins, carrying mainly low grade copper values. Company claims an ore body more than 300′ wide and more than 4,500′ long, which seems a serious overestimate as regards width. Development, begun 1897, is by 2 tunnels, second started circa 1907, at base of the mountain, to cut ore at about 2,000′ estimated depth. The tunnel, at distance of 900′, is said to cut 50′ of ore, without proving the walls, carrying chalcopyrite, estimated at 2 to 4% copper tenor, with small and variable silver values and circa $1 gold per ton. Ore is said, in the press, to average about $14 per ton in gross values.

Equipment includes a 200-h. p. hydro-electric power plant, taking water from Sinlahekin Creek. Improvements include a sawmill and several good mine buildings.

The management claims to show more ore than the Granby, which is not true, and of about double the average tenor of Granby ore, which is considered something more than doubtful. Notwithstanding these exaggerations, the company is to be commended for its steady continuance of work, which seems well planned, and the property is considered promising.

QUANTOCK MINING & MILLING CO. **MONTANA.**

Mine office: Coloma, Powell Co., Mont. H. B. Salisbury, superintendent. Has gold, silver and copper ores, with steam power, employing 12 men at last accounts.

QUARTZ KING MINING CO. **ARIZONA.**

Mine office: Parker, Yuma Co., Ariz. Capitalization $1,500,000, shares $1 par. Lands, circa 2,000 acres, 4 miles north of Parker, having 4 shafts, of about 100′ depth each, and several tunnels, longest 125′. Employed circa 85 men at last accounts.

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QUEBEC COPPER CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Deadwood, Boundary district, B. C.

MINA LA QUEBRADA. **VENEZUELA.**

Mine office: Aroa, Lara, Venezuela. Includes the principal mines of the Quebrada or Aroa district of Venezuela, which have produced about 60,000 tons of fine copper. Lands, 67 miles west of Puerto Cabello, include the Cumuragua mine, having a vein of carbonate ore 1′ to 5′ wide; the Titiara mine, with vein 2′ to 25′ wide; the San Antonio mine, with vein of 3′ to 18′; and the Quebrada mine, with a vein 50′ to 75′ wide, 2,000′ long and of unknown depth, from which oxide and carbonate ore have been mined in the alteration zone, leaving a large body of sulphide ore, averaging possibly 4 to 6% copper, in the lower workings. Was operated extensively, 1881-1894, producing 271,770 long tons copper ore, valued at about £1,250,000. Idle since 1894, and likely to remain so until Venezuela enjoys more settled political conditions, and better treatment is accorded foreign owners of mining concessions.

QUEEN BEE COPPER MINING CO.

Dead. Formerly had an office at 220 Broadway, New York, N. Y. Location of lands, if any, unknown.

QUEEN BEE COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Wrightsville, Robinson Co., N. S. W., Australia. T. E. Farquhar, chairman; preceding officer, J. R. Ratcliff and G. D. Elliott, directors. Lands are in the Bee Mountains, about 11 miles southeast of Cobar. Mine has a 500′ main shaft, showing ore assaying up to 45% copper, with fair gold and silver values, and, on the 4th level has a vein of circa 20′ width, averaging about 7% copper. Has steam power and an air-compressor. Smelter has 4 reverberatory furnaces and a small water-jacket blast-furnace, and company plans installation of larger blast-furnace. Ore smelted, last half of 1907, gave average extraction of 7.75% copper. Production, 1907, was 1,104,320 lbs. fine copper. Employs circa 200 men.

QUEEN BEE MINING & MILLING CO. **WYOMING.**

Dead. Was succeeded, June, 1902, by Wyoming Queen Mining Co. Formerly at Jelm, Albany Co., Wyo.

QUEEN COPPER MINING CO. **ARIZONA.**

Office: Globe, Ariz. Mine office: Superior, Pinal Co., Ariz. W. D. Fisk, president; J. H. Thompson, vice-president; Joseph W. Bandhauer, secretary and superintendent; Richard Fleming, treasurer. Organized 1906, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Property is the old Silver Queen mine, near the Lake Superior & Arizona, opened circa 1880, and worked some years for silver. Mine, opened to depth of 300′, has extensive old workings, showing, on the 300′ level, an 18″ paystreak of chalcocite and 2′ to 4′ of malachite assaying up to 40% copper, chalcocite carrying up to 310 oz. silver per ton. Has steam power. Property considered promising.

QUEEN & CRESCENT COPPER CO. **IDAHO.**

Dead. Was merged, circa 1908, in Copper Queen Mining & Smelting Co., shareholders receiving one share new stock for 8 shares of old. Formerly at Copper Queen, Lemhi Co., Idaho.

QUEEN GOLD & COPPER MINING & SMELTING CO. **OREGON.**

Office: 1345 Pierce St., San Francisco, Cal. Mine office: Wonder, Josephine Co., Ore. W. H. Ramsey, president; B. M. Cahill, vice-president; John Dawson, secretary; W. A. McElroy, treasurer. Organized under laws of Oregon, with capitalization $1,000,000, shares $1 par.

QUEEN LYELL MINING CO., N. L. **TASMANIA.**

Office: 90 Queen St., Melbourne, Australia. Mine office: Gormanston, Montagu Co., Tasmania. G. A. Lawson, manager. Capitalization £100,000,

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shares £1 par. Lands, sundry leasehold claims, in the Mount Lyell field. Idle and presumably moribund.

QUEEN MINING & MILLING CO. **NEW MEXICO.**

Office: Galveston, Tex. Mine office: Cooney, Socorro Co., N. M. H. A. Griffin, secretary. Organized under laws of Texas. Lands, 5 claims, known as the Copper Queen group, showing good bodies of low grade gold-silver-copper ores, developed by about 3,000′ of underground workings. Has steam power and a 15-stamp pan-amalgamation mill. Idle.

QUEEN OF ARIZONA COPPER CO. **ARIZONA.**

Dead. Merged, circa 1902, in Great Belcher of Arizona Co. Formerly at Providence, Yavapai Co., Ariz. Described Vol. III.

QUEEN PRINCESS COPPER CO. **COLORADO.**

Mine office: Copperfield, Frémont Co., Colo. John R. Stephen, president; Edward S. Halter, secretary; Edward Baugh, treasurer. Capitalization $3,000,000, shares $1 par. Lands, 14 claims, area 147 acres, in the Red Gulch district, 9 miles north of Cotopaxi. Property has a main ore body said to average 2.5% copper, and has secured assays of 40 to 60% in tenor, and company claims that trial shipments returned 17% copper. Main vein is claimed to be 300′ wide, which is doubtful. Development is by a 135′ shaft. Equipment includes steam power and a hoist.

QUEEN REGENT COPPER & GOLD CO. **NEVADA.**

Office: 368 Bush St., San Francisco, Cal. Letter returned unclaimed from former mine office, Fairview, Churchill Co., Nev. J. E. Kerr, manager. Organized 1907, under laws of Arizona, with capitalization $2,000,000. Lands, 14 claims, 14 miles south of Fairview, on the southern side of Copper Mountain, known as the Copper King group, claimed to have a hematite gossan of 50′ to 100′ width, and claimed to show, in a trench, native copper of 12% tenor, with gold and silver values aggregating $42 per ton, which seems an unusual, if not impossible, combination. Has a 100′ tunnel, cutting a 4′ vein and planned to cut 5 additional veins in length of about 500′.

QUEENSLAND COPPER CO., LTD. **QUEENSLAND.**

Office: 6 Princes St., London, E. C., Eng. Mine office: Mount Perry, Bowen Co., Queensland, Australia. Employs 337 men. Geo. Grannell-Milne, chairman; J. G. Tait, secretary; S. T. Williams, mine manager; Sydney H. Pulbrook, superintendent; J. S. MacArthur, consulting engineer. Organized Feb. 1, 1898, under laws of Great Britain, with capitalization £500,000, shares £1 par, in £250,000 cumulative 6% preference shares and £250,000 ordinary shares. After payment of 6% on ordinary shares, in any year, remaining profits are divisible equally between preference and ordinary shares. Last dividend, 1903, on ordinary shares, was 6%. For fiscal years ending July 31, profits have been as follows: £12,756 2s. 11d. in 1905; £28,893, with dividends of £12,810, in 1906; £36,143, with dividends of £19,486, in 1907.

Lands include 1,650 acres bought of the Mount Perry Copper Co., also the Normanby mine, near Mount Perry, taken over June, 1905, under 2 years option, and bought, 1907, for £12,000. Miscellaneous holdings include the Reed's Creek, Great Freehold and New Moonta mines, and company also bought the lands of the Burnett (Queensland) Exploration Co., Ltd. The 3 principal mines of the company have 15 shafts, of 120′ to 800′ depth, and the company also works various mines in the Wolca and Boolboonda districts. The combined area of the Mount Perry and Reed's Creek mines is 650 acres, freehold.

The Mount Perry mine has fissure veins traversing granite, the main vein, of about 12′ average width, having a paystreak 6″ to 8″ wide in the upper levels and 10″ in the lower levels, carrying an average of circa 16% copper. The mine formerly was opened by 3 shafts, poorly located and inadequate,

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which have been replaced by new shafts. The ground is growing harder with depth.

The Kennedy shaft, 1,020′ deep, with bottom level at 1,000′, shows a strong vein of ore of fair copper tenor, opened by crosscut. About two-thirds of the production, 1906, was from the Kennedy shaft.

The Milne shaft, planned to cut the lode at circa 1,000′ depth, early 1909, is between the Kennedy and Southern shafts, and is planned to replace the Kennedy as the main working shaft of the mine. The Milne shaft is vertical, and will obviate considerable crosscutting and long trams.

The Southern shaft probably will be abandoned, and the ground tributary thereto developed from the new Milne shaft.

The Palmer shaft is a considerable producer, showing good ore, and has a good hoisting plant, installed 1906.

The Reed's Creek mine has a fissure vein in granite, similar to that of the Mt. Perry, and is extensively developed, but the shafts are small and poorly located for modern mining requirements.

The Normanby mine, 240 acres, freehold, on the other side of the mountain from the Mount Perry, formerly held under option, is now owned outright. The Normanby shows a vein paralleling the Mount Perry, with ore of a similar nature, averaging circa 13% copper and 10 to 15 dwts. gold per ton. The main shaft, on the southern part of the property, 352′ deep, is in a vein of about 12″ average width, carrying ore averaging circa 12% copper, 6 oz. silver and 10 dwts. gold per long ton. The Normanby mine was producing about 400 tons of ore monthly, at end of 1907.

The Great Freehold mine, area 811 acres, has a nearly vertical fissure vein, in granite, averaging 5′ width, with an 18″ paystreak carrying chalcopyrite averaging circa 14% copper, with fair gold and silver values, developed by a 200′ main shaft. Apparently this mine is idle.

In addition to the mines of the Mt. Perry district, the company holds the Greenback, Potosi and Wolca mines, in the Wolca district, northeast of Mt. Perry, and the New Moonta, Edena and Boolboonda mines, in the Boolboonda district, northeast of the Wolca district. The veins of these latter properties are narrow, but persistent, and carry high-grade auriferous and argentiferous copper ores.

The New Moonta mine, at Boolboonda, 12 miles northeast of Mount Perry, is a new mine having a 121′ shaft, from which circa 2,000 long tons of high grade ore were extracted, 1905, and gives promise of holding good ore values to depth.

The smelter, at Mount Perry, built 1902, has 40-ton and 90-ton water-jacket blast-furnaces, and a reverberatory furnace, with a 120′ smokestack. The smelter is connected with the principal mines by a tram-line, and does custom smelting.

Production, for fiscal years, has been as follows: 10,388 long tons of ore, about 25% of which was custom ore, yielding 2,952,320 lbs. fine copper, 74,395 oz. silver and 2,055 oz. gold in 1905; 3,857,280 lbs. fine copper, 9,355 oz. silver and 2,201 oz. gold in 1906; 4,575,648 lbs. fine copper, 105,761 oz. silver and 3,341 oz. gold, from 17,944 long tons ore smelted, in 1907, showing an average extraction of about 11.4% copper from all ores treated, including custom ores. Costs, 1907, were £70 14s. 8d. per long ton of copper, in the form of matte.

The company's properties have proven somewhat disappointing as a whole, possibly because the hopes originally entertained were based upon an imperfect understanding of the circumstances, but the management very wisely continued vigorous development work during the era of high prices, hence

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was not caught unprepared by the slump of 1907. Property considered valuable and management good.

QUEENSLAND COPPER FREEHOLDS, LTD. **AUSTRALIA.**

Office: 2 Broad St. Place, London, E. C., Eng. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. T. G. Scott, chairman; Alex Hill & Stewart, consulting and managing engineers; C. D. Comrie, secretary. Organized Jan. 31, 1907, under laws of Great Britain, with capitalization £300,000, shares £1 par; issued, £250,000. Owns a third interest in the Mountain Home Copper Co., Ltd. Lands, 378 acres, freehold, circa 90 miles north of Cloncurry, in 8 groups, including the Malbon and Argylla, former having a 25′ shaft showing cuprite, azurite, malachite and chalcocite. Presumably idle.

QUEENSLAND MINES EXPLORATION CO. **AUSTRALIA.**

Dead. Formerly at Mt. Perry, Bowen Co., Queensland, Australia.

QUEENSLAND SMELTING CO., LTD. **AUSTRALIA.**

Office: Dashwood House, London, E. C., Eng. Works office: Aldershot, Cook Co., Queensland, Australia. Chas. Poston, chairman; Jas. Lewis, secretary; T. Rowe and E. P. Landon, trustees for debenture holders. Organized Jan. 3, 1899, under laws of Great Britain, as reconstruction of a company of same name organized 1888, with capitalization £50,000, in £30,000 cumulative 5% preference shares and £20,000 ordinary shares; issued, £38,630. Debentures, £65,000 authorized, £43,800 issued, in £100 bonds, at 5%. Paid a 5% dividend, on preference shares, 1903. Last published accounts, 1904, showed profits of £3,105. Property is 1,168 acres, freehold, with a smelting plant having furnaces for reduction of copper, gold, silver and lead ores.

QUEEN VICTORIA MINE. **BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Nelson, Kootenay district, B. C. Lands, at Beasley Siding, 7 miles from Nelson, show a big bluff of ore, claimed to be 300′ wide and 400′ long, with rhyolite walls, carrying copper ore of low average tenor, with small silver and gold values, and a little nickel. Mine, worked opencast, is estimated to have 200,000 tons of ore in sight, said to assay 5 to 7% copper, but probably averaging 2 to 4% copper and 1 oz. silver per ton, with small gold values. Has a tramway and rail connection, and made, 1907, considerable shipments to the Trail smelter. Is a property of considerable promise, owing to immense size of ore body, though low in copper tenor.

COMPAÑIA EXPLOTADORA DE LA MINA DE COBRE QUILILLA. **MEXICO.**

Office: Scranton, Pa. Mine office: Ameca, Jalisco, Mex. Chas. S. Weston, president; John W. Fowler, secretary and treasurer; Independence Grove, general manager; Felix Orozco, superintendent. Lands, 50 pertenencias, area 123 acres, showing 2 fissure veins in porphyry, of which one, of 4′ to 6′ average width has 5 shafts, of 40′ to 190′, and 5 tunnels, longest 460′, with about 1,500′ of workings. Ores give average assays of about 9% copper, 10 to 25 oz. silver and $3 gold per ton.

QUINCY & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. IV.

QUINCY MINING CO. **MICHIGAN.**

Office: 1000-32 Broadway, New York, N. Y. Mine and works office: Hancock, Houghton Co., Mich. Employs circa 1,800 men. Wm. R. Todd, president; Walter P. Bliss, vice-president; preceding officers, Cleveland H. Dodge, Jas. L. Bishop, Chas. J. Devereaux, Isaac H. Meserve, Daniel T. Brigham, Wm. M. Belcher and Otto Kirchner, directors; W. A. O. Paul, secretary and treasurer; Chas. L. Lawton, superintendent; Jas. W. Shields, mill superintendent; Alex Laist, smelter superintendent; Thos. Whittle, chief

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mining captain; Chas. K. Hitchcock, engineer; M. J. McLain, clerk; E. E. Lynch, assistant clerk; H. M. Tompkins, smelter clerk.

Organized March 30, 1848, under special charter from the state of Michigan, with capitalization $500,000, for a period of 30 years; renicorporated, March 6, 1878, under laws of Michigan for a second period of 30 years, with capitalization $1,000,000, shares $25 par, increased later to $1,250,000, and again increased, Apr. 16, 1897, to $2,500,000; reincorporated, 1908, under laws of Michigan, for a third term of 30 years, with capitalization $3,750,000; issued, $2,750,000. Old Colony Trust Co., Boston, transfer agent. Shares are listed on the Boston stock exchange.

The Quincy paid its first dividend in 1862, and profits have been disbursed to shareholders in every succeeding year, except 1866 and 1867, giving the company a continuous dividend record of more than 40 years, from 1868, rendering it the oldest dividend paying American copper mine, and, among the copper mines of the world, the second-oldest dividend payer, being preceded only by the Tharsis Sulphur & Copper Co., Ltd., which has a record of continuous dividends since 1867, or one year longer than the Quincy's record. Recent dividends, by years, have been as follows: $550,000 in 1903; $500,000 in 1904; $600,000 in 1905; $1,250,000 in 1906; $1,350,000 in 1907; $495,000 in 1908. Dividends for 1908 were $1.50 for the first quarter, and $1 each for the three remaining quarters of the year. The new stock issue, of 10,000 shares, was sold to stockholders, at $70 per share. The company has paid total dividends, to end of 1908, of $18,450,000.

The following table shows statistics of production, costs, etc., 1864-1905:

Year.	Product. Pounds.	Yield fine copper per fathom broken. Pounds.	Price obtained. Cents.	Cost per pound exclusive of construction. Cents.	Number of miners.	Average monthly contract wages.
1864.....	2,498,574	562	44.8	26.7	242	$65.50
1865.....	2,720,980	501	....	....	212	57.53
1866.....	2,114,220	451	31.3	29.0	227	53.16
1867.....	1,921,620	526	22.7	18.9	167	50.83
1868.....	1,417,941	447	25.2	23.1	157	50.44
1869.....	2,417,365	446	21.9	16.7	210	51.10
1870.....	2,496,774	528	21.5	15.3	181	46.09
1871.....	2,409,501	441	22.8	15.2	104	47.08
1872.....	2,269,104	391	32.5	22.9	233	60.62
1873.....	2,621,087	491	26.5	18.6	223	62.40
1874.....	3,050,154	577	21.9	15.1	234	43.38
1875.....	2,798,281	485	22.7	15.8	217	46.74
1876.....	3,073,171	507	20.0	15.7	227	47.13
1877.....	2,837,014	467	18.6	15.1	247	43.79
1878.....	2,991,050	395	14.9	14.0	234	41.50
1879.....	2,639,958	403	16.3	13.7	212	38.76
1880.....	3,609,250	563	18.5	11.8	192	49.10
1881.....	5,702,606	766	18.7	10.6	212	48.54
1882.....	5,682,663	800	17.1	9.5	152	48.83
1883.....	6,012,239	850	13.7	8.9	165	46.02
1884.....	5,680,087	722	12.2	8.6	157	43.35
1885.....	5,848,497	710	11.4	7.5	132	44.00
1886.....	5,888,517	638	11.1	6.8	140	45.80
1887.....	5,603,691	781	11.7	8.6	142	48.40
1888.....	6,367,809	690	15.9	10.1	158	49.60
1889.....	6,405,686	690	12.0	9.4	145	49.15
1890.....	8,064,253	769	15.7	8.2	146	52.60

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1891	10,542,519	685	12.8	9.1	182	53.40
1892	11,103,926	572	11.2	8.8	238	53.75
1893	14,398,477	574	10.4	7.1	259	49.60
1894	15,484,014	584	9.5	5.7	285	50.70
1895	16,304,721	517	10.1	5.9	336	50.00
1896	16,863,477	477	10.9	6.5	379	52.00
1897	16,924,618	481	11.1	6.8	393	52.52
1898	16,354,061	513	12.0	6.8	381	52.50
1899	14,301,182	427	17.0	8.1	401	56.72
1900	14,116,551	391	16.6	9.3	433	62.00
1901	20,540,720	409	16.1	8.8	533	62.00
1902	18,988,491	347	11.9	9.0	562	62.00
1903	18,498,288	325	13.2	9.7	586	62.00
1904	18,343,160	307	13.3	9.7	592	62.40
1905	18,827,557	277	15.8	10.1	643	65.10

Lands are very extensive, the Quincy, by virtue of recent purchases, now owning the Pewabic lode, and a number of parallel cupriferous beds, from the Hancock mine, on the northern shore of Portage Lake, to the Franklin Junior mine, or about half way from Hancock to Calumet. The holdings of the Quincy now include lands formerly held by the Quincy, Pewabic, Franklin, Mesnard, Pontiac and St. Mary's companies, in order named, from south to north.

The Quincy mine is opened on the Pewabic amygdaloidal bed, having a strike of circa N. 30° E., with an average dip of 52° to 54° at surface, and a dip of approximately 37° 30′ at a depth of more than one mile, in the lowest workings, the shafts following the pitch of the lode, on catenary curves. The bed averages about 20′ width, in the upper workings, but is materially narrower at the bottom, with decreased copper values, the rock showing very little heavy copper in the lower stopes, but being more uniform in value than above. The Pewabic lode has an extreme width of 40′, at various points, but is only 10′ to 15′ wide in the upper workings of the Mesnard shaft. In the Ninth Decade of the Nineteenth Century about 40% of the production was heavy copper, but this decreased to 9% in 1905. In the upper levels immense masses of native copper were found frequently, these ranging up to 300 tons in weight. Practically the entire bed is now mined, walls being strong and requiring little timbering. Dry-walls are built of waste rock, in wide stopes, saving the cost of hoisting and the expense of extra timbering. Fire-doors have been installed, and every precaution is taken against fire. Miners are carried to and from their work in man-cars holding 30 men, and hoisting cables are inspected frequently, with every care taken to prevent accidents. Shafts are sunk mainly in the footwall, obviating the necessity of leaving large quantities of payable stamp-rock in pillars. The southernmost drifts of the Quincy are under the city of Hancock, and about 3,000′ below mean water datum of Portage Lake, while the northernmost workings, at No. 9 shaft, are fully two miles from the southern breasts.

In addition to the Pewabic amygdaloid, there is a footwall branch, known as the Pewabic East Lode, underlying and paralleling the main bed, which occasionally yields good returns. The mine was opened, 1848, on the Quincy amygdaloid, a parallel bed lying some distance west of the Pewabic lode, which was abandoned, 1856, when the Pewabic was opened. The so-called West Lode, circa 300′ west of the Pewabic bed, has been opened from shafts Nos. 4 and 7 by cross-cuts on the 30th, 39th, 40th, 44th and 49th levels, and considerable stamp-rock has been extracted therefrom. About 150′ west of the West Lode is another amygdaloidal bed, averaging 40′ in width, and carrying more or less copper, which possibly may prove workable at some

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future time. About 1,000′ west of the Pewabic bed is the Hancock amygdaloid, which is narrow, but fairly mineralized, and yielded an average of 21 lbs. fine copper, per ton of rock stamped, when worked in the old Hancock mine, which is materially above the present average return from the old Pewabic lode.

The Quincy has been troubled greatly by air-blasts, these being violent disturbances brought about by the settling of superincumbent rock in the scores of miles of worked-out openings, causing violent compression of the air elsewhere throughout the mine, giving considerable trouble and occasional loss of life. The most serious disturbances from air-blasts, which practically are artificial earthquakes, of local scope, felt for only a few miles distance upon surface, were experienced in February, 1906, and there seems reason to fear that these troubles will prove intermittently continuous for the balance of the mine's history, but there was less trouble from air-blasts during 1908 than for several years previously.

The mine has compressor capacity for 260 power drills and operates about 175 machines, in sinking, drifting and stoping, and the diamond drill is used extensively in exploratory work. The mine has total hoisting and rockhouse capacity for the production of 5,000 tons of stamp-rock daily.

Electric underground traction is in extensive use throughout the mine. The plant was installed by the General Electric Co., tram-lines averaging about 1,800′ each in length, with gradients of 1.5% towards the shafts. The equipment includes 20 electric locomotives, each weighing 5,500 lbs., standing 3′ high by 43″ wide and 9′ long, with draw-bar pull of 700 lbs. on a level track, each hauling 4 or 5 three-ton rock-cars, at a speed of 6 to 8 miles per hour, one man caring for each train. The haulage plant will be extended to No. 8 shaft, on the 49th level, from end to end of the mine. The underground traction power plant is on the 57th level of No. 2 shaft, having a 100-kw. direct current motor operating the haulage system. Tram-cars are unloaded into 500-ton storage bins, built on the hanging-wall side of the shafts, there being such bins on 2 levels of No. 2 shaft, 4 levels of No. 6 shaft and 7 levels of No. 7 shaft. This system of storage obviates the loss of time by either the tram-lines or skips, and adds at least 25% to the hoisting capacity of the mine.

Owing to the absorption of adjoining mines, from time to time, the Quincy shafts are numbered irregularly, and are described hereinafter in order of occurrence from south to north, rather than in order by number.

No. 7 shaft, the southernmost, planned and sunk by Mr. John L. Harris, is 5,162′ deep. This shaft is sunk on a catenary curve, leaving surface at an angle of 53°, and being bottomed at an angle of 37° 30′. The shaft was sunk 4,000′, in 18 months, through very refractory rock, this speed being rendered possible by sinking and raising in 5 sections, simultaneously. This shaft operates 30 drills, and has a productive capacity of 1,800 tons daily, as compared with a former capacity of about 1,000 tons.

The equipment of No. 7 shaft includes a steel shaft-rockhouse, 100′ high, with large wings, which was remodeled, 1907, and nearly doubled in capacity, being given 750-ton bins. The rockhouse has a steam-hammer and two 24x36″ crushers, latter replacing 5 smaller crushers. In 1904 this rockhouse required 28 men for its operation, the force being reduced, 1905, by remodeling, to 16 men, while after the changes of 1907, five men can handle 1,800 tons of rock daily, where 28 men were needed, five years previously, to handle less than half this tonnage. It is this sort of progress that keeps the Quincy vigorous and successful in its seventh decade of active production.

Equipment of No. 7 shaft includes an 8,000-h. p. Allis-Chalmers Corliss hoist, with 52x84″ cylinders and winding drums 28′ in diameter by 11′ 9″ face, carrying 8,000′ of 1½″ steel cable, the main shaft weighing 120,000 lbs. The hoist can raise 6-ton skips, from a depth of 1½ miles, at a speed of 3,000′

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per minute, hoisting being limited to this rate by an automatic cutoff, which also prevents overwinding. Starting a load of 6 tons from a depth of more than a mile, the hoist, if untouched, will check, without damage, after raising the skip a few feet higher than the appointed place in the shafthouse. There also is a 1,300-gallon bailer. The engine-house at No. 7 shaft is 58x94', with a 56x92' boiler-house adjoining, both of stone, with steel truss roofs, and there is a second boiler-house, each having eight 100-h. p. Roberts tubular return horizontal boilers.

No. 4 shaft, 860' next north of No. 7, is 4,186' deep, bottomed on the 51st level. The stoping ground tributary to No. 4 being nearly exhausted, and as a new hoist would be required for greater depth, the lower stretches of ground are reached from No. 7 shaft, by electric tram. Previous to abandoning No. 4, a more systematic search was made of the West Lode, which was successful, to the point of opening several years' reserves of stoping ground of fair tenor, though below the average grade of the Pewabic lode. Surface equipment at No. 4 shaft includes air-compressors of 40 drills aggregate capacity.

No. 2 shaft, 585' next north of No. 4, is 5,500' deep, being, except Quincy No. 6, the deepest in the Lake Superior district, outside of the Calumet & Hecla and Tamarack mines. This shaft operates 40 power drills and has a 1,300-gallon bailer for raising water.

No. 2 shaft has a new shaft-rockhouse, 160' high, of steel and reinforced concrete, built, 1908, by the American Bridge Co. Stamp-rock from the shaft is dumped onto grizzlies, with wide bars, smaller material falling into circular bins, whence it passes by gravity to the crushers and thence into the main rockhouse bin, which is circular, built of steel plates. The smaller mass copper passes through the grizzly-bars, and is picked out by workmen and dropped into a chute carrying it to a steam-hammer, there also being a chute for waste-rock. The grizzlies allow large pieces of rock to fall into a bin of reinforced concrete in front of the steam-hammer, where broken and sent to the main rockhouse bin through a chute, while mass copper from the steam-hammer is dropped into a tube of steel leading to a circular steel bin, with bottom of steel rails reinforced by concrete, which loads into railroad cars, through chutes with gates operated pneumatically.

No. 2 shaft has a special crushing plant for waste-rock, between the collar of the shaft and the rockhouse. Poor rock is dumped into a circular bin, and drawn by gravity to a crusher, going thence to circular storage-bins, from which it is drawn off into wagons or railroad cars, for use in railroad ballasting, road building and concrete work. When required, larger masses of rock are selected and stored for masonry work.

The surface equipment at No. 2 shaft is very heavy, being practically a duplicate of that at No. 7, including a powerful hoist. The 53x69' compressor house, of stone and steel, with fire-proof truss roof, houses two 60-drill cross-compound 2-stage condensing right and left hand Corliss air-compressors, so connected that air therefrom is available in any part of the mine, the cross-connection eliminating danger of inadequate air supply through disabling of either section. Steam from the compressor-plant exhausts into a dam built for the purpose. The boiler-house has 5 Hawley down-draft furnaces.

No. 6 shaft, 1,928' north of No. 2, is only 200' south of the Franklin line. This shaft has a 1,300-gallon bailer and operates 40 power drills. The shaft was 5,500' deep June, 1908, and production was somewhat decreased by No. 8 shaft taking considerable ground under the Franklin mine, previously tributary to No. 6. Equipment includes an Allis-Chalmers duplex hoist, with 22' 6" straight-face drum, raising 8-ton skips. There is a 100-drill 2-stage compound air-compressor, and a centrifugal feed-water heater, attached to

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one cylinder of the duplex hoist. The boiler-house, 56x75′, has four 250-h. p. Wickes water-tube vertical boilers and nine 100-h. p. locomotive firebox boilers, and a powerful fire-pump.

The Franklin mine lies next north of No. 6. The Quincy bought the old Franklin mine, area 160 acres, for $170,000, taking possession December, 1908, the Franklin being closed down as soon as taken over by the Quincy. It is uncertain whether the old shafts of the Franklin will be used by the Quincy.

No. 3 Franklin shaft is 3,200′ deep, bottomed at the Quincy line, and has been a scram for some years.

No. 5 Franklin shaft, 2,850′ deep, also is bottomed at the Quincy line. Some stopes have been opened on the West Lode from this shaft.

No. 8 shaft, also known as the Mesnard, is 4,168′ north of No. 6, and is 4,500′ deep, the 24th level of No. 8 corresponding to the 42d level of No. 6. Permanent production was begun circa April, 1907, No. 8 operating 50 drills and being one of the largest producers of the mine. No. 8 shaft showed poorly in the upper levels, but the lower workings, while by no means up to the Quincy average of twenty years ago, in either quantity or quality of ore developed, show a wider and better mineralized lode than above, and the ground is of very satisfactory average, the improvement beginning with the 10th level and being marked below the 20th level, and the average of No. 8 is nearly or quite up to the present average of the old Quincy and Pewabic workings. The best ground apparently is shown to the southward, though improvement was noted, 1908, in the northern drifts, toward the Pontiac boundary. Levels in No. 8 are opened, uniformly, at 135′ intervals, and connection was secured July 15, 1906, between the 24th level of No. 8 and the 42d level of No. 6, at a depth of 3,354′, this level passing underneath the entire workings of the old Franklin mine. The productive capacity of No. 8 shaft is fully 1,000 tons daily.

The shaft-rockhouse at No. 8, of frame and structural steel, is 41x155′ on the ground and 150′ high. Stamp-rock is dumped from the skips, as hoisted, upon grizzlies of 2″ steel bars, placed 2″ apart, at an angle of 45° in an upper section, with a lower section at 20° only, in which bars are 12″ apart from center to center, the combination grizzly assorting rock automatically into two grades, the fine stuff going to ore-bins and the coarse falling into two chutes, receiving equal portion, which feed direct to two rock-crushers on the floor below, no shoveling being required. The heavy rock, too large to pass the 10″ aperture in the lower section of the grizzly, falls to the floor, and is broken by a trip-hammer. The new grizzlies save one-half on rock-house labor, and greatly lighten the work of the remaining employes.

The power plant at No. 8, of structural steel and brick, is 140x162′ in size, with a 9′ basement under the engine room. Hoisting is by a Nordberg 32x72″ duplex-cylinder engine, with double-conical drum of 12′ 6″ minimum and 18′ 6″ maximum diameter, good for 6,000′ depth. In a wing, built 1907, on the south side of the power-house, is a 65-drill Nordberg 2-stage cross-compound air-compressor. The boiler room has ten 250-h. p. Parker and Burt boilers, with steel and brick coal-bins that have direct rail connection over a trestle, and a 140′ reinforced concrete smokestack, standing on a 16′ base. Equipment at No. 8 shaft includes a change-house, with concrete walls and roof, and a considerable number of dwellings for employés.

No. 9 shaft, 2,600′ north of No. 8, is the old 100′ Pontiac shaft, cut down to 3-compartment size, and was about 200′ deep at the end of 1908, giving a promising showing at this shallow depth. The Pontiac tract never was a producer, and has been but slightly explored.

The Quincy bought of the Arcadian, Nov. 19, 1906, for $750,000, a tract of 800 acres, to the north of the Pontiac tract, carrying about one mile of

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the Pewabic lode. These lands, formerly held by St. Mary's Mining Co., before bought by the Arcadian, are the N. ½ of Section 18, T. 55 N., R. 33 W., and the N. ½ and SE. ¼ of Section 13, T. 55 N., R. 34 W.

The surface plant of the Quincy is exceptionally complete. Near No. 2 shaft is the 62x145′ fireproof machine-shop, of stone, brick and steel, with truss roof, having a traveling crane with crane-run for entire length of shop, with a complete equipment of machinery and tools. A plastered brick tunnel, connecting the machine-shop, compressor plant and boiler-house, serves as a conduit for steam and air pipes. The blacksmith-shop is 50x154′, with a 50x90′ wing, of ashlar-finished redstone, with fireproof steel truss roof having 3 large ventilators, and is equipped with 12 forges, steam-hammer, fans, bolt-cutters, drills, etc. Steam has been replaced by electric motors in the carpenter shop, smithy and roundhouse.

Miscellaneous buildings at the mine include a carpenter-shop, warehouse and a considerable number of miscellaneous structures required in the operation of an extensive mine. The general office is a handsome and substantial two-story and basement structure of ashlar-finished redstone.

Water for boilers, and for potable use at the mine location, is taken from Portage Lake, the pumping station, on the margin of the lake, being of ashlar-finished redstone, the pumps forcing water for a mile, against a head of 640′. A large coal-yard is located between shafts No. 2 and 4.

A private telephone exchange, with the central station in a 20x25′ frame building, has a switchboard for 100 instruments, with telephones installed in all parts of the mine, shops, mills and smelters.

The company owns several hundred dwellings at the mine location, and a considerable number of dwellings at the mills. The newer houses are mainly of 7-room size, on solid stone foundations, and the mine and mill locations are exceptionally neat. The company also has extensive holdings of valuable land, in and adjoining the city of Hancock, and portions of this land have been platted, from time to time, for residence purposes, and sold at good prices.

The company's private rail line, known as the Quincy & Torch Lake Railroad, built 1890, is 6 miles long, touching all of the shafts and shops at the mine, and at the boiler-house, wharves and coal-sheds at the mill, and is connected with the Mineral Range, Hancock & Calumet and Copper Range railroads. The rail line has solid rock ballasting and steel bridges, with a continuous down-grade haul between the mine and the mill. Equipment includes 6 locomotives, freight cars and nearly 150 hopper-cars for rock, the latter having automatic couplers and air-brakes. The roundhouse, near No. 7 shaft, has a 36x40′ addition containing a special machine shop, for the use of the railroad only.

The mills, 6 miles from the mine, at Mason, on Torch Lake, have a combined stamping capacity of about 4,500 tons daily. No. 1 mill, of wood, had 5 Allis-Chalmers 2-way stamps, with 20″ cylinders, using the coarse-stamping system, but 2 heads were given 24″ cylinders in 1908, with work begun on a third head. The heads with 24″ pistons take steam at 100 lbs. pressure, and it is probable that all the remaining stamps will be changed over to cylinders of 24″ size, credit for which is due Mr. Jas. W. Shields, the mill superintendent On test, one 24″ head stamped 865 tons of rock in 24 hours, oversize being handled in another head, equivalent to handling oversize in rolls, as is done generally in the case of compound stamps. The heads with 24″ pistons have an average daily working capacity of 700 tons, occasionally reaching 800 tons, which compares favorably with the work of steeple-compound stamps. Dressing machinery at No. 1 mill includes 92 Hodge jigs and 32 Wilfley tables.

No. 2 mill, standing 630′ north of No. 1, is 132x210′ in size, of steel on stone foundations, with 180 windows, each having 13⅓ sq. ft. of glass,

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flooding the interior with light. This mill has three 20" Allis-Chalmers heads, each stamp set on foundations of heavy timbers and concrete, surmounted by a bottom plate of 22 tons, a middle plate of 18 tons and a top plate of 18 tons, all of solid iron castings, above which are the mortar-boxes of the stamps. One head was remodeled, as a steeple-compound stamp, in 1905, and this was carefully tested, the water condensed from steam used being weighed, giving a close check on the duty of the engine. The result of the very careful tests made decided the management to stick to simple heads. Finishing jigs and slime-tables have been replaced by 24 Wilfley tables, 8 for each stamp, assisted by 4 Standard concentrators. Each stamp has 12 rough jigs, 6 Wilfleys for finishing and 2 Wilfleys and 1 Standard table for slimes. Stamps have 1" revolving screens for mortar-boxes and the mill has a settler, from which slimes are taken to the Wilfley tables. Regrinding is done by a Trent Chilean grinder, with 3 jigs and 3 Wilfleys as auxiliaries. Regrinding of raggings in No. 1 is done by an Allis-Chalmers Huntington mill. The mortars of all stamps have hydraulic discharges, as have the launders leading from the mortars, these giving about 60% of the total production of copper secured at the mills. By the adoption of hydraulic discharges and other improvements, the capacity of the stamp-heads has been increased about 25%, while changes in the wash have given an increased capacity of 30%, with labor costs reduced 25% and loss in tailings cut down 40 to 50%. About 35% of the present product of the mill is No. 3 grade mineral, carrying very fine copper. Mineral is dressed much lower than formerly, averaging, 1907, only 63.2% fine copper.

Mineral bins receive mineral in buckets by overhead trolley from the wash-room in No. 1 mill, and from No. 2 mill in hopper-cars drawn by an electric locomotive traversing a 650' track connecting the mills. The mineral-bins, of concrete and cement, are kept at a temperature of 80° F., to dry out the water remaining from the wash, and gates are operated by steam pistons. There is a 54' platform-scale, with minimum weighing capacity of 10 lbs. and maximum of 220,000 lbs.

The 56x90' power-house, of steel frame, on stone foundations, at No. 2 mill, is equipped with four 250-h. p. Wickes vertical water-tube boilers and a 100' smokestack on a 30' foundation. There is an electric light plant, and in connection with the mills there is a machine shop and several minor buildings.

The 54x54' brick and steel pumphouse at the mills has a 20,000,000-gallon Allis-Chalmers vertical triple-expansion pump, and the old pumphouse has 3 pumps with a combined capacity of 21,000,000 gallons daily. Water is taken from a 7x7' 6" tunnel, driven 100' under the bed of the lake. A 6x6' 6" tunnel 440' long connects the mills, boiler-houses and pump-houses, this being bricked and plastered inside, and carrying both water and steam pipes.

A considerable village, made up solely of employes and their families, has grown up about the mills.

The extensive tailings of the mills at Mason are under lease to the Mason Mfg. Co., and various experiments on reconcentration have been conducted, at intervals, since 1902.

The Quincy has 3 docks, of which the first is at Hancock, with a 40x416' wharf and a 64x124' warehouse, having deep water in front and railroad tracks behind. A second dock, at the Ripley smelter, has a 350' shipping wharf for copper and a 250' coal-wharf. The third dock, at the Torch Lake mills, has a 40x400' wharf, built of Washington fir, with 18' of water alongside, on it being a 300x800' coal-shed, of steel, with corrugated iron siding and roofing, having storage capacity for 80,000 tons of bituminous coal, this being about the annual consumption of the mine and mills. There are 3 steam coal-hoists, capable of unloading 100 tons per hour each. These have 120'

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steel towers, traveling on a track 22′ wide and 300′ long, running the entire length of the shed. The plant was built by the American Bridge Co., at a cost of about $200,000, and effects a saving of circa 12 cents per ton on all coal used. The railroad reaches the coal-shed by a 650′ trestle, partly of timber and partly with steel bents, supported on 240 concrete piers.

The smelter, blown in Dec. 1, 1898, is at Ripley, on the shore of Portage Lake, opposite Houghton, just east of Hancock and only a half-mile from the mine. These works do a custom business, treating the mineral of the Franklin, Mass and Adventure mines, in addition to that of the Quincy. The principal buildings are of ashlar-finished redstone.

The 40x95′ mineral-house is reached by a 460′ trestle, mineral arriving from the mills in hopper-bottom cars, and being dumped into storage bins, whence it is drawn off, as required for smelting, into steel trucks, running on rails under the gates of the bins.

The 84x144′ reverberatory furnace building has four 40-ton reverberatories, and a second furnace building, erected 1904, has a 60-ton reverberatory furnace, equipped with an automatic casting machine. On arriving at the reverberatory building, the trucks containing mineral are lifted by electric cranes, and contents dumped into the furnaces, which are top-charged. An overhead trolley, in the main furnace building, permits handling large bars and cakes, and a trolley dipping system is in use for casting. Owing to lack of slag room, a new system has been installed, by which 3,000-lb. slag-pots have replaced the diminutive pots formerly used. The slag-pots are trammed from the furnaces to a 30′ hydraulic elevator, which raises the pots and dumps their contents over the end of a trestle.

A briquetting plant, built 1906, of concrete blocks, has 2 retorts of boiler-iron, each 31′ long and 72″ in diameter, for briquetting low grade mineral, previous to smelting.

The smelting plant includes a cupola building with one blast-furnace, an engine-house, casting-house, cooper-shop, office, laboratory, coal-shed, a small concrete machine-shop and a 50x100′ warehouse.

Production of fine copper has been as follows: 18,498,288 lbs. in 1903: 18,343,160 lbs. in 1904; 18,827,557 lbs. in 1905; 16,194,838 lbs. in 1906; 19,799,973 lbs. in 1907, and to the end of 1907 the mine had produced 390,274,045 lbs. fine copper. Production, 1908, was circa 20,000,000 lbs. fine copper. The mine makes about 100,000 oz. silver yearly. The last detailed annual figures, for 1905, gave a yield of 16.6 lbs. fine copper per ton of rock stamped, but returns probably were about 15 lbs. only, in 1908. Production for last quarter of 1908 was circa 4,200 tons of stamp-rock daily.

But for the heavy outlay for improvements, begun in 1898, the wisdom of which was questioned at that time by many shareholders, the Quincy today would be a decadent property, with but a few uncertain years of life remaining, whereas, it secured, in 1908, the largest production in the history of the mine. The policy of growth, begun with the purchase of the Pewabic mine, nearly 20 years ago, has been continued steadily, and the management is entitled to credit for following, consistently, the policy of expansion that is necessary to the successful operation of any large industrial enterprise in the Twentieth Century.

QUINCY MINING CO. **UTAH.**

Dead. Property sold, April, 1902, to Daly West Mining Co. Formerly at Park City, Summit Co., Utah.

QUINTERA MINING CO., LTD. **MEXICO.**

Office: 11 Rue Boudreau, Paris, France. English office: 20 Bishopsgate St., London, E. C., Eng. Mine office: Adeana, Alamos, Sonora, Mex. Employs circa 400 men. Jacques F. Kulp, chairman; A. Dubois, vice-chairman; S. Ein-

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horn, secretary; E. May, treasurer; J. Hebart, manager; C. Mahant, superintendent; Miguel Valenzuela, mine superintendent; L. Le Bouticant, mill superintendent; Francisco A. Esquer, smelter superintendent. Organized May 4, 1888, under laws of Great Britain, with capitalization £52,000, shares £1 par. Pays annual dividends of 2s. to 5s. Net earnings were £8,196, and dividends were £5,850, in 1907.

Lands, 26 claims, area 154 hectares, also a 2-hectare millsite, and the ranchos of Cieneguita and Calera, with total holdings of 6,000 hectares, in the Alamos district of Sonora and the Fuerte district of Sinaloa. Property shows fissure veins in trachyte, and contact deposits between trachyte and granite, there being 4 ore bodies, of which one, under development, is reported as a chimney vein, raking south, with strike of North 15° East, and dip of 80°, of 20′ average width, traceable 500′, reported as proven to depth of 2,000′. Property is primarily a silver mine, making lead and copper as by-products, ore being reported by company to average 10% copper; 11% lead; 15% zinc; 200 oz. silver and $5 gold per ton, principal copper ores being malachite and chalcocite.

The mine is opened by shafts of 600′, 950′ and 540′, with circa 3,000′ of workings, showing 45,000 tons of concentrating ore and upwards of 10,000 tons of ore blocked out for stoping. Mine was opened in the Sixteenth Century, and has been working continuously.

Equipment includes a 450-h. p. steam plant and 90-h. p. electric plant, with 300 h. p. used at the mine, and 540 h. p. at the mill. There are 3 hoists, of 220 aggregate horse power, good for 700′ depth, and a 4-drill Fraser & Chalmers air-compressor.

Buildings include a wooden carpenter-shop of 220 sq. ft. area, smithy of 684 sq. ft., office and 3 dwellings. There also is a sawmill.

The mill, of wood, of 2,100 sq. ft. area, and of 45 tons daily capacity, has 20 gravity stamps.

The concentrator, of brick and lumber, of 3,024 sq. ft. area, has a No. 3 Sturtevant crusher, 3 Wilfley tables and 6 slime tables.

The smelter, 2 miles from the mine, receiving ore by tramway, has a 12-ton Fraser & Chalmers blast-furnace, making matte carrying 40% copper, 1,200 oz. silver and 10 grams gold per ton, shipped to Ledoux & Co., New York, for refining.

Production, 1907, was 14,500 tons of ore treated, yielding circa 350 metric tons of matte, carrying about 300,000 lbs. fine copper, 425,000 oz. silver and 3,500 grams gold.

RADIUM COPPER MINING CO. **COLORADO.**

Office: 1226 Seventeenth St., Denver, Colo. Mine office: Radium, Grand Co., Colo. Harry S. Porter, president and treasurer; W. H. Gould, vice-president; P. O. Warren, secretary; preceding officers, A. Cunba and L. D. Cunba, directors. Organized under laws of Colorado, with capitalization $1,500,000, shares $1 par. Lands, 12 claims, in the Red Gorge district, having about 700′ of workings, with 2 tunnels, upper showing malachite and chalcocite, giving assays of 5.82 to 45.7% copper, from a trace to 5 oz. silver, and from 20 cents to $5.90 gold per ton.

RADIUM MINES CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Lands, 60 claims, circa 4 miles north of the Old Dominion, in a block of 1 to 2 miles width and nearly 4 miles length, running eastward from Pinal Creek. Ten or more of these claims are said to have produced $10,000 to $20,000 each, from surface ores raised by hand-windlasses. Idle.

RAINBOW MINING CO. **ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. N. E. Paul, general man-

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ager. Lands, 2 miles from Crown King, opened by a 160′ shaft and 340′ tunnel, show a vein of 30″ to 6′ width, with an 8″ paystreak carrying argentiferous and auriferous copper ore of good average tenor. Presumably idle.

RAINBOW MINING CO. **UTAH.**

Office: care of Ernest M. Fowler, secretary, Salt Lake City, Utah. Mine office, Alta, Salt Lake Co., Utah. Richard J. Jarvis, president and manager; Geo. Saxon, vice-president; preceding officers, Andrew M. Jarvis, and Andrew F. Jackson, directors. Organized 1906, with capitalization $50,000, shares 10 cents par. Has a 215′ tunnel, showing stringers of ore, and expects to cut the main vein at about 300′ length.

RAINBOW MINING & MILLING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Osburn, Shoshone Co., Idaho. Hon. Herman J. Rossi, president; G. E. Marlowe, secretary and treasurer; Chas. F. O. Merriam, consulting engineer. Lands, 6 claims, near the Gray, opened by a 200′ tunnel on a 10″ vein of gray copper with iron and quartz gangue.

RAMBLER COPPER MINING CO. **ARIZONA.**

Dead. Lands sold, February, 1903, to Lion Copper Mining Co. Formerly at Stoddard, Yavapai Co., Ariz. Described Vol. IV.

RAMBLER COPPER MINING CO. **WYOMING.**

Dead. Was succeeded, Oct. 1, 1902, by Rambler Mining & Smelting Co. Formerly at Holmes, Albany Co., Wyo.

RAMBLER COPPER & PLATINUM CO. **WYOMING.**

Office: 710-145 LaSalle St., Chicago, Ills. Mine office: Holmes, Albany Co., Wyo. Frank M. Wootton, president; W. J. Sherwood, vice-president; M. M. Green, secretary; Frank C. Sheldon, treasurer; preceding officers, Dorchester Mapes, A. C. Jones, W. C. Stone, W. R. Smythe, Jr., J. Thielman, Frank T. Day and J. B. Stephens, directors. Organized, circa 1907, as a merger of Rambler Mining & Smelting Co. and New Lincoln Copper Co.

The lands formerly held by New Lincoln Copper Co. are 2 claims, patented, area 40 acres, lying north of and adjoining the Rambler mine, on which shafts of 30′ and 50′, sunk to cut the extension of the Rambler vein, are said to show auriferous and argentiferous copper ore.

The Rambler mine, 10 claims, area 200 acres, fairly timbered, is at the head of Douglas Creek, on the crest of the Medicine Bow Mountains. Mine, opened 1870, for gold, and relocated, 1900, for copper, shows a fault fissure in grano-diorite, carrying a great variety of copper minerals in various stages of alteration, associated with sundry rare metals in commercial quantities, comparatively free from such deleterious elements as bismuth, antimony and arsenic. Ore includes a little native copper, in nuggets and dendrites, associated with cuprite, in the upper levels, also melaconite, chalcocite, covellite, chalcopyrite and chrysocolla, and is especially notable for containing large quantities of covellite, carrying gold, iridium, osmium, palladium and platinum, latter occurring as sperrylite. The ores have a gangue of decomposed granite, giving talcose alteration products, and carrying more or less pyrite, hematite and marcasite, all with small percentages of copper.

Development is by a 65′ vertical shaft, from the bottom of which an incline runs, on the vein, at an angle of 45°, with three levels opened, there also being a 175′ vertical main shaft, connecting with the original workings on the 2d and 3d levels. The mine has circa 2,800′ of workings, and was claimed, by former owners, to have 22,100 tons of ore, ranging from 20 to 45% copper, blocked out for stoping on the first and second levels, but these figures were exaggerated. Exact size of the ore body apparently is undetermined, but ores give assays ranging from 6 to 39% copper, with average smelter returns of 20 to 33% copper from carefully hand-selected ore. Assays of Rambler matte have given 6.75 oz. silver, 2.25 oz. gold and platinum combined, and 6

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oz. palladium per ton. Cost of refining the matte and separating the various rare metals is approximately $40 per ton of copper, or 2 cents per pound.

Surface improvements include a 21x44' shafthouse, ore-bins, carpenter-shop, smithy, office, assay office, sawmill, boarding-house and bunk-houses.

There is a small smelter having a 40-ton water-jacket blast-furnace, connected with the ore-bins by trestle, but the smelter has been idle since 1903, when production was 249,196 lbs. fine copper. Property considered promising, but management, which is practically same as that of the old company, is not regarded favorably.

RAMBLER MINING CO. **WYOMING.**

Dead. Company lost lands through failure to do assessment work. Formerly at Rambler, Carbon Co., Wyo. Fully described Vol. VII.

RAMBLER MINING & SMELTING CO. **WYOMING.**

Dead. Succeeded, circa 1907, by Rambler Copper & Platinum Co. Formerly at Holmes, Albany Co., Wyo. Very fully described Vol. VII.

RAMMELSBERG MINE. **GERMANY.**

Office and mine: Clausthal im Harz, Prussian Saxony, Germany. Employs circa 650 men. Bergrat Richard, director. Property, owned jointly by the Crown of Prussia and the Duchy of Brunswick, is a very ancient mine, worked since A. D. 972.

Lands carry a lenticular ore body, of 40' to 50' width and circa 4,000' length, in schists intercalated in Devonian slates. The ore is a dense mixture of chalcopyrite, galena, sphalerite and pyrite, with occasional tetrahedrite, gangue being mainly of barium sulphate, aluminum silicate and calcium-magnesium carbonate. Ore as mined is divided into 3 grades, first averaging 18.37% copper and 3.85% lead; second grade averaging 12.07% copper and 1.7% lead; third grade averaging 5.44 copper and 1.25% lead. The three grades of ore carry from 0.008 to 0.017% silver, and from 0.00011 to 0.00013% gold. All ores are slightly arsenical, ranging from 0.1% arsenic in the richer copper ore to 0.2% arsenic in third grade ore. The mine also has mixed ore, carrying about 5% copper and 6% lead, both with gold and silver values, and lead ore averaging 9.15% lead, with a trace of copper.

The mine is developed by shafts of 296 and 316 meters depth, and has about 16,000 meters of workings, estimated to show circa 15,000,000 metric tons of cupriferous and plumbiferous slates, averaging circa 4.5% copper, 10% lead, 20% zinc and 3 oz. silver per ton.

Equipment includes 2 hoists, good for 350 meters each, and a 30-drill air-compressor.

The copper smelter, known as the Oker Hütte, at the mine, is of 300 tons daily capacity, while lead ores are reduced at other works, known as the Julius Hütte and Sophien Hütte. Equipment of the Oker Hütte includes 20 kilns and ovens for calcining, twelve 25-ton blast-furnaces and five 15-ton reverberatory furnaces. The first-fusion product is a matte of 35 to 40% copper tenor, carrying 3 to 4% lead in mixed ores treated, and this matte therefore is roasted and resmelted. The Oker works produce also considerable speiss, carrying about 51% copper, 35% lead, 1.8% zinc and 0.175% combined gold and silver, with traces of nickel and cobalt, also iron, arsenic, bismuth, antimony and sulphur. Product of the Oker Hütte is blister copper and anodes.

The Oker Hütte includes an electrolytic refinery and acid plant, annual capacity of latter being 25,000 metric tons sulphuric acid of 50° Beaumé. The electrolytic refinery has 600 tanks with multiple arrangement. Annual production of the Oker Hütte is circa 1,700 metric tons of fine copper, in various forms, and about 1,100 metric tons of bluestone. Production, 1902, was 3,608,930 lbs. electrolytic copper, 1,074 metric tons bluestone, 5,239 metric tons

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lead, 11,522 kgs. silver and 96.5 kgs. gold, also quantities of various by-products, including copperas, zinc sulphate, soda, etc. Production, 1905, was 3,527,360 lbs. fine copper, and, 1907, was circa 3,500,000 lbs. fine copper.

COMPAÑIA MINERA IGNACIO RODRIGUEZ RAMOS, S. A. **MEXICO.**

Office: Jiménez, Chihuahua, Mex. Mine office: Baca, Hidalgo, Chihuahua, Mex. Alfredo Rodriguez, president; Rafael L. Quiroz, general manager; Ramón G. Aguirre, superintendent. Organized 1902, under laws of Mexico. Lands, 15 pertenencias. Country rock is limestone, carrying lenticular ore bodies. One lense, under development, has a width of 78′ and length of 140′, with depth not ascertained, carrying malachite, azurite and galena, said to average 5% copper, 25% lead, 6% zinc, 15 oz. silver and $8 gold per ton, opened by an 800′ shaft and tunnels of 400′ and 900′. Mine has a steam hoist and two electric drills, and ships ore to the American Smelting & Refining Co., for reduction. Output, 1905, was circa 35,000 metric tons of ore, and production therefrom is estimated at 1,750,000 lbs. fine copper.

JOSÉ TOMÁS RAMOS i RAMOS. **CHILE.**

Office and mine: Chalingâ, Illapel, Coquimbo, Chile. Property is the Llamaco mine, showing large ore bodies of 4 to 7% average copper tenor, well adapted to concentration, but output is hampered by carriage charges of 13 pesos per metric ton to the railroad. Has a small smelter. Production, 1903, was only 155 metric tons of 22% ore, secured with 14 workmen. With rail communication and a modern reduction plant the property could be made a considerable producer.

RAMSDELL-PARROT MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

RANKIN COPPER MINING CO. **WYOMING.**

Office and mine: Rawlins, Carbon Co., Wyo. Organized 1904, with capitalization $25,000. Idle and apparently moribund.

RANSON COPPER MINING CO. OF ONTARIO, LTD. **ONTARIO.**

Office: Sault Ste. Marie, Mich. B. Frank, president; David Rustander, secretary; D. J. Ranson, superintendent; R. H. Taylor, consulting engineer. Organized 1902, under laws of Ontario, with capitalization $3,000,000, shares $1 par. Lands, 3,600 acres, in Chesley and Anderson townships, Algoma, Ontario, said to show 14 veins, of which 6 contact veins have been opened by 8 shafts, of 23′ to 75′ depth, veins averaging 25′ width and giving assay values up to 12% copper and 3 oz. silver per ton, from chalcopyrite. Has steam power. Idle for several years and apparently moribund.

RARITAN COPPER WORKS. **NEW JERSEY.**

Owned by United Metals Selling Co.

RARUS MINE. **MONTANA**

Owned by Butte Coalition Mining Co.

RATTLER MINING CO. **ARIZONA.**

Office: 740 Postal Telegraph Bldg., Chicago, Ills. Mine office: Globe, Gila Co., Ariz. Kendrie P. Crawford, president and manager; Wm. A. Gilpin, superintendent. Organized under laws of Maine, with capitalization $500,000, shares $1 par. Controls, through ownership of 53% of issued stock, the Iron Horse Mining Co. Lands, 6 claims, known as the Iron Horse group, 5 miles from Globe and circa 3 miles east of the Iron Cap mine, having a 55′ three-compartment shaft, in a vein showing a 25′ outcrop, selected ores from which have assayed up to 16% copper and 192 oz. silver per ton.

RAVEN MINING CO. **MONTANA.**

Office and mine: 68 Silver Bow Blk., Butte, Silver Bow Co., Mont. E. C. Frisbie, president; John Berkin, vice-president and general manager; J. A. Poore, secretary; A. B. Curtis, treasurer; preceding officers, Donald Campbell,

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Robt. A. Griffing, E. J. F. Rea and E. A. Slack, directors; W. Spencer Hutchinson, consulting engineer. Organized 1903, under laws of Montana, with capitalization $500,000, increased, 1907, to $1,000,000, shares $1 par; issued, circa $630,000. Bonds, $65,000, at 7%. On Sept. 11, 1908, the company had on hand $1,822 in cash, with bills payable of $16,500. American Trust Co., Boston, transfer agent. Annual meeting, second Tuesday in June.

Lands, 2 claims, fractional, area 23 acres. Property includes the Raven claim, owned outright, and a six-sevenths interest in the Snoozer mine, one-seventh of which is owned by the Red Metal Mining Co., which is the operating corporation of the Butte Coalition Mining Co. Lands, which are considered well located, have an east and west length of circa 2,000', in line with the Mountain Consolidated mine.

The Snoozer claim has shafts of 75' and 125', with 5,780' of workings, but was a producer, through the Buffalo shaft of the Anaconda company, until June, 1906, when the company was enjoined from working the Snoozer vein, which is subject to litigation, as the Butte & Boston claims that the vein apexes on the La Plata claim of that company, and, July, 1907, the lease of the Buffalo shaft was canceled by the Amalgamated Copper Co., and the claim advanced that the Snoozer vein apexed beyond the Raven side-lines. This matter remains unsettled. The Snoozer claim shows 4 veins, and ore produced therefrom, prior to suspension, averaged about 4% copper, 8 oz. silver and $1.25 gold per ton. The Snoozer has been opened on the 800', 1,200' and 1,500' levels, by crosscuts from the Buffalo shaft of the Anaconda, the 1,200' level showing a 4' vein carrying high grade ore, while on the 1,500' level the ore body was much wider. Previous to suspension, the Snoozer was shipping about 20 tons of ore daily, to the Washoe works.

The Raven claim, previously idle for some time, has been developed vigorously since Apr. 1, 1907. Development is by a 700' air-shaft and a 1,200' incline known as the Raven shaft, planned to be sunk to 1,500'. The depth of 1,200' on the incline gives a vertical depth of about 1,000', and there are circa 5,500' of workings on the Raven claim. On the 900' level a crosscut shows a 25' vein carrying a hanging-wall paystreak averaging about 3.5% copper. On the 1,100' level the vein is of about 30' width, showing ore, below commercial grade, averaging circa 2% copper, with small gold and silver values. The Raven claim has 3 veins, and to depth of circa 500' was a silver-gold mine, yielding ore averaging circa 16 oz. silver per ton, with fair gold values.

Equipment includes a 20x36" hoist, good for one-half mile depth, and a 5-drill Ingersoll-Rand air-compressor, with 4 mine buildings.

From June 1, 1907, to Sept. 11, 1908, four sets of leasers, working in the upper levels, extracted gold and silver ores, on a royalty basis, company's proportion of values amounting to $2,771.

The standing of the company was injured, 1906, by rank manipulation of the share market, stock going up to $8 per share, then back again to 50 cents. In November, 1908, large shareholders came to the company's relief, by purchasing 30,000 shares of treasury stock, at par, giving the company funds sufficient to liquidate its floating indebtedness, and provide for further development. Property is considered promising, though it has not yet reached an assured basis.

RAVENSTHORPE SMELTER. **AUSTRALIA.**

Owned by Phillips River Gold & Copper Co., Ltd.

RAWLEY MINING CO. **COLORADO.**

Mine office: Bonanza, Saguache Co., Colo. David G. Weems, manager, at last accounts. Ores carry lead, silver and copper. Has steam and electric power. Presumably idle.

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RAY CONSOLIDATED COPPER CO. **ARIZONA.**

Office and mine: Exchange Bldg., Colorado Springs, Colo. Branch office: 1107 Union Trust Bldg., Los Angeles, Cal. Mine office: Kelvin, Pinal Co., Ariz. Sherwood Aldrich, president; D. C. Jackling, vice-president; E. P. Shove, secretary and treasurer; Philip Wiseman, general manager; Seeley W. Mudd, chairman executive committee; preceding officers, C. M. MacNeill, Spencer Penrose, John Arnan and J. G. Gordon, directors; Chas. H. Cutting, superintendent; A. Chester Beatty, consulting engineer.

Organized circa May, 1907, under laws of Maine, with capitalization $6,000,000, increased, circa 1908, to $8,000,000, shares $10 par; issued, $6,156,000. Bonds, $3,000,000, at 6%, dated July 1, 1907, due July 1, 1924, convertible into stock until July 1, 1914; issued, $1,156,000. Hayden, Stone & Co. have an option, until July 1, 1909, on $1,800,000 of convertible bonds remaining unissued. Company was said, November, 1908, to have circa $275,000 on hand. Company is a twin of the Gila Copper Co., and is controlled by the same interests as the Utah Copper Co. Morton Trust Co., New York, registrar and transfer agent.

Lands, 1,296 acres, on Mineral Creek, 6 miles from Kelvin, the nearest railroad point, also the townsite of Kelvin, bought of the Ray Copper Mines, Ltd. The property shows a mineralized zone approximately 3,000′ wide and 12,000′ long, with prospects of further extensions, with a porphyritic belt, cut by numerous diabase dikes, having impregnations of low grade copper sulphides; ore being disseminated in granules and veinlets through the country rock, the deposits being markedly similar to those at Ely, Bingham and Clifton. Depth of payable ore apparently is undetermined, but presumably is at least 200′ to 300′. Under the old management the property was said to show nearly 1,000,000 tons of ore, claimed to average 4.5% copper, the claimed ore tenor being much too high, as apparently the average tenor of the ore is 2 to 2.5% copper, though with some ore of higher grade.

Development is by a 300′ shaft and several working tunnels, but the ore body has been proven mainly by the use of 6 diamond drills, each averaging about 50′ of boring daily, holes being bored at 100′ intervals to depth of 350′, the drill borings being estimated to develop between 4,000,000 and 5,000,000 tons of ore, averaging 2.25 to 2.5% copper. The former owners expended about $1,000,000, largely in misdirected work.

Transportation between the mine and mill is by a 6-mile narrow-gauge private railway, which was not entirely completed, at the end of 1908.

An old concentrator, enlarged, 1907, to 300 tons daily capacity, on the Gila river, is planned to be enlarged to 1,000 tons size, as the first unit of a 6,000-ton mill. It is claimed that the ore can be concentrated 15 or even 20 into 1.

The property formerly had a smelter, erected 1897, but never blown in, which was burned, March, 1906, the fire being a blessing in disguise, as the smelter was of no particular value for the present day.

Very extensive development was under way, 1907, with a force of about 600 men, until September, 1907, when the force was first cut in half, and then all work suspended, work being resumed, 1908, with a smaller force. The Ray Consolidated is a property of exceptional promise, and is under thoroughly competent management.

RAY COPPER MINES, LTD. **ARIZONA.**

Dead. Lands sold, circa 1907, to Ray Consolidated Copper Co. Formerly at Ray, Pinal Co., Ariz. Fully described Vol. VI.

RAY EXTENSION COPPER CO. **ARIZONA.**

Mine office: Ray, Pinal Co., Ariz. Organized circa July, 1907, under laws of Arizona, with capitalization $1,000,000, by D. A. Seaman and R. W. Seaman.

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RAYMOND COPPER & SILVER MINING CO. **MONTANA.**

Office and mine: Helena, Lewis & Clark Co., Mont. J. E. Teague, secretary. Lands are in the Lump Gulch district, east of the Liverpool mine, between the heads of Strawberry and Shingle Gulches, on the western slope of Strawberry Mountain. Development is by two shafts, one of 140', and a 240' tunnel. Shipped a little ore, 1907.

RAYNOR COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Lewis, Mariposa Co., Cal. Described Vol. VI.

READY BULLION COPPER CO. **ALASKA.**

Office: 517-131 State St., Boston, Mass. Property is in Alaska. Presumably idle.

READY PAY MINING CO. **NEW MEXICO.**

Mine office: Hillsboro, Sierra Co., N. M. Has auriferous and argentiferous copper ore. Idle and presumably moribund.

COMPAÑIA MINERA REAL DEL MONTE y PACHUCA. **MEXICO.**

Office: 50 Congress St., Boston, Mass. Mexican general office: 11 San Bernardo, Mexico, D. F. Mine office: Pachuca, Hidalgo, Mex. Pablo Martinez del Rio, president; A. F. Holden, managing director; preceding officers, W. H. Coolidge, E. A. Clark and Señor Eiguero, directors; Edw. E. Merrill, manager; H. A. Prosser, metallurgical superintendent; T. H. France, consulting engineer. Capitalization 225,000 pesos, shares 100 pesos par. Is controlled, through ownership of practically entire stock issue, by United States Smelting, Refining & Mining Co. Paid first dividend, under new management, April, 1908.

Lands, 116 claims, in 2 districts, principal mines being the Camalia, Barron and Juatimoctzin at Coreteza, and the Cabrera, Aviadero, Santa Brigida, Dificultad and Resquicio at Real del Monte.

The Real del Monte is possibly the oldest Spanish mine in Mexico, dating from A. D. 1553, and the patio process of reduction was first used at this mine, in 1557. Electric power is used throughout, 5,000 h. p. being taken from the Compañía Electrica y Irrigadora de Hidalgo. Equipment includes 6 powerful electric hoists, capable of raising 10-ton loads at average speed of 500' per minute, equipped with 3-phase, 440-volt, 50-cycle motors. Has electric pumps in the Camalia and Cabrera mines, and steam pumps in the Dolores, San Juan and Dificultad mines.

Plant comprises various mills for ore reduction, including the Loreto mill in Pachuca, using the patio process, and the Hacienda de Beneficio San Antonio de Regla, using the barrel process, with a capacity of 12,000 tons of ore yearly. The Loreto mill has been remodeled and increased to 250 tons daily capacity, using electric power throughout. The new Guerrero mill, opened Apr. 25, 1908, having 40 stamps, tables and a cyanide plant, is rated at 300 tons daily capacity.

Production, under old management, averaged 65,000 metric tons of ore yearly, carrying an average of better than 1 kilogram silver per metric ton. Capacity of new works is practically 3 times that of the old.

NEGOCIACION MINERA REAL DEL MONTE. **MEXICO.**

UNION y BILBOA.

Mine office: Ojocaliente, Zacatecas, Mex. H. Dalonne, manager, at last accounts. Has cupriferous silver-lead ores. Presumably idle.

REALITO GOLD, SILVER & COPPER CO. **MEXICO.**

Mine office: Alamos, Sonora, Mex. J. L. Shepard, general manager; D. Durfee, superintendent. Has argentiferous copper ores, with steam power, employing circa 40 men.

REALITO MINING CO. **MEXICO.**

Letter returned unclaimed from former office, Guadalajara, Mex. Mine office: Tapalpa, Sayula, Jalisco, Mex. Silviano Camberos, manager, at last

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accounts. Lands, 25 pertenencias, near Chiquilistlán, 50 kilometers northwest of Sayula, including the Cuprifera, Rinconada and Sin Nombre groups. Ore occurs in "mantos," or blanket veins, and in fissures, giving assays up to 60% copper, 2 kgs. silver and $10 gold per ton. A little ore, smelted in adobe furnaces, at the mines, has given good returns. Presumably idle.

REBELJ & VIS COPPER MINES, LTD. SERVIA.

Office: care of A. F. V. Wild, 28 Budge Row, London, E. C., Eng. Mine office: Rebelj, Vljewo, Servia. Organized Nov. 21, 1907, under laws of Great Britain, with capitalization £25,000, shares £1 par.

R. E. BRUNER COPPER CO. ARIZONA.

Office: 812 Grand Ave., Kansas City, Mo. Mine office: Patagonia, Santa Cruz Co., Ariz. R. E. Bruner, president; Rea M. Bruner, vice-president; Glen L. Bruner, secretary and treasurer. Organized June 24, 1907, under laws of Arizona, with capitalization $3,000,000. Company reported 680,000 shares unissued, Aug. 6, 1908.

Lands, 8 claims, unpatented, near the Anaconda-Arizona and Mansfield. A 54' tunnel, on the Mescal claim, is said to give indications of argentiferous lead and copper ore, and company claimed, August, 1908, to have opened the vein for nearly a mile in length, presumably by trenching, and planned driving a tunnel at least 500' on the Mescal claim.

RED BIRD MINING CO. MONTANA.

Office: Helena, Mont. Mine office: Austin, Lewis & Clark Co., Mont. J. M. Clements, president and treasurer; Frank Jacquemin, vice-president; A. A. Pelletier, secretary and general manager; preceding officers, Robert Lucas and C. O. Clark, directors. Organized Aug. 18, 1902, under laws of Montana, with capitalization $1,500,000, shares $5 par. Paid dividends of $72,000, to end of 1905. Lands, 7 claims, area 140 acres, in the Greenhorn district, carrying 15 fissure veins, of which 2, of 5' average width, are developed by the 400' Red Bird shaft and the 300' Copper Hill shaft. The Copper Hill mine shows sulphide ore averaging 1.3% copper, with a 90% excess of iron, in a 60' vein. The Red Bird mine has about one mile of workings, claimed to put 250,000 tons of ore in sight. Estimated average ore values of the Red Bird, as given by a former management, were 21% copper, 45% lead, 35 oz. silver and $5 gold per ton, this being manifestly a great exaggeration. Has a 180-h. p. steam plant with 4 hoists and a 4-drill air-compresser. Has 5 mine buildings. Presumably idle.

RED CANYON MINING CO. NEVADA.

Office: 703 Marquette Bldg., Chicago, Ills. Mine office: Gardnerville, Douglas Co., Nev. H. P. Obesley, president; D. F. MacKay, vice-president; A. F. Doyle, secretary and manager; C. L. Doyle, treasurer; preceding officers, L. C. Hunter, W. L. Thompson and P. C. Wilder, directors; H. C. Jessen, superintendent. Organized February, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 5 claims, area 100 acres, well watered and fairly timbered, said to be in the Yerington district, but mine office is in the adjoining county. Property is said to show 3 veins, with northeasterly and southwesterly strike, traceable 7,500'. The main vein is said to be 80' to 100' wide, with dip of 30° to 45°, showing cuprite, malachite, bornite and chalcopyrite, assaying 2 to 6% copper, with some lead. Company claims to have exposed 13,000 tons of ore averaging 8% copper and $1.30 per ton in combined gold and silver values. Development is by 6 shafts of 30' to 75', and 6 tunnels of 60' to 350'. Company is said to plan a 100-ton smelter.

RED CLOUD MINING CO. CALIFORNIA.

Office: Los Angeles, Cal. Mine office: Salton, Riverside Co., Cal. E. H. Gould, superintendent. Has auriferous and argentiferous copper and lead

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orea, with steam and gasoline power, 2-stamp mill, concentrator and 80-ton smelter. Idle.

RED CLOUD MINING CO. **MEXICO.**

Dead. Apparently was successor of Consolidated Gold & Copper Co., and was merged, circa August, 1908, in Kansas-Cananea Copper Co. Lands, circa 8 miles south of La Cananea, were said to show considerable ore of low average copper tenor. Formerly at La Cananea, Arizpe, Sonora, Mex.

RED CROSS MINING CO. **WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. David Boyle, president; D. F. Scanlan, treasurer; R. W. Emerson, secretary. Organized 1906, under laws of Washington, with capitalization $1,000,000. Lands, 15 claims, in the Wallace district, near the Bunker Hill Mining & Smelting Co., said to show 4 veins, 3 of 7′ to 8′ average width, and one, in granite, of 25′ claimed and apparently about 8′ actual average width, opened by a 65′ tunnel.

REDDING GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: 15-951 Eddy St., San Francisco, Cal. Letter returned unclaimed from former mine office, Redding, Shasta Co., Cal. Has a bad habit of changing offices and leaving no address behind. Letters have been returned at various times from former offices at Oakland and San Francisco. H. D. Irwin, president; R. W. Mayhew, vice-president; Thos. Gilbert, secretary; J. H. Creighton, superintendent; preceding officers, A. Ahnefeld and T. S. Rasmussen, directors. Organized under laws of South Dakota, with capitalization $1,000,000. Has authorized a bond issue at 6%. Lands, circa 30 claims at mouth of Middle Creek, and sundry claims at Clear Creek, in the Muletown district, circa 7 miles west of Redding, also placer gold claims. Company claimed, 1905, to be developing a hydro-electric power plant, and claimed to plan building a 500-ton smelter. Is regarded with suspicion.

REDEMPTION COPPER MINING & MILLING CO. **ARIZONA.**

Office: Kingman, Ariz. Mine office: Chloride, Mohave Co., Ariz. Robt. J. Ferguson, president and general manager. Has auriferous and argentiferous oxidised ores of copper.

RED FOX MINING CO. **BRITISH COLUMBIA.**

Mine office: McGuigan, Yale district, B. C. Has argentiferous lead and copper ores, slightly developed. Idle several years.

RED GULCH GOLD-COPPER MINING & MILLING CO. **COLORADO.**

Office: care of E. G. Bettis, president, Cañon City, Colo. Mine office: Copperfield, Frémont Co., Colo. Wm. T. Bridwell, vice-president; M. M. Van Fleet, secretary. Is capitalized at 3,000,000 shares, presumably $1 par. Lands, 11 claims, in the Red Gulch district of Frémont county, 83 acres in the Ilse district of Custer county, and sundry claims in the Monarch district of Chaffee county, Colorado. The Red Gulch group has a 210′ shaft, developing silver-lead ore, and shipped, 1907, some ore of good grade.

RED HILL MINING & SMELTING CO. **CALIFORNIA.**

Office: care of C. B. Allen, secretary, Los Angeles, Cal. Mine office: Victor, San Bernardino Co., Cal. Dr. C. J. Allen, president; J. W. Jackson, vice-president. Lands are about 10 miles from Victor. Idle and apparently moribund.

RED HORSE COPPER CO. **IDAHO.**

Mine office: Springston, Kootenai Co., Idaho. Jasper Neederhood, president; John Neederhood, vice-president; preceding officers and Geo. Ripley, directors; Rudolph A. Jonas, manager. Organized 1904, under laws of Idaho, with capitalization $1,500,000, shares $1 par.

Lands, 18 claims, having a shaft and a 748′ tunnel, with circa 1,500′ of workings, showing ore said to assay 18% copper, with high gold values. Equipment includes a 3-drill air-compressor.

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Apparently the local officers stand well, but the company's advertisements, through H. J. Leighton, fiscal agent, were outrageously exaggerated and highly misleading.

RED JACKET & BISBEE DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Bisbee, Cochise Co., Ariz. Fully described Vol. IV.

REDMAN MINING, MILLING & SMELTING CO. **ARIZONA.**

Office: 17 Battery Place, New York, N. Y. Mine office: McCabe, Yavapai Co., Ariz. W. D. Wintemute, secretary and treasurer; John Derry, superintendent. Organized under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands include claims in Nevada and Mexico, with principal group one mile northeast of McCabe, said to have about 1,000′ of workings, showing a 30″ vein of sulphide ore on the 100′ level. Plans a 10-stamp mill and concentrator. Management makes promises more lavish than are warranted by development secured.

RED METAL MINING CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Thos. F. Cole, president; W. D. Thornton, vice-president; perceding officers, J. C. Lalor, C. D. Fraser and James O'Grady, directors; Arthur C. Carson, general manager; Geo. Moulthrop, general superintendent. Organized Feb. 23, 1906, under laws of New York, with capitalization $11,000,000, shares $100 par. Entire stock issue is held by the Butte Coalition Mining Co., and the Red Metal Mining Co. is a holding company for the Butte Coalition, direct title to lands being vested in the Red Metal. Holdings supposedly include lands described under the title of Butte Coalition Mining Co., also stock control of the Alice, and a few other small properties, including a seventh interest in the Snoozer mine of the Raven Mining Co.

RED METAL MINING CO. **NEVADA.**

Office: care of Alex Colbath, secretary, Salt Lake City, Utah. Mine office: Luning, Esmeralda Co., Nev. Lemuel U. Colbath, president; W. J. Craig, vice-president and general manager; preceding officers, W. Wrightman, Wm. Pischel and Dr. John T. White, directors. Organized circa January, 1907, under laws of Colorado, with capitalization $1,000,000.

RED MOUNTAIN GOLD & COPPER REDUCTION CO. **WASHINGTON.**

Dead. Formerly at Chelan, Chelan Co., Wash.

RED MOUNTAIN RAILROAD, MINING & SMELTING CO. **COLORADO.**

Office: 1004 West End Trust Bldg., Philadelphia, Pa. Mine office: Red Mountain, Ouray Co., Colo. Geo. Crawford, general manager; W. C. Aston, superintendent. Lands include the Yankee Girl, Genesee and Vanderbilt properties, carrying auriferous and argentiferous copper ores. Has steam and electric power.

REDOUBTABLE GOLD & COPPER MINING & MILLING CO. **COLORADO.**

Office: Salida, Colo. Mine office: Turret, Chaffee Co., Colo. David Heaton, president; W. W. Roller, vice-president; J. W. Calhoun, treasurer; J. H. Hunt, secretary; preceding officers and Geo. Sullivan, directors. Organized circa 1907, under laws of Colorado, with capitalization $1,000,000.

Property, formerly held by Par Value Gold & Copper Mining Co., includes a 3-year bond and lease on the Gold Bug and Mandate claims. Lands show 4 fissure veins of about 3′ average width, carrying oxidized and sulphide ores, former said to average 5% copper, 3 oz. silver and $10 gold per ton, opened by shafts of 200′ and 400′, with about 3,000′ of workings.

RED RIVER COPPER CO. **NEW MEXICO.**

Mine office: Red River, Taos Co., N. M. Geo. B. Paxton, superintendent. Property is the Anaconda mine. Has steam power. Presumably idle.

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RED ROCK COPPER CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. J. C. Perry, agent, at last accounts. Lands, 9 patented claims and a millsite. Idle several years.

RED STAR MINING CO. **WASHINGTON.**

Mine office: Kalama, Cowlitz Co., Wash. Has auriferous copper ore and cinnabar. Idle several years.

RED WARRIOR MINING CO. **UTAH.**

Office: Lonsdale Bldg., Duluth, Minn. Mine office: Milford, Beaver Co., Utah. W. A. Eaton, president; Lucien Merritt, vice-president; Geo. W. Logan, secretary; H. L. Palmer, treasurer; preceding officers, Guy A. Eaton, John E. Merritt and Angus Buchanan, directors; T. W. Hamilton, superintendent; R. Hightower, mine superintendent. Organized Jan. 25, 1907, under laws of Minnesota, with capitalization $150,000, shares $1 par.

Lands, 9 claims, area 98 acres, freehold, except 3 acres, held under option, in the Star district, 8 miles from a railroad, showing 2 ore bodies, occurring in bedding planes of limestone, of which one, with northeast and southwest strike and dip of 48°, of 6′ estimated average width, is opened by numerous old tunnels and shallow shafts, with new shafts of 90′ and 318′, property having about 1,200′ of new workings and 3,000′ of old workings, estimated to show 20,000 tons of ore, with about 10,000 tons blocked out for stoping. The average of 15 carloads, shipped late 1908, was 0.75% copper, 31.3% lead, 1.9% zinc, 11.28 oz. silver and 0.18 oz. gold per ton, with net returns of about $1,000 per car. The mine is an old property, discovered 1870 and reopened 1907.

Equipment includes a 50-h. p. gasoline plant, with a 25-h. p. hoist and 3-drill air-compressor. Company plans installing a 50-h. p. steam hoist and developing the second ore body.

RED WING EXTENSION MINING CO. **UTAH.**

Dead. Title changed, circa March, 1906, to Massasoit Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

RED WING MINE. **ALASKA.**

Mine office: Kitchikan, Alaska. Capt. and Mrs. E. E. Wyman, owners and managers. Shipped a little ore to Tacoma, 1907.

RED WING MINING & MILLING CO. **UTAH.**

Dead. Succeeded, circa 1900, by New Red Wing Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

REDWOOD COPPER QUEEN MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, San Francisco, Cal. Mine office: Ukiah, Mendocino Co., Cal. W. P. Ferguson, president; Thos. Mellersh, secretary and treasurer. Lands, 840 acres, patented, 35 miles southeast of Ukiah, developed by tunnels and winzes. Vein, much broken by faults prominent on surface, has a 2′ to 4′ gossan capping, traceable for a mile. Country rocks are brecciated porphyry and sandstone. Ores include cuprite, melaconite, malachite, azurite, chalcopyrite and tetrahedrite. Idle several years and apparently moribund.

REED GOLD & COPPER MINING CO. **VIRGINIA.**

Dead. Formerly had an office in Norfolk, Va.

REFORMA MINING CO. **MEXICO.**

Mine office: Campo Morado, Aldama, Guerrero, Mex. Eduardo Ortiz, manager. Lands, 1,000 hectares, showing 2 parallel zones, one carrying oxidized lead ores, said to give assays of 800 to 5,000 grams silver and 10 to 50 grams gold per metric ton. The second zone, said to be 40 meters wide, in places, carries an immense body of cupriferous pyrite, giving assays of 3 to 8% copper, with fair silver values. Has electric mine haulage. Smelter has two 25-ton lead furnaces, and it is planned to add a blast-furnace for copper, to be operated on the pyritic plan.

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REFORMA MINING CO. **MEXICO.**

Dead. Formerly at Fuerte, Sinaloa, Mex.

REFUGIO SYNDICATE, LTD. **MEXICO.**

Office: 3 Princes St., London, E. C., Eng. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. S. A. Bird, chairman; Henry H. Knox, consulting engineer; J. S. Dare, secretary. Organized Nov. 30, 1905, under laws of Great Britain, with capitalization £11,250, in 1,000 A shares and 10,000 ordinary shares of £1 par each, and 5,000 deferred shares of 1s. par each. Lands, 6 groups of copper claims, area 382 hectares. Presumably idle.

REID-NEWFOUNDLAND CO. **NEWFOUNDLAND.**

Mine office: New Bay, Newfoundland. Donald McKenzie, superintendent. In 1907 was sinking a shaft planned to be 100′ deep, for prospecting purposes.

COMPAÑIA MINERA LA REINA. **MEXICO.**

Dead. Lands sold, circa 1907, to Mexican Mines Syndicate, Ltd. Formerly at Cusihuiriáchic, Iturbide, Chihuahua, Mex. Fully described Vol. VII.

COMPAÑIA MINERA REINA DE COBRE. **MEXICO.**

Mine office: Ejutla, Oaxaca, Mex. Capitalization 100,000 pesos. Jas. Butler, general manager; Juan de Peza, superintendent, at last accounts. Property is the Luna de Oaxaca mine. Presumably idle.

MINA REINA DE COBRE. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Alfredo R. Cano y Ca., owners; Juan G. Cano, manager. Has auriferous and argentiferous copper ores.

COMPAÑIA MINERA REINA DE COBRE DE SONORA. **MEXICO.**

Letter returned unclaimed from former office, Nogales, Sonora, Mex. Mine office: Santa Ana, Magdalena, Sonora, Mex. John Henderson, superintendent. Has auriferous and argentiferous copper ores. Has steam power, employing circa 30 men, at last accounts.

REINA COPPER CO., LTD. **SPAIN.**

Office: 18 Walbrook, London, E. C., Eng. M. Graham, chairman. Organized Aug. 13, 1906, under laws of Great Britain, with capitalization £60,000, shares £1 par, to acquire copper mines in Spain. Presumably idle.

REINDEER COPPER & GOLD MINING CO., LTD. **IDAHO.**

Office: 510 Bank St., Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. F. C. Norbeck, secretary; Norman Ebberley, manager. Apparently is a Siamese twin of the Reindeer Copper Mining & Milling Co., Ltd. Lands, 5 claims, on Willow Creek, said to have a vein carrying a paystreak of 16 to 21% copper tenor, with 3′ to 6′ of copper ore of concentrating grade. Is developing by a tunnel, driven jointly with Copper Queen Mining Co., planned to be 3,000′ long. Has steam power and an air-compressor.

REINDEER COPPER MINING & MILLING CO., LTD. **IDAHO.**

Office: 510 Bank St., Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. H. A. Keough, president; F. C. Norbeck, secretary. Apparently a Siamese twin of the Reindeer Copper & Gold Mining Co., Ltd., and impossible to tell "t'other from which."

REINDEER MINING CO. **IDAHO.**

Dead. Succeeded by Reindeer Copper & Gold Mining Co., Ltd. Formerly at Mullan, Shoshone Co., Idaho.

REINS COPPER CO. **MONTANA.**

Office and mine: 46 East Broadway, Butte, Silver Bow Co., Mont. Col. J. M. Guffey, president; John P. Reins and Asa Childs, vice-presidents; preceding officers, Wm. P. De Armit, Hon. John Miller, Frank J. Weixel, E. W. Marland, Geo. W. Stapleton, W. W. McDowell, E. D. Leavitt and Guy Stapleton,

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directors; W. F. Johnson, secretary and treasurer; G. B. Thompson, assistant secretary and treasurer; John Stewart, superintendent. Organized Apr. 27, 1903, under laws of Montana, with capitalization $1,500,000, increased, 1907, to $3,000,000, shares $1.50 par.

Lands, 3 fractional claims, area 18 acres, known as the Betsy Dahl or Combination, Ella and Louise, in the Meaderville district, just at the eastern end of Butte. Mine was idle, 1881-1902, on account of litigation. Property, though small, is considered valuable, being excellently located, near the Leonard and Colusa mines of the Boston & Montana, and supposed to carry the extension of the Leonard vein, also lying near the Minnie Healy mine of the Butte Coalition.

The Combination shaft is 1,200′ deep, with north and south crosscuts on the 1,200′ level, and it is planned to deepen this shaft to 2,000′, but the ground is broken and wet, rendering sinking slow and costly. The shaft has 2 compartments, and is planned to be cut down to 3-compartment size. The Combination mine has shown some good argentiferous copper and lead ores, including chalcopyrite, assaying up to 60% copper and 200 oz. silver per ton.

The Ella mine has an 800′ shaft, filled with water, said to have produced about $500,000 worth of ore, and it is planned to develop the Ella ground through the Combination shaft, on the 1,200′ level.

Equipment includes a 240-h. p. steam plant, with a hoist good for 2,000′ depth, 5-drill air-compressor and two 700-gallon pumps, on the 800′ and 1,200′ levels.

Production, for the Montana mining year ending June 1, 1907, was 2,061 tons of ore, averaging 4.7% copper, yielding 96,867 lbs. fine copper. Property is said to have shipped about $100,000 worth of ore, from development work. The company's finances became badly tangled, early 1908, when upwards of 100 claims, aggregating about $110,000, were made liens and attachments on the property. Property is considered valuable, though company's finances are in poor shape.

RELIANCE GOLD & COPPER MINING CO. **ARIZONA.**

Office: 15 Brown Palace Hotel, Denver, Colo. Mine office: Turkey, Yavapai Co., Ariz. C. S. McElrath, president; E. J. Price, vice-president; H. G. Trester, secretary; W. D. Webster, superintendent. Organized January, 1904, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Was promoted by Herbert S. Shaw. Lands, 11 claims, area 220 acres, in 2 groups, in the Big Bug district, circa 10 miles from a railroad, opened mainly by tunnel, showing auriferous and argentiferous copper ore of uncertain tenor. Idle since circa 1904, and apparently moribund.

RELIANCE GOLD MINING CO. **ARIZONA.**

Dead. Formerly at Groom Creek, Yavapai Co., Ariz. Described Vol. VI.

RELIANCE GOLD MINING CO. **NEW MEXICO.**

Office: 262 Washington St., Boston, Mass. Letter returned unclaimed from former mine office, Albuquerque, Bernalillo Co., N. M. Arthur S. Percy, president; Walter Haynes, secretary and treasurer; preceding officers, J. E. Baker, Harry Owens, A. H. Drummond and Geo. F. Ropes, directors; W. S. Baker, fiscal agent. Capitalization, $250,000, shares $1 par. Company claimed to be paying regular monthly dividends, at rate of 8% yearly, on the 25th inst. of each month.

Lands, 9 claims, 20 miles from Albuquerque, said to be in the heart of the richest mineral zone of the continent, which is untrue, and the company is viewed with deep suspicion.

RELIANCE MINING & MILLING CO. **NEVADA.**

Office: 1410-134 Monroe St., Chicago, Ills. Mine office: Tenabo, Lander Co., Nev. Lands, 19 claims, 2 fractional, area 355 acres. Principal develop-

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ment is on the Little Gem group, one mile from Tenabo, showing a contact deposit between rhyolite and sedimentary rocks, carrying auriferous and argentiferous copper carbonates and chalcopyrite, with quartz gangue. Has a 250′ incline shaft, sunk at an angle of 22°, showing an ore body ranging from a few inches to 5′ in width, giving assays up to 31.1% copper, 122 oz. silver and $9.60 gold per ton.

RELIANCE MINING & MILLING CO. **PENNSYLVANIA.**

Office: Lancaster, Pa. Mine office: Hunterstown, Adams Co., Pa. Presumably idle.

RENDALL ORE REDUCTION CO. **ARIZONA.**

Office: 16 State St., Boston, Mass. Mine office: Gila Bend, Maricopa Co., Ariz. Chas. S. Ashley, president; Leonard L. Allen, vice-president; H. Carlton Slack, secretary; A. D. Lee, superintendent.

Property is the Ajo mine, an antigua, opened A. D. 1763, and reopened circa 1861, when native copper and considerable rich ore, said to have been worth $300,000, was shipped to San Francisco and Swansea. Property is hampered by lack of rail transportation. Mine has a 150′ shaft, showing ore of good average tenor. During idleness of mine considerable regulus was produced by deposits on old rails and pipes.

Reduction plant, rated at 50 tons daily capacity, uses the Rendall process, which is claimed to treat, with equal facility, all classes of copper ores, including oxides, carbonates, sulphides, chloride, silicates and arsenides, and it is claimed that average ores can be treated at cost of $1 per ton, with extraction of 95 to 98% of values, which claims seem very sweeping. The plant has a special upright furnace, practically air-tight, with suction draft operating above the charge. Ore is heated to low incandescence by gases from wood, coal or oil, and at a proper degree of heat the combustion draft is increased, fuel supply shut off, and a specially fluxed hot blast admitted to furnace, causing chemical reactions by which the volatile elements are said to be drawn off. The special fluxing gas is said to prevent oxidation, carbonization or chlorination of the ores, and it is claimed that copper, gold and silver are left in suspension, as the gangue rock of quartz or limestone is not fused. It is difficult to understand just what is volatilized, if neither metals nor gangue rock are fused, and the utility of the volatilization process is not apparent. After volatilization, the ore is plunged into a vat containing water, which is said to shock the gangue, and assist in breaking it up. Ore is then passed through a set of rolls, crushed fine, and copper ore concentrated or treated by an arastra or Chilean mill, if containing high gold or silver values.

RENO-YERINGTON COPPER CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. S. H. Baker, manager. Lands, north of the Bluestone, have a 700′ tunnel, 200′ of which is said to show a vein of 8′ average width, carrying ore of 3 to 4% copper tenor. Presumably idle.

REPUBLIC CONSOLIDATED MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Idaho Springs, Clear Creek Co., Colo.

REPUBLIC MINES CO. **NEW MEXICO.**

Office: 526 Exchange Bldg., Denver, Colo. Mine office: Lucero, Mora Co., N. M. Felix J. Woodward, president; Walter Littlefield, vice-president; Marcus Finch, secretary, treasurer and general manager. Organized Dec. 8, 1903, under laws of Colorado, with capitalization $500,000, shares $1 par; issued, $490,000.

Lands, circa 7,500 acres, patented, half freehold and half held under bond and lease, known as the Constitution group, 30 miles from a railroad, stretching for 8 miles along Coyote Creek, from Mora river to the adjacent mountains, showing a series of 3 parallel cupriferous beds of slate and arenaceous shale, alternating with limestone, having an approximately meridional strike.

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The property has upwards of 120 openings, mainly shallow pits, showing copper, principal workings being a 50′ shaft and several tunnels, longest 650′. The 3 main beds are of 3′ to 8′ thickness, with 3 minor ledges, said to show considerable chalcocite, presumably in connection with oxidized ores, giving average assays of 8 to 17% copper, with an estimated average tenor of 6%. Company plans building a small smelter with a reverberatory furnace.

REPUBLIC MINING CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Lands, 9 claims, including the Old Republican mine, having a 350′ shaft; the Republic Extension mine, with shafts of 50′, 75′ and 150′, and the Mammoth mine, having incline shafts of 150′ and 400′. Property shows auriferous and argentiferous sulphides, up to 15% in copper tenor.

REPUBLIC SMELTING CO. **COLORADO.**

Office and works: Leadville, Lake Co., Colo. Capitalization $500,000. Property is the remodeled 500-ton smelter, with 3 furnaces, formerly owned by the Boston Gold-Copper Co. Presumably idle.

RESCUE COPPER CO. **ARIZONA.**

Dead. Merged, Feb. 19, 1907, in Cornelia Copper Co. Formerly at Gila Bend, Pima Co., Ariz. Described Vol. VII.

RESERVATION MINING & SMELTING CO. **WASHINGTON.**

Dead. Lands sold, circa 1907, to Dominion Copper Co., Ltd. Formerly at Danville, Ferry Co., Wash.

RESOLUTE COPPER CO. **MICHIGAN.**

Dead. Wound up. Lands sold, 1905, to Keweenaw Copper Co. Formerly at Central Mine, Keweenaw Co., Mich. Fully described Vol. II.

MINA LA REVANCHA. **MEXICO.**

Mine office: Ojocaliente, Zacatecas, Mex. J. Incarnación Spina, owner; R. Spina, manager. Has argentiferous lead and copper ores, with a Chilean mill and steam power.

REVENUE MINING CO. **ARKANSAS, UTAH & WASHINGTON.**

Dead. Formerly in Stevens county, Washington. Described Vol. VII.

REVENUE MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

REWARD COPPER MINING CO. **ARIZONA.**

Dead. Lands sold, Oct. 15, 1903, to United Arizona Copper Co., Ltd. Formerly at Vekol, Pinal Co., Ariz.

REWARD GOLD-COPPER MINING CO. **BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Spokane, Wash. Mine office: Princeton, Boundary district, B. C. W. C. Lyall, attorney. Organized 1906, with capitalization $1,000,000, shares $1 par. Idle and apparently moribund.

REXALL SILVER & COPPER MINING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Lands are on the south fork of the Big Cottonwood.

REX COPPER MINING CO. **ARIZONA.**

Office: Muskegon, Mich. Mine office: Safford, Graham Co., Ariz. Dr. R. D. King, president; J. B. Barlow, secretary and treasurer. Organized 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 20 claims, area 320 acres, in the Lone Star district, showing fissure veins, developed by a 2-compartment incline shaft of 540′, with 700′ of underground openings. Has a 28-h. p. steam hoist. Idle several years.

REX GOLD MINES & INVESTMENT CO. **COLORADO.**

Mine office: Leadville, Lake Co., Colo. Jesse F. McDonald, manager. Lands include the Rattler and Reconstruction mines, carrying gold, silver, lead and copper ores. Has steam power. Presumably idle.

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REY DEL ORO MINING CO. **MEXICO.**

Mine office: Mulatos, Sahuaripa, Sonora, Mex. Is controlled, through entire stock ownership, by the Greene Gold-Silver Co. Property is the Mulatos mine.

COMPAÑIA MINERA LOS REYES. **MEXICO.**

Mine office: Zitácuaro, Michoacán, Mex. Rafael Rodriguez Gil, manager, at last accounts. Has a tunnel, showing copper ore. Presumably idle.

REYNOLDS-ALASKA DEVELOPMENT CO. **ALASKA.**

Office: 43 Exchange Place, New York, N. Y. Mine office: Valdez, Prince William Sound district, Alaska. C. M. Baldwin, president; Percy Brundage, vice-president; Hon. John G. Brady, secretary; J. Frank Birdsell, treasurer; preceding officers, Horace E. Kistler, E. T. Teter, D. B. Hawes, O. W. Cobb, Omar J. Humphrey, A. E. Austin, H. M. Coffin, Chas. H. Kingsbury, J. J. Blackmore and W. S. Burrows, directors; Blamey Stevens, engineer; J. W. Spaulding, superintendent. Organized 1903, under laws of Washington, with capitalization $3,000,000, shares $1 par, in $1,000,000 cumulative 6% preferred and $2,000,000 common shares; issued, $2,632,906. Bonds, $500,000, twenty-year 6% gold bonds, authorized March 3, 1908; issued, none. Company paid dividends, to Oct. 1, 1908, of $38,644.72 on preferred stock, which was wrong, as the company was not in a position to earn any dividends. Company is said to have offered to pay 6% on preferred stock, from date of issue, and 6% on common shares thereafter. In March, 1908, the company had an indebtedness of circa $280,000. Washington Trust Co., Boston, registrar; Beacon Trust Co., Boston, transfer agent. Annual meeting, first Tuesday in April.

The Reynolds string of promotions included companies formed to carry on a great variety of businesses, including hotels, a dray-line, newspaper, building construction, smelting, laundering, merchandising, and the sale of musical instruments and sheet-music. Company controls the Copper River Lumber Co., with sawmills and yards at Valdez, and also holds, at Valdez, 39 parcels of real estate, including various hotels, warehouses, dwellings, etc.

Lands, 62 claims, area circa 1,200 acres, patents applied for, also an 80-acre millsite and 6,000 acres of coal and oil lands, in several different groups, in 2 different localities in the Valdez district. The coal and oil lands are not productive. The various properties show slate, greenstone and porphyry, carrying various contact deposits between slate and greenstone.

The Boulder Bay group, 23 claims, area 460 acres, on the Kenai peninsula, shows a contact deposit between greenstone and slate, carrying chalcopyrite, assaying up to 11% copper and $3 gold per ton, but probably averaging 2 to 4% in copper tenor, developed by 2 tunnels. Equipment includes a 60-h. p. boiler and a 5-drill Rand air-compressor.

The Aurora mine, at Kachekmak Bay, Cook Inlet, is a gold property, where considerable money was spent, and apparently little ore found. At one time a mill was planned for this property.

The Latouche Iron Mountain group, 20 claims, includes the Duchess and Blue Fox properties, on the west coast of Latouche Island, circa 60 miles west of Boulder Bay. The Blue Fox mine has a 4′ vein of ore, of about 7% estimated copper tenor, which it was planned to develop by shaft. The Duchess mine, opened by tunnel, shows ore of low grade, but in larger quantities than found in the Blue Fox, having a vein estimated by company as of 100′ width, traceable circa 700′. Another authority states that there is an ore zone up to 250′ in width, traceable nearly one mile. Development is by tunnel and crosscuts, showing a large body of low grade copper ore, intersected by several high grade ore bodies.

Equipment includes a 200-h. p. hydro-electric installation, with a flume and steel pipe leading from Big Falls Creek to a Pelton wheel, direct-connected to

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two 40-kw. generators. There is a 50-h. p. hoist and 2 Rand air-compressors, of 5 drills aggregate capacity, with 6 air drills and 10 Ingersoll-Temple electric drills.

Improvements include a sawmill, electric light plant, 3 steamers, a store, bank, hotel and barber-shop.

The company is giving tentative consideration to the erection of a 1,000-ton smelter. The management estimates that the mine should have a mean probable ore capacity of 3,000,000 tons.

Henry D. Reynolds was arrested, April, 1908, on a secret indictment returned against him by a Federal grand jury in Massachusetts, for using the mails to defraud, but wrote, Apr. 28, 1908, stating that he had just resumed control of the company and its subsidiary corporations, including the Alaska Home Railway and 13 other companies comprising the so-called Reynolds-Alaska system. The company, together with its associated bank, railroad and industrial enterprise, came to grief financially, 1907, but seems to have improved its financial position during 1908.

REYNOLDS MINE. **VERMONT.**

Mine office: South Strafford, Orange Co., Vt. J. B. Reynolds, manager and principal owner. Lands, 900 acres, held under deed of mining rights, near the Elizabeth mine, 13 miles from Boston & Maine railroad, showing gneiss, mica-schists and hornblende-schists, carrying lenticular ore bodies in series conforming to dip of the country rocks, under garnetiferous mica-schist and above hornblende-schist, with strike of West of North, and average dip of about 45°. One ore body, of 40′ extreme width, not mineralized for full width, traceable circa 4,000′ on the property, shows chalcopyrite disseminated in pyrrhotite, giving average assays above 3% copper. Development is by a 110′ incline shaft, with about 70′ of workings on the 100′ level.

Equipment includes steam and air power, with a 3-drill compressor and several mine buildings.

RHEINBACH COPPER MINES, LTD. **GERMANY.**

Office: 5 Copthall Bldgs., London, E. C., Eng. Mine office: Rheinbach Kreis Bruhl-Unkel, Rheinprovinz, Germany. Oliver Wethered, chairman; A. Eick, manager; C. Acton Dodds, secretary. Organized May 11, 1907, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £100,007. Lands, 437 hectares, showing copper, lead and zinc sulphides, opened by 2 shafts.

RHENOSTERKOP COPPER SYNDICATE. **CAPE COLONY.**

Mine office: Kakamas, Kenhardt district, Cape Colony. Capitalization £20,000. Lands, 19,000 morgen, area circa 40,000 acres, known as the Farm Rhenosterkop, on the southern bank of Orange river, circa 72 miles west of the town of Kenhardt, held under 17 months option. Property shows copper veins, between gneiss and schist, with northeasterly and southwesterly strike. Principal vein, with vertical dip, opened to shallow depth only, is 3″ wide at the surface, gradually increasing to 4″, carrying high grade carbonates, oxides and chalcocite. The veins, as developed, are trivial in width, but are rich and apparently worthy of further tests.

RHODE ISLAND COPPER CO. **MICHIGAN.**

Office: 1000-32 Broadway, New York, N. Y. Mine office: Hancock, Houghton Co., Mich. Employs 25 men. Chas. J. Devereaux, president; Wm. R. Todd, secretary and treasurer; preceding officers, Stephen R. Dow, Chester L. Dane, S. L. Lawton, Isaac H. Meserve and Jas. S. Dunstan, directors; M. H. Dennis, superintendent. Organized 1898, under laws of Michigan, with capitalization $2,500,000, shares $25 par; paid in, $10. Last assessment was $1, due Jan. 14, 1907. Statement, as of date Jan. 1, 1908, showed cash on hand, $58,216.51, with total quick assets of $63,672.89, and total accounts payable of $2,717.43.

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Lands, 800 acres, north of the Franklin Junior, on which extensive diamond drill borings have been made, giving drill cores from the Mesnard epidote, Kearsarge amygdaloid, Allouez conglomerate, Pewabic amygdaloid and other copper-bearing beds.

No. 1 shaft, 275′ north of the Franklin Junior boundary, is 8x18′ in size, with 3 compartments, 500′ deep, sunk on the Pewabic amygdaloid, which is 8′ to 10′ wide, with 2′ to 3′ near the hanging-wall well mineralized, at points. This shaft, abandoned 1902, is filled with water, to the first level, on which it connects with No. 2.

No. 2 shaft, 1,200′ north of No. 1, also is 8x18′ in size, and is circa 1,300′ deep, at the 10th level. This shaft has east and west crosscuts, and a crosscut, driven 180′ east, encountered the Allouez conglomerate, March, 1903, but work thereon was discontinued, July, 1904, owing to poor showing secured. The east crosscut, on the 8th level, at depth of 1,000′, cut 2 apparently valueless amygdaloidal beds, one being the Mesnard epidote lode. The East lode, about 5′ wide, carries a little copper, but nothing especially encouraging. The West lode, 96′ from the shaft, is 7′ to 9′ wide, carrying occasional bunchy copper. The 4 amygdaloidal beds lying between the West lode and the Allouez conglomerate have been tested by north and south drifts, 3 proving barren. On the 9th level a 6′ vein shows about 35′ of good copper ground, but the showing on the level below is poor. The south drift on the Pewabic lode, on the 8th level, is said to develop a good stretch of copper ground, in a 600′ drift toward the Franklin Junior. The Pewabic lode was explored, 1906-1908, by drifts, on various levels, a 1,400′ drift on the 8th level north showing occasional 25′ to 75′ stretches of payable ground. No. 2 has a frame shafthouse, and a Nordberg hoist capable of raising 2-ton skips from a quarter-mile depth.

No. 3 shaft, 1,800′ north of No. 2, was started May, 1905, but work was discontinued at slight depth, and attention turned to diamond drilling, to locate the Kearsarge bed. The first cores from the Kearsarge lode showed copper, in somewhat encouraging quantities, from a bed of circa 19′ width.

Surface improvements include a 36x200′ machine and blacksmith shop, a 30x50′ frame warehouse and 15 dwellings. No. 2 engine-house has a 12-drill Rand air-compressor.

It is possible that the Rhode Island may be absorbed by the Franklin, as negotiations to that end were under way, late 1908. The Rhode Island has given very discouraging results, for 10 years of conscientious effort.

RHODESIA COPPER CO., LTD. **RHODESIA.**

Office: Salisbury House, London, E. C., Eng. Mine office: Bulawayo, Rhodesia. Lord Gifford, chairman; Bechuanaland Exploration Co., Ltd., manager in South Africa; F. White and Percy Tarbutt & Co., consulting engineers; Tom Donald, secretary. Organized Jan. 31, 1902, under laws of Great Britain, with capitalization £750,000, shares £1 par. Company has floated the Rhodesia Broken Hill mine, a zinc and lead property, and paid a 10% dividend to shareholders, 1905, in the stock of that corporation.

Lands, 640 square miles, and the right to locate 8,000 mining claims and 33 farms, in northern Rhodesia, of which 5,665 mining claims and 24 farms had been located, at last accounts. The company has a close working alliance with the Northern Copper (B. S. A.) Co., Ltd., and apparently both companies have some sort of interest in the Bwana M'Kubwa and Hippo mines, which are described under title of Northern company. The Kitakata mine, one-half mile northeast of the Broken Hill property, shows stains and hand-specimens of oxide and carbonate copper ores.

JUAN DE Q. RIBILLO. **CHILE.**

Mine office: Carrizalillo, Chañaral, Antofagasta, Chile. Property is the

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Yolesito mine, which, 1903, produced 850 metric tons of ore averaging 15% copper, equivalent to about 275,000 lbs. fine copper.

RICHARD III DEVELOPMENT CO., LTD. BRITISH COLUMBIA.

Office: Duncans, B. C. Mine office: Mt. Sicker, Vancouver Island, B. C. Lands, east of the Tyee are opened by a 510′ two-compartment shaft, with 2,191′ of workings on 5 levels, having ore on each level, with considerable ore of good average tenor in sight. Best ore is on the bottom level, a sample ton smelted giving returns of 3.29% copper, 25.85 oz. silver and 0.06 oz. gold per ton. Has shipped considerable ore to the Tyee smelter, and paid, 1907, a 2½% dividend.

RICHFIELD COPPER CO. MEXICO.

Office: 1410 H St., Washington, D. C. Mine office: Querobabi, Ures, Sonora, Mex. Dr. S. T. Haffner, president; Maj. Jas. A. Cooper, vice-president; Dalbys L. Fickes, secretary and treasurer; Stewart Ellis, general manager; John Glasson, superintendent. Organized 1908, as successor of Richfield Mining Co.; which was organized May, 1901, under laws of Arizona, with capitalization $5,000,000, shares $2 par. Old company had a $100,000 bond issue, at 6%.

Lands, 382 pertenencias, area 955 acres, in 2 groups, including the Dos Naciones group, 12 miles east of Tuape, down the San Miguel river, and 35 miles from a railroad. Also has 26,512 acres of timber lands, in the Ures district. The Dos Naciones group, having traces of antigua workings, is said to show 7 contact veins, between granite and limestone, of 15″ to 40′ estimated average width, opened by shafts of 75′ and 75′, and by tunnels of 48′ and 60′, showing oxidized ores and chalcopyrite assaying 3% copper and 20 to 60 oz. silver per ton, with small gold values. Is said to have a body of high grade ore at depth of 350′. Has a 120-h. p. steam plant, with two 20-h. p. hoists and a 4-drill air compressor, and several mine buildings. Camp was raided by Yaqui Indians, 1907, whereupon the Mexican workmen left, and mine was closed down.

RICHFIELD MINING CO. MEXICO.

Dead. Succeeded, 1908, by Richfield Copper Co. Formerly at Querobabi, Ures, Sonora, Mex. Described Vol. VI.

RICHMOND-EUREKA MINING CO. NEVADA.

Office: 1114-25 Broad St., New York, N. Y. Mine office: Eureka, Eureka Co., Nev. Albert Fries, president; W. H. Coolidge, vice-president; A. J. Seligman, treasurer; A. F. Holden, managing director; A. P. Mayberry, mine superintendent. Organized October, 1905, under laws of Maine, with capitalization $3,600,000, shares $10 par, as a merger of Richmond Mining Co. and Eureka Consolidated Mining Co., which were in litigation, thus reconciling the conflicting interests. The Richmond Mining Co. paid dividends of about $5,000,000, from 465,297 tons of ore produced. The United States Smelting, Refining & Mining Co. owns circa 35% of the capital stock authorized, which is about 40% of outstanding stock, and names one of the 5 members of the voting trust.

Lands are said to be circa 700 claims, including the old Richmond and Eureka mines, contiguous properties, opened circa 1869, which were large ore producers, but were tied up by litigation for some years, until formation of present company, during which time mines were idle, except for extensive scramming, done by tributors. Under former ownership mines were highly productive and profitable. Ore values are mainly in silver and lead. The Eureka mine is opened by the 900′ Locan shaft and the Econ incline, with development mainly below the 900′ level. The Richmond mine is developed principally through the Lizette tunnel; the old bonanza ore bodies apparently not continuing below the 600′ level. Ore bodies developed, while low in grade, possibly may turn into higher grade ore. Equipment includes a good mining

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plant and an antiquated smelter, at Eureka, 3 miles from the mines, which has been idle for some years. Company has secured the very reasonable freight rate of $3.75 per ton to Salt Lake smelters, for ore averaging less than $12 per ton in gross values, and, early 1908, was shipping circa 200 tons daily. Property considered valuable and management good.

RICHMOND GROUP GOLD MINES CO. NEW MEXICO.

Dead. Formerly at Hillsboro, Sierra Co., N. M.

RICHMOND MINE. MONTANA.

Mine office: Saltese, Missoula Co., Mont. Chas. J. Heidenreich, manager. Lands, 6 claims, southwest of Saltese, adjoining the Monitor mine, opened by 4 shafts, deepest 275', on a vein parallel to the Monitor, showing frequent occurrences of native copper, and auriferous copper ores of good average assay values. The property has been a small producer for some years, and is said to have been worked at a profit.

RICHMOND MINING CO. NEVADA.

Dead. Merged, October, 1905, in Richmond-Eureka Mining Co. Formerly at Eureka, Eureka Co., Nev.

RICKARD-ELY COPPER CO. NEVADA.

Letter returned unclaimed from former office, 20 Broad St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. G. L. Rickard, president; Webster Bishop, vice-president; Jos. H. Hutchinson, second vice-president; W. A. B. Ogden, secretary; Herbert T. Cook, treasurer. Organized circa February, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, adjoining the Veteran-Ely on the west, slightly prospected, 1907, by churn drilling. Idle at last accounts.

RIDGE COPPER CO. MICHIGAN.

Office: 1105-6 Beacon St., Boston, Mass. Mine office: Mass, Ontonagon Co., Mich. Organized October, 1863, under laws of Michigan, with capitalization $500,000, shares $25 par. Has levied assessments of $470,000, and paid dividends of $100,000. Practically entire stock issue is owned by Mass Consolidated Mining Co., and it is planned to wind up the corporation and transfer its landed holdings to the Mass.

CÁRLOS RIESCO. CHILE.

Office and works: Tiltil, Santiago, Chile. Property is the Tiltil smelter, having railroad connection. Works have two 55-h. p. boilers and three 60-h. p. engines, with Blake crusher and two Connersville blowers. Smelter has 1 calcining furnace and 2 water-jacket blast-furnaces. Fuel is Chilean coke, costing 35.5 pesos, and coal, costing 22.3 pesos, per metric ton. Slags average about 0.5% copper. Employs about 35 men, at average wages of 1.8 pesos daily. In 1903 treated 4,850 metric tons of ore averaging 6.5% copper, producing 650 metric tons of ejes, of about 45% average tenor, containing circa 650,000 lbs. fine copper.

RIGBY MINING & REDUCTION CO. ARIZONA.

Office: Beaver Falls, Pa. Works office: Mayer, Yavapai Co., Ariz. Col. T. Johns Rigby, president and general manager; F. H. Walker, secretary and treasurer; preceding officers, R. D. Mead, L. S. Neely and Edward C. Fink, directors; A. W. Hudson, manager; Harry A. Clarke, superintendent.

Property is a custom smelting plant, on a 70-acre site, near Mayer, connected by a 3,000' spur with the Prescott & Eastern Railway.

This company holds the Yavapai county rights to the Poehle & Crossland volatilization process, and has a 125-ton reduction plant, blown in, April, 1906. The process of reduction is as follows: from the receiving bins, ore is taken in tram-cars to 2 revolving dryers, one of 40" diameter by 18' length and the other of 60" diameter by 26' length, heated ore passing from them, by gravity, to cars, which take it to the feed-hoppers in the roll-house, latter having 3

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sets of 30x14" rolls and 1 set of 20x12" rolls, with screens and elevators. Dust from rolls is collected by 3 large dust-collectors. Crushed ore is taken from the screens to a 40-ton ore-bin in the mixing house, by an 84' automatic belt-conveyor. In the mixing-house, ore and salt from the salt-bins are weighed by 2 sets of hopper scales, and deposited on a 50' belt-conveyor, which takes the material to a box-mixer, whence the mixed charge is dumped into a car which takes it to 4 feed-hoppers, which feed the charges automatically to revolving furnaces, in a furnace building 88x132' and 40' high, having four 25-ton revolving calcining furnaces. Fumes from the ore are drawn from the furnaces through the flue-house, which contains 4 sets of 3' wrought-iron pipe, each 175' long, into the condensing house, by 4 large blowers, each capable of handling 6,600 cubic feet of gas per minute. Fumes are cooled by water, in the flue-chamber, then forced under pressure into the condensing room, where deposited as chlorides, condensing-room fumes going to the filtration room, where all insoluble matter is filtered, and where metallic values are precipitated, either by electric action, or on iron. Precipitates are melted and refined in the ordinary manner. The residue of the roasted ore, from which the metallic values are supposed to have been volatilized, is carried to the tailings dump, in tram-cars. The theory of the process is that the application of heat to the mixture of ore, salt and sulphur, causes a chemical reaction, by which the sulphur and sodium chloride form sulphate of soda, the chlorine from the salt uniting with the metals to form chlorides, which pass off in the fumes, and are recovered in the manner previously explained.

The company has made several smelter tests in the past few years, all pronounced satisfactory by the management, but apparently has secured no regular production, and the success of the process seems doubtful.

RILLITO MINING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz. Idle and apparently moribund.

RINCON MINES CO. **ARIZONA.**

Office: North American Bldg., Philadelphia, Pa. Mine office: Congress Junction, Yavapai Co., Ariz. W. C. De Armond, president; S. S. White, vice-president; Edw. P. Vogel, secretary and treasurer. Organized January, 1904, under laws of Arizona, with capitalization $1,200,000, shares $1 par, in $200,000 cumulative 7% preferred stock and $1,000,000 common stock. Lands, 31 claims, area 570 acres, in the Weaver district, showing auriferous and argentiferous copper and lead sulphides.

RINCON MINING CO. **ARIZONA.**

Office: care of B. J. O'Reilly, secretary, Bisbee, Ariz. Mine office: Benson, Cochise Co., Ariz. Organized under laws of Arizona, with capitalization $2,500,000, shares $25 par. Lands, 27 claims, 22 miles north of Benson, developed by a 130' tunnel, showing ore giving assays up to 23% copper. Presumably idle.

RINGING ROCKS COPPER MINING CO. **PENNSYLVANIA.**

Mine office: Pottstown, Montgomery Co., Pa. Idle several years.

RING VALLEY MINING CO., LTD. **TASMANIA.**

Office: Finsbury House, London, E. C., Eng. Mine office: Williamsford, Dundas Co., Tasmania. H. T. Walker, chairman; H. St. John Hodges, secretary; Geo. Barker, mine manager. Organized July 20, 1900, under laws of Great Britain, with capitalization £125,000, shares 10s. par. Lands, 370 acres, leasehold, on the Ring river. Is a small shipper of argentiferous copper ore, employing about 10 men.

RIO ARRIBA CONSOLIDATED MINES CO. **NEW MEXICO.**

Dead. Formerly at Tres Piedras, Taos Co., N. M.

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RIO BACANUCHI MINING CO. MEXICO.

Letter returned unclaimed from former mine office, Bacanochi, Arizpe, Sonora, Mex. Property shows cupriferous copper and silver-lead ores. Sundry ore shipments were made, 1907.

RIO BLANCO SMELTER. PERU.

Owned by Peruvian Mining, Smelting & Refining Co.

COMPAÑIA MINERA RIO COLORADO. CHILE.

Office: Santiago de Chile. Mine office: Victoria, Santiago, Chile. Organized Dec. 12, 1906, under laws of Chile, with capitalization 300,000 pesos, shares 20 pesos par.

RIO DOLORES COPPER CO. UTAH.

Office: 731 East 18th Ave., Denver, Colo. Mine office: Castleton, Grand Co., Utah. Employs circa 10 men. C. L. Dyer, president; Victor Elliott, vice-president; Col. Thos. B. Crawford, secretary, treasurer and general manager; Wm. Eastman, superintendent. Organized Feb. 8, 1906, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Annual meeting, first Thursday in July.

Lands, 15 claims, area 300 acres, also 100 acres in millsites, on Mineral Mountain, at the head of Castle Creek, 6 miles above Castleton, in the La Sal district, showing mainly granite, with porphyritic intrusions, said to carry 12 ore bodies, of which 2 are slightly developed by tunnels, a 250′ tunnel being said to show a 3′ vein of high grade auriferous and argentiferous copper ore, estimated to average 2 to 3% copper, 10 oz. silver and $3 gold per ton. Ores are mainly lead and copper sulphides. Equipment includes a 5-drill air-compressor and 6 log buildings. The company was promoted by Fred G. Shaffer, whose reputation is bad, but Col. Crawford, now in charge, is said to be an experienced mining man.

RIO DOLORES MINING CO. COLORADO.

Office: care of W. K. Cowan, treasurer, Chicago, Ills. Mine office: Rico, Dolores Co., Colo. Lands, 2 miles north of Rico, are said to show a 3′ vein carrying up to 8% copper.

SOCIÉTÉ DES MINES DE CUIVRE ET DE PLOMB DE RIO PARDIS. SPAIN.

Mine office: Molinillo, Ciudad Real, Spain. Organized August, 1903, under laws of France, with capitalization 2,500,000 francs, shares 250 f. par, to develop argentiferous lead and copper properties, near Molinillo. Idle.

COMPAÑIA MINERA RIO GRANDE y DOLORES DE LONDRES. MEXICO.

Office: 37 Old Jewry, London, E. C., Eng. Mine office: Guadalupe, Rio Grande, Coahuila, Mex. A. T. MacSwinney, manager. Property is La Nave mine, carrying argentiferous copper ore, with values mainly in silver. Has steam and water power, with a 20-ton mill and leaching plant, employing circa 75 men.

RIO GRIO DISTRICT COPPER CO. (TOBED & CODOS EXPLORATION), LTD. SPAIN.

Dead. Title changed, January, 1907, to Aragon Copper Mines, Ltd. Formerly at Codos, Zaragoza, Spain.

RIO HONDO COPPER CO. NEW MEXICO.

Dead. Property sold, circa 1900, to San Cristobal Copper Co. Formerly at Arroyo Seco, Taos Co., N. M.

RIO LUNA MINES CO., LTD. SPAIN.

Dead. Formerly at Campo La Lomba, Leon, Spain. Described Vol. VI.

SOCIÉTÉ DES MINES DU RIO MURTIGA. SPAIN.

Office: 34 Rue de Provence, Paris, France. Mine office: Encinasola, Huelva, Spain. Organized Jan. 7, 1904, under laws of France, with capitaliza-

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tion 57,500 francs, shares 250 francs par. Property is the Santo Domingo and Santa Isabel mines. Presumably idle.

RIO NEGRO MINES, LTD. **SPAIN.**

Office: 6 Suffolk St., Pall Mall, London, S. W., Eng. Mine office: Campo La Lomba, León, Spain. Alfred DuCros, chairman; W. T. Cunningham, secretary. Organized Aug. 2, 1899, under laws of Great Britain, with capitalization £250,000, shares £1; issued, £235,007. Debentures, £15,000 authorized; £14,000 issued. Lands, 8 claims. Idle several years and apparently moribund.

RIO RIMAL COPPER CO., LTD. **SPAIN.**

Dead. Wound up August, 1905. Formerly at Figueras, Gerona, Spain. Described Vol. VI.

RIO TAMBO DEVELOPMENT SYNDICATE, LTD. **PERU.**

Office: 4 Broad Street Place, London, E. C., Eng. Mine office: Arequipa, Perú. Capt. W. B. McTaggart, J. P., chairman; E. J. Summers, secretary; Gerald V. Hopkins, manager. Organized Aug. 26, 1905, under laws of Great Britain, with capitalization £15,025, in 15,000 shares of £1 par and 500 founders shares of 1s. par. Property is gold and copper claims near Arequipa.

RIO TENIDO COPPER MINES, LTD. **SPAIN.**

Dead. Voluntarily liquidated, April, 1903. Formerly in Huelva, Spain.

RIOS DE COBRE DE RIO TINTO. **MEXICO.**

Dead. Was succeeded, 1907, by Rio Tinto Mines & Smelting Co. Formerly at Terrazas, Chihuahua, Mex. Fully described Vol. VI.

COMPAÑIA MINERA RIO TINTO. **MEXICO.**

Mine office: Guadalupe, Zacatecas, Mex. Property is said to carry gold, silver and copper ores.

RIO TINTO CO., LTD. **SPAIN.**

Office: 30 St. Swithin's Lane, London, E. C., Eng. Mine office: Las Minas de Rio Tinto, Huelva, Spain. Works office: Port Talbot, Glamorganshire, Wales. Employs circa 11,000 men. Chas. Wm. Fielding, chairman; preceding officer, Rt. Hon. Earl of Denbigh, Lionel C. G. Sartoris, John MacFarlan and John M. Macdonald, directors; J. Gordon Macleod, general secretary; Samuel J. Bowes, financial secretary; Turquand, Youngs & Co., auditors; Commercial Bank of Scotland, Ltd., bankers; Freshfields, solicitors; Walter J. Browning, mine manager; R. E. Palmer, assistant manager; W. G. Nash, estates manager; G. W. Porteous, traffic manager; Geo. Davey, superintendent; Gordon Douglas, engineer; D. Gonzalo Tarin, consulting engineer.

Organized March 29, 1873, under laws of Great Britain, with capitalization £3,250,000, increased, November, 1905, to £3,500,000, shares £5 par, in £1,625,000 cumulative 5% preference shares and £1,875,000 ordinary shares. The new issue of 50,000 ordinary shares, par £5, was sold to shareholders at £63 per share, netting the company £3,150,000, for the redemption of an outstanding bond issue of £2,989,740, at 4%, which was fully retired. Transfer form, common; fee, 2s. 6d.; warrants to bearer issued in denominations of 1 share, fee 6d., and 5, 10 and 25 shares, fee 1s.; fee for conversion into registered shares, 2s. 6d. per certificate. Stock Exchange settlement, all shares quoted in the official list. Fiscal year ends with calendar year; accounts are issued in April, and an interim semi-yearly report is issued in October. Dividends are payable in Paris by the Société Générale, 54 Rue de Provence, and in Bremen, Germany, by the Deutsche Bank.

Dividends were begun 1879, and have been paid continuously, varying greatly according to net earnings. Dividends on the old ordinary shares, of £10 par, 1879, to 1896, ranged from 6s. in 1886 to 38s. in 1896. On the present ordinary shares of £5 par, dividends have ranged from 40% in 1897 to 110% in 1906. Dividends were small at first, because the company was seriously handicapped by three different sets of mortgage bonds, bearing 5% interest.

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In 1895 the mortgage debt was consolidated into a single issue of £3,600,000 first-mortgage debentures, bearing 4% interest, with a sinking fund and semi-annual redemption, which would have extinguished the mortgage in 1919, but, by the issue of new share capital, November, 1905, floated at the tremendous premium of 1,160%, the company has placed itself in an impregnable financial position, the credit for this able stroke of finance being due mainly to Mr. Fielding. Recent dividends on ordinary shares have been as follows: £3 12s. 6d., or 72½%, for 1901; £2 10s., or 50%, for 1902; £3 10s., or 70%, for 1903; £3 10s., or 70%, for 1904; £4, or 80%, for 1905; £5 10s., or 110% for 1906; £2 7s. 6d., or 47½%, for 1907.

Gross profits and dividends paid for recent years have been as follows: £1,691,723 profits and £1,214,687 dividends in 1903; £1,714,507 profits and £1,214,772 dividends in 1904; £1,900,539 profits and £1,477,187 dividends in 1905; £2,478,594 profits and £2,139,687 dividends in 1906; £2,139,688 dividends in 1907. The company ended 1908 with a reserve fund of £500,000, of which £400,000 was in consols and £100,000 in selected shares. The company's dividends in 1907 were the greatest ever paid in one year by any copper mine.

Lands, 23,000 acres, freehold, of which 1,922 hectares, or circa 4,700 acres, were secured from the Spanish government, and 18,300 acres adjoining were purchased from various private owners. Mining operations are conducted in an area of practically 5 square miles.

The Rio Tinto is much the most ancient of the great mines of the present day, and its history stretches back into the mists of antiquity. The first semi-authentic account of the mine dates from the Eleventh Century before Christ, when the Phœnicians traded in copper made from its ores. Carthage, that vigorous young offspring of Tyre, succeeded to the hegemony of the Iberian mines, and worked the Rio Tinto extensively, for several centuries, being displaced, in turn, by the Romans, after the repulse of the second Punic invasion, followed by the total overthrow of the Carthaginian power. The Rio Tinto was worked by the Romans, for centuries, upon a very considerable scale, and, after the decadence of the Roman power, the mines were operated, in a very crude way, by the Goths. Again the fortunes of war gave the Iberian peninsula to new masters, and the Moors, in turn, were owners and operators of this great copper deposit. Following the expulsion of the Moors from southern Spain, by Ferdinand and Isabella, those most Catholic and most warlike sovereigns of Castile and Aragon, the mines fell into the hands of the Spaniards, and were reopened by them, very early in the Sixteenth Century. The Spaniards, while among the world's best miners, and the pioneers of silver and gold mining in both North and South America, never paid close attention to copper or iron, and, even at home, the Rio Tinto, although the property of the Spanish Crown, was worked, during its most successful periods, by foreigners, as it is to this day. In the Seventeenth Century the mine became a considerable producer, under the management of a Swede named Wolters, and after his death did fairly well under the direction of a French metallurgist named Tiquet. In the Eighteenth Century the mine was leased by the crown to a company of English adventurers, of whom the leading spirit was Lady Maria Theresa Herbert. During the chaotic period of the French invasion, early in the Nineteenth Century, the mine was abandoned, and after being reopened, in 1812, by the Spanish Crown, was worked in a small way only. For the next sixty years the mine was under the management of various lessees, until sold outright, in 1873, to Matheson & Co., of London, for 92,800,000 pesetas, that firm organizing the present company, which has proven one of the most profitable mining corporations in existence.

The remains of mining and smelting operations of the ancients are very notable. Don Gonzalo Tarin, consulting engineer of the company, who has

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been closely connected with the mine since 1867, in his very able work, "Memorias," estimates the quantity of scoria remaining from ancient smelting operations, whether Roman or Phœnician, or both, at no less than thirty million metric tons, and his acquaintance with the property and its history, and his opportunities of estimating and verifying these figures, are perhaps the best of any individual living. Lying above slag-piles left by the Phœnicians is a 10′ bed of alluvium, on top of which are the Carthago-Roman slags. The smelting practice of the Romans apparently was very good, the slags left by them being as clean as those produced today. It is possible, however, that some of the copper left in the old slags has been leached out, during some 2,000 years of partial exposure to the elements, but it is the opinion of Señor Tarin that the slags have been resmelted, in which case the very latest modern metallurgical practice is but a repetition of the work of two thousand years ago.

The only remains of ancient mining tools and machinery that have been found at the Rio Tinto are three oak water-wheels, and some bronze rims of kibbles, which presumably were of wickerwork. There also are many pot-sherds, including fragments of miners' lamps of the well-known classic pattern, and Roman coins are unearthed occasionally.

The Roman system of mining, so far as can be judged from the evidence offered by the Rio Tinto mine, apparently was to cut narrow seams and slab off the ore in large masses, either by wedging, or by the agency of quicklime, tamped into the crevices and then wetted, and possibly both methods were used, these being the systems most generally employed, previous to the adoption of gunpowder for blasting. The richer veins were followed persistently, and the ancients were good judges of values, as has been learned by many a modern mining company that has reopened old mines in Spain and Italy, in the hope of finding that much high-grade ore was left unmined. The Rio Tinto was not worked out, because the deposit was too vast, but the rich ores of the secondary zone of enrichment were quite effectually extracted, in all the old workings. Indications favor the hypothesis that the ancient miners at the Rio Tinto used hard-faced tools and hand-drills, working directly on the faces and in the ore bodies.

The Rio Tinto is situated in a rugged district, in a spur of the Sierra Andevallo, though the hills sometimes are held to be a spur of the Sierra Aracena, which itself is a branch of the famous Sierra Morena. The Rio Tinto, however, is separated from the Sierra Andevallo, which is some 12 miles distant, by the rivers Odiel and Iárrama. The mines are 51 miles by rail from the seaport of Huelva, in the province of that name, lying in the extreme southwestern corner of Spain, near the Portuguese boundary.

The ore bodies of the Rio Tinto occur in mammoth lenses, with clay-slate on the south and porphyry to the north, and are surmounted by large gossans, much decomposed. The surface ore has been leached to the point of absolute worthlessness, the zone of secondary enrichment beginning at a depth of approximately 100′, and continuing to an average depth of 300′. Diamond-drill borings have shown untouched ore bodies carrying upwards of 130,000,000 long tons of ore, giving sufficient reserves for nearly 70 years' production, at the present rate of mining, and it is unlikely that the full extent of the ore bodies available has been proven. For removal of overburden there are 4 steam-shovels, each with dippers of 4 cubic yards capacity, and about 2,000,000 cubic meters of overburden are removed yearly.

Ore, as extracted, is divided into 3 classes. Smelting ore carries 4 to 6% copper, export ore about 3.5% copper and 45 to 50% sulphur, while leaching ore carries 1.5 to 2% copper only. The average percentage of copper carried by the ores treated has ranged from 1.5% copper, in 1876, the first year of

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production by the present company, to 3.234% in 1884, the average of copper extraction being 2.39% in 1903, 2.34% in 1905 and 2.411% in 1906, in which year the lower grades of ore averaged copper returns of 2.302% and 1.198%. The ores carry an average of 1.5 oz. silver per long ton, with traces of gold, and considerable silver is saved, by the Claudet process, at the smelter. About one-third of the total production is exported for sulphur contents, and about one-third of the ore produced is smelted, balance being leached, or sent abroad to burners. The ores average 4 to 5% copper in the zone of secondary enrichment, and with depth decline gradually in value, until at about 1,000′ depth the average copper tenor is only about 1.25%. The main ore body formerly was considered to carry chalcopyrite, sparingly disseminated in massive iron pyrites, but apparently the bulk of the ore is cupriferous pyrite, carrying copper in the form of fine grains of chalcocite, not chalcopyrite, as formerly generally held. Owing to the ore being unusually rich in sulphur, the shipping ores of the Rio Tinto are in good demand, and, in addition to supplying various British works, the company exports washed sulphur ore, in very large quantities, to Germany, France, Belgium and sundry seaboard acid works in the United States. The reserve heaps at the mine are estimated to carry about 150,000 long tons fine copper, and the copper output of the mine has shown little change since 1898.

The Rio Tinto has 3 mineral zones, carrying a succession of lenses, these being known as the South or Nerva lode, the Middle or San Dionisio lode and the North lode, in addition to which there are 2 smaller detached lenses, adjacent to the North lode, which, like it, are being worked open-cast. There are 5 different mines, of which 3 are worked open-cast and 2 underground, though one of the latter is being changed over for open-cast extraction. The underground mines are worked pillar-and-stall, with levels at intervals of 12½ meters, levels being opened 4 meters high, and the entire floor divided into galleries and crosscuts of 4x4 meters, leaving pillars of 6x6 meters, which is not an entirely satisfactory method of extraction, leaving, as it does, more ore in the pillars than is mined.

The San Dionisio mine, which is the westernmost, also is the deepest, having a shaft of nearly 1,200′ depth. Work was begun, 1907, in changing over the San Dionisio for open-cast extraction, and open pit production probably will begin 1911. The San Dionisio is likely to afford the chief source of ore supply for several decades to come, and the management has laid out work for 10 years in advance.

The principal workings of the Rio Tinto are open-cast, and in these the capping is sliced down, in terraces, and the ore mined in terraces also, cars being brought in by locomotives to as great depths as practicable, both in stripping and quarrying. The possibility of using the caving system for underground mining was considered, but apparently an adverse decision has been reached. The principal disadvantage of underground mining, beyond the loss of more than half of the ground left unmined in the pillars, is the scarcity and high price of wood for timbering, which could be obviated, largely, by the adoption of the caving system.

Some trouble was caused, early 1908, by subsidance of the ground over the South lode mine, this causing the collapse of a considerable number of buildings. This subsidance was not unexpected, though coming somewhat sooner than anticipated, and the buildings lost will be replaced at other points.

Owing to the extensive employment of open-cast extraction, the Rio Tinto lacks the immense hoists and powerful machinery found at the other great copper mines of the world, which is due, not to lack of enterprise, but to the mine's ability to dispense with such expensive machinery, the underground workings being neither especially deep nor extensive. The company erected,

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1908, a large central electric power plant, to replace a number of widely scattered and uneconomical steam installations.

The methods of lixiviation followed by the Rio Tinto are described at length in the chapter on hydrometallurgy in this volume. In addition to the amount of copper estimated in the teleras, or primary leach-heaps, there are upwards of 100,000 long tons of copper in the tereros, or secondary leach-heaps. Owing to alternations of heavy rainfalls with protracted seasons of drought, water storage is necessary, dams having been constructed for that purpose, and an additional reservoir was built, 1907. The average rainfall of the Sierra Morena, 1873-1905, was 28" yearly, but, in 1906, the precipitation was only 18", causing serious trouble, during 1907, from lack of water, heavy rainfalls at the end of 1907 giving an ample supply for 1908 operations. The ore leached at the mines is no longer calcined, the copper becoming soluable by natural weathering, assisted by systematic sprinkling. About 7,000,000 gallons of leach-water, strongly charged with copper, are treated daily, in the various lixiviation plants of the Rio Tinto. The product of the leaching plants is cascara, or cement copper.

There are 5 towns for workmen on the property, and the company has planned an unusually heavy building campaign for 1909, as a large number of dwellings must be constructed, to replace those destroyed, early 1908, by subsidence of the workings of the South lode.

The smelter, at the mine, built 1902, is treating an increasingly large proportion of ore on the ground, including considerable ore of a grade formerly leached. The smelter has two 42x160" elliptical water-jacket cupolas, 25' 4" over all in height, with charging doors 10' above the bottoms, which are detachable, and mounted on wheels. Each furnace has 8 water-jackets and 2 charging doors, ore and fuel being charged alternately. The furnaces have continuous discharge into 30-ton settlers, 12' in diameter and 40" high, which have continuous slag discharge. Furnace product is matte, of 29 to 34% copper tenor.

Molten matte is taken, in 8-ton ladles, by electric traveling cranes, to the converter department, where there are 6 stands, rotated hydraulically, from a pulpit. Shells are 80x120", of horizontal barrel type, with spherical valves and 12 tuyeres each, and are in 2 parts, for convenience in lining. Shells are double-lined with a 4" external course of fire-brick, rarely replaced, and an inner section, 22" to 26" thick, of ground silica and low-grade quartzose copper ores, with 10% of clay for a binder. When newly lined shells have a capacity of only 3 to 4 tons each, increasing to about 8 tons when the inner linings are nearly burned out. The smelter product is converter bars, of 98 to 99% copper tenor.

The mines are connected with the seaport of Huelva by the Rio Tinto-Huelva railway, a single-gauge line of 84 kilometers length, built, 1873, by the company. This line does a general freight and passenger business, in addition to handling the company's heavy traffic, and earns substantial net profits. At Huelva, which probably is built on the site of the old Phenician city of Onoba, at the junction of the Tinto and Odiel rivers, the Phenicians and Carthaginians as the Urium and Anas rivers, the company has extensive railway terminals and wharves. The Rio Tinto Company owns the steamer Don Hugo, of 1,249 tons registered burden, plying between Spain and Wales.

The Rio Tinto employs nearly 11,000 men, in Spain, of which number about 60 members of the staff are British, the Spanish workmen, as a rule, latter earning average wages of 15 reals, equal to about 60 cents, per day of 8 and 9 hours. There is no Sunday work, and the men are paid daily, the labor being docile and giving very efficient and satisfactory workmen, in all grades. The population of the dual mining township of Rio Tinto-Nerva is

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about 27,000, and of the port of Huelva 24,000, hence it is estimated that the Rio Tinto Co., Ltd., is the direct source of support of 50,000 people in Spain, and indirectly supports perhaps half as many more in Spain, England and upon the Continent.

For many years the company maintained extensive smelters and acid works at Cwm Avon, Wales, but the lease was surrendered, 1906, the works being poorly located for receipt and dispatch of material.

The new Welsh reduction plant, at Port Talbot, Glamorganshire, Wales, is a modern smelter of good design and equipment, receiving material by sea from Spain, and having direct rail connection with the Great Western Railway. Electric power is used throughout, and there are 2 Temperley transporters, operated electrically, for carrying bags of precipitate and bars into the ore-sheds. The Port Talbot works have five 30-ton refining furnaces, top-charged by cars operated electrically, and the reverberatory furnaces have side-slag discharge. Slags from the reverberatories, carrying 4 to 6% copper, are resmelted in a water-jacket blast-furnace. The works have mechanical ladleing, with traveling carriages running on rails, the carriages having ball-bearings, with metal weights on the handles to counterbalance the charges. The cinder from the acid plant is treated by the Henderson wet process, for the extraction of copper.

Production of copper, for the past 5 years, has been as follows: 80,214,400 lbs. fine copper in 1904; 72,307,200 lbs. in 1905; 75,379,520 lbs. in 1906; 72,390,080 lbs. in 1907. Ore production has been as follows: 1,918,538 long tons in 1903; 1,948,819 tons in 1904; 1,930,100 tons in 1905; 1,923,716 tons in 1906; 1,906,948 tons in 1907. Average cost of copper is about 7 cents per pound. About two-thirds of the ore extracted is treated locally and balance shipped, and copper production is approximately 60% from smelting ore and precipitate, and 40% secured from the residue of ore shipped for sulphur burning.

The management of the Rio Tinto happily combines British conservatism with Twentieth Century progress, and the mine itself, having been a producer for three thousand years, scarcely requires endorsement.

RIO TINTO COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

RIO TINTO COPPER SYNDICATE, LTD. **TRANSVAAL.**

Dead. Liquidated August, 1908. Former office was Robinson's Bldgs., Johannesburg, Transvaal. Capitalization was £6,000, shares £1 par, with working capital of £2,000. Property was the Farm Klipplaatdrift No. 52. Formerly in the Middelburg district, Transvaal.

RIO TINTO DEVELOPMENT CO. **U. S. A.**

Office: Majestic Bldg., Denver, Colo. W. W. Ellis, president; A. A. Marshall, secretary and treasurer. Organized January, 1908, under laws of Arizona, with capitalization $2,750,000, shares $1 par, in $250,000 cumulative 15% preferred stock and $2,500,000 common stock. Was formed to buy stocks in copper mining companies.

RIO TINTO GOLD & COPPER CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz. Described Vol. VI.

RIO TINTO (HILLGROVE) COPPER MINES, N. L. **AUSTRALIA.**

Office: Charters Towers, Queensland, Australia. Organized Aug. 3, 1907, with capitalization £8,000, shares 2s. 6d. par.

COMPAÑIA MINERA RIO TINTO MEXICANO. **MEXICO.**

Office: Chihuahua, Mex. Mine office: Terrazas, Chihuahua, Mex. Employs 150 men. Juan A. Creel, president; Frank Fletcher, general manager; H. L. Schneider, superintendent.

Lands, 96 pertenencias, area circa 200 acres, including the Rio Tinto group

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of 50 hectares, at Terrazas, 25 miles north of Chihuahua, on the Mexican Central Railroad, and the Savanarola group, at Savanarola, circa 50 miles south of Chihuahua and 35 miles west of Ortiz, latter carrying argentiferous copper and lead ores.

The Rio Tinto Mexicano mine, opened 1860, closed 1902, and reopened circa 1905, shows limestone and altered andesite, carrying 5 lenticular ore bodies, traced 1,500 meters, in a metamorphic zone between limestone and eruptive rocks, ore, mainly in limestone, occurring apparently as replacements, also as lenses, between the bedding planes of limestone, near a large intrusive quartzite dyke. The ore bodies are erratic in size and occurrence, but are connected, and practically continuous, as a rule. The limestone has an average dip of 45° NW., carrying 5 ore bodies, of 5′ to 6′ average width. Ores, as developed, are mainly oxidized, and are estimated to average 2.5% copper, with traces of lead and zinc, 5 oz. silver and 0.02 oz. gold per ton.

Development is by the 412′ Verde shaft, 350′ Promontorio shaft, 150′ Bronce shaft, 120′ Pedernal shaft, 180′ San Martin shaft and 100′ Vinagre shaft, with about one mile of workings.

Equipment includes a 50-h. p. gas plant at the mine, and a 100-h. p. steam plant at the smelter. There are 5 hoists, of 6 to 22 h. p., good for circa 500′ depth. Buildings include various shops, of adobe, and 5 stone shafthouses, with 150 adobe dwellings for workmen.

The smelter, at Terrazas, one mile from the mine, receiving ore by wagon and rail, is reached by a 1-kilometer spur from the main line of the Mexican Central Railway. Water is secured from a pumping station, one mile distant, through a 4″ pipeline. The smelter, enlarged 1908, which does a general custom business, has a 200-ton water-jacket blast-furnace, making matte averaging 50% copper, 50 oz. silver and 0.6 oz. gold per ton, sent to the Aguascalientes works for refining. The smelter is planned as the first unit of a 600-ton copper and lead plant. Mine fuel is wood, costing 7 pesos per cord, and coal, costing 13 pesos per metric ton, and smelter fuel is coke, costing 19 pesos per ton.

Production was circa 1,000,000 lbs. fine copper in 1906, circa 1,400,000 lbs. in 1907, and circa 1,500,000 lbs. in 1908. Ore treated, 1907, was 27,000 metric tons, averaging circa 2.5% copper, secured at a mining cost of 7 pesos per ton, and smelted at a cost of about 7 pesos per ton, giving an average cost for finished copper of 12.5 cents per ton.

The company plans deepening its shafts and opening new ore bodies, also building an addition to the smelter, material for which was on the ground, late 1908, and constructing a narrow-gauge railroad between the mines and smelter. In August, 1908, the mine was producing circa 75 metric tons of ore daily, averaging 2.5 to 3% copper, 5 oz. silver and 0.02 oz. gold per ton. The mine, while low in average tenor, has very large ore bodies, with a favorable location, and the management is considered good.

RIO TINTO MINES & SMELTING CO. **MEXICO.**

Mine office: Terrazas, Chihuahua, Mex. Martin J. Condon, president; John M. A. Conner, general manager; W. C. Murray, superintendent. Organized 1907, under laws of Mexico, with capitalization 3,000,000 pesos, as successor of Minas de Cobre de Rio Tinto. Property is described under title of Compañía Minera Rio Tinto Mexicano.

RIO TONTO COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Wickenburg, Maricopa Co., Ariz. Lands, 15 claims, in the Picacho district, east of Wickenburg, said to show gossans of 200′ to 300′ width, traceable up to 700′ in length, with ores carrying 2 to 25% copper.

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RIO VERDE COPPER CO. **MEXICO.**

Letter returned unclaimed from former office, Kansas City, Mo. Mine office: Baborigame, Mina, Chihuahua, Mex. Oliver Krull, manager. Capitalization, $2,000,000. Lands are the San Carlos group, 20 miles from Baborigame and circa 50 miles from Choix, having 2 shafts, one showing a 2′ vein of mixed copper and lead sulphides, and the other a 2′ vein of copper sulphides assaying 12 to 15% in tenor. Presumably idle.

RIO VISTA GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: 25 Nevada Blk., San Francisco, Cal. Mine office: Fair Play, El Dorado Co., Cal. L. H. Hand, president; R. M. Harris, secretary; J. T. Lantford, superintendent. Organized January, 1901, under laws of South Dakota, with capitalization $1,000,000, shares $1 par.

Lands, 5 claims, 2 patented, area 100 acres, 3 miles from Fair Play, including the Consumnes mine, area 40 acres, opened by a 400′ shaft, said to show a 23′ vein, carrying a 4′ paystreak of bornite giving average assays of circa 15% copper and $10 combined gold and silver values. Mine has about 500′ of tunnels, the Volcano tunnel being claimed to show a 10′ vein carrying bornite. Equipment is said to include a steel gallows-frame, hoist, and 3-drill Rix air-compressor, using baby drills.

The company was said to be building a 30-ton smelter, but same failed to materialize, and the company disappeared from its former office. Company is viewed with suspicion, on account of extremely untruthful advertising in its early days, and the fact that it does not pay its bills.

RIPLE COPPER MINES, LTD. **NORWAY.**

Office: Finsbury House, Blomfield St., London, E. C., Eng. Organized May 8, 1908, under laws of Great Britain, with capitalization £175,000, shares £1 par, to acquire mines in Norway.

RIP VAN WINKLE CONSOLIDATED GOLD MINING & MILLING CO. **WYOMING.**

Office: Laramie, Wyo. Mine office: Morgan, Carbon Co., Wyo. Dr. I. R. Swigart, secretary and treasurer.

RISING SUN COPPER MINING & SMELTING CO. **MARYLAND.**

Dead. Formerly at Mt. Washington, Baltimore Co., Md.

RITO ALTO COPPER CO. **COLORADO.**

Office: 102 Exchange St., Portland, Me. Mine office: Hillside, Frémont Co., Colo. H. M. Comstock, general manager. Capitalization $1,500,000, shares $1 par, half common and half 8% preferred shares. Lands, circa 300 acres. Company claimed to have 3½ miles of underground workings, and to be building a 50-ton reduction plant, but neither statement verified nor considered credible.

RIVERSIDE COPPER CO. **ARIZONA.**

Dead. Formerly at Morristown, Maricopa Co., Ariz. Described Vol. VI.

RIVERSIDE COPPER MINING CO., LTD. **IDAHO.**

Office: Wardner, Idaho. Letter returned unclaimed from former mine office, Cataldo, Kootenai Co., Idaho. Lands are about 10 miles from Cataldo.

ROARING FORK MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Rambler, Carbon Co., Wyo.

ROBERTA MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Thos. Roberts, manager. Lands, 12 claims, patented, well timbered, one Nine Mile Creek, having several short tunnels, lower, of 100′, planned to be driven 2,000′, to give a back of 800′, to tap 4 parallel veins, 1 of which shows surface ores assaying up to 6% copper, 10% lead, 16 oz. silver and $3 gold per ton.

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ROBERT EMMET COPPER CO. **MONTANA.**

Mine office: Boulder, Jefferson Co., Mont. Robt. Q. Ranft, general manager; Robt. Angus, superintendent. Lands, 5 claims, about one mile south of the western portal of the Wickes tunnel, having a 230′ shaft, and a tunnel, with about one-fourth mile of workings, showing a 12′ vein of auriferous and argentiferous copper and lead ore, assaying up to 15% copper, 15% lead, 5 oz. silver and $2.40 gold per ton. Property is said to show good ore on the 250′ level, carrying payable values in copper, lead, silver and gold. Equipment includes a 100-h. p. electric installation and a 10-drill air-compressor.

ROBINSON MINING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization $1,000,000, shares $1 par. Lands, 11 claims, area circa 128 acres, near the Giroux Consolidated, having a 40′ shaft showing ore said to give average assays of 5.42% copper, 25% lead, 7 oz. silver and 80 cents gold per ton.

ROBLES GRANDE GOLD & COPPER MINING CO. **NEVADA.**

Dead. Formerly at Goldfield, Esmeralda Co., Nev. Described Vol. VI.

ROB ROY MINING CO. **UTAH.**

Office: care of Edward McGurrin, secretary and treasurer, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Emanuel Rauch, president; Angus McKellar, Jr., vice-president. Capitalization, $75,000. Lands, 4 claims, on Clipper hill. Idle several years.

NEGOCIACION MINERA LA ROCA NEGRA. **MEXICO.**

Dead. Mine sold, circa 1903, to American-Mexico Mining & Development Co. Formerly at Velardeña, Cuencamé, Durango, Mex.

ROCHELLE MINING & MILLING CO. **CALIFORNIA.**

Mine office: Bishop, Inyo Co., Cal. A. C. Ringwald, president. Ores are said to include native copper, bornite, chalcopyrite and tetrahedrite.

ROCHESTER SHOSHONE MINING & MILLING CO. **WYOMING.**

Office: 429 Granite Bldg., Rochester, N. Y. Mine office: Shoshoni, Fremont Co., Wyo. Samuel A. Millington, president; Sam B. Palmer, vice-president; August J. May, secretary; Daniel J. Gregg, treasurer; Fredk. O. Morse, general manager. Capitalization $1,500,000, shares $1 par. Lands, 12 claims, area 240 acres, circa 2 miles from the Williams-Luman mine, said by company to be in one of the richest copper producing sections in the world, and to be especially valuable because all virgin territory.

ROCK CREEK COPPER MINING CO., LTD. **IDAHO.**

Dead. Formerly at Mullan, Shoshone Co., Idaho.

ROCIADA GOLD & COPPER CO. **NEW MEXICO.**

Mine office: Rociada, San Miguel Co., N. M. Property is said to show a 6′ vein of ore, assaying 10 to 20% copper, with lead, silver and gold values, opened to depth of 200′.

ROCK ISLAND MINE. **MONTANA.**

Office: Pittsburg, Pa. Mine office: De Borgia, Missoula Co., Mont. Equipment includes a steam plant with two 60-h. p. boilers, hoist good for 1,200′ and a 6-drill air-compressor. Idle.

ROCK ISLAND MINE. **MONTANA.**

Owned by Butte Coalition Mining Co.

ROCK LAKE MINING CO., LTD. **ONTARIO.**

Dead. Liquidated, 1905, and property sold to Algoma Copper & Smelting Co. Formerly at Bruce Mines, Algoma, Ont. Described Vol. IV.

ROCKLAND COPPER CO. **BRITISH COLUMBIA.**

Dead. Formerly at Silverton, Kootenay district, B. C.

ROCKLAND COPPER CO., LTD.

Office: 566, The Bourse, Philadelphia, Pa. Location of lands, if any, unknown.

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ROCKY MOUNTAIN CONCENTRATING & MILLING CO. **COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Ores carry gold, silver and copper. Has gasoline power, 25-stamp mill and 75-ton concentrator. Presumably idle.

ROCKY MOUNTAIN COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

ROCKY MOUNTAIN SMELTING CO. **COLORADO.**

Dead. Property was the Rocky Mountain Smelter. Formerly at Florence, Frémont Co., Colo.

SOCIÉTÉ DES MINES DE CUIVRE DE RODAM. **PORTUGAL.**

Office: Brussels, Belgium. L. Maudet, R. Hoëd, E. Fournier, P. Steenlet and L. Mourgues, directors; Jacques François, commissaire. Organized Feb. 28, 1906, under laws of Belgium, with capitalization 1,000,000 francs, shares 200 francs par. Presumably idle.

RODMAN MINING & MILLING CO. **NORTH CAROLINA.**

Dead. Formerly at Guilford College, Guilford Co., N. C.

ROEBURNE COPPER & GOLD MINES, WESTERN AUSTRALIA, N. L. **AUSTRALIA.**

Office: Sydney, N. S. W., Australia. Mine office: Roebourne, Western Australia. Organized circa January, 1907, with capitalization £40,000, shares 10s. par. Lands are the Carlow Castle group, leasehold, carrying 2 ore bodies, said to show considerable ore. Shipped, 1907, several small trial parcels of copper ore to New South Wales smelters, but, owing to fall in price of copper latter half of 1907, has concentrated efforts on gold claims.

ROGERS COPPER & IRON CO. **TENNESSEE.**

Dead. Formerly at Ducktown, Polk Co., Tenn. Described Vol. VI.

ROGERS FREEHOLD COPPER MINES, LTD. **AUSTRALIA.**

Office: Townsville, Queensland, Australia. Organized Aug. 31, 1907, under laws of Queensland, with capitalization £65,000, shares 10s. par.

ROGERS MINING CO. **COLORADO.**

Dead. Formerly at Pearl, Larimer Co., Colo. Described Vol. VI.

ROGERS SPRINGS MINING CO. **ARIZONA.**

Office: Detroit, Mich. Mine office: Cave Creek, Maricopa Co., Ariz. Lands, supposedly 20 claims, 36 miles from Phœnix, the nearest railroad point. Company is said to contemplate a smelter, with a first unit of 100 tons.

ROGUE RIVER MINING & SMELTING CO. **OREGON.**

Dead. Was abortive. Formerly at Grants Pass, Josephine Co., Ore. Described Vol. VI.

ROHR-GEDDES MINING & DEVELOPMENT CO. **NEW MEXICO.**

Office: Raton, N. M. Mine office: Clayton, Union Co., N. M. Fred Rohr, president; Robt. Vogl, vice-president; L. G. Gregory, treasurer; Frank A. Wall, secretary; J. E. Geddes, general manager. Lands, 420 acres, a few miles west of the Pittsburg Copper Co., in the Peacock Cañon district, having several pits and shafts of 15′ to 40′ depth, and a 267′ shaft showing sulphide ore said to assay 22% copper, with small gold and silver values.

RAFAEL ROJAS. **CHILE.**

Office and mine: Tres Puntas, Tocopilla, Antofagasta, Chile. Property includes Tres Puntas mines, showing a vein traceable 140 meters and opened to depth of circa 100 meters. In 1904 produced circa 200 metric tons of ore averaging about 17% copper tenor.

RONQUILLO COPPER CO. **MEXICO.**

Office and mine: 2 Postoffice Bldg., La Cananea, Arizpe, Sonora, Mex. A. D. Nanney, president; G. C. Eastman, vice-president and superintendent; P. J. Tehaney, secretary. Organized Aug. 31, 1905, under laws of Arizona,

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with capitalization $1,000,000, shares $1 par. Also is organized under laws of Mexico as Ronquillo Mining Co., S. A.

Lands, 72 pertenencias, well timbered, known as the Ronquillo group, 4 miles from Janoverachi, 8 miles south of Cananea and one-half mile from the Sonora river. Formerly owned the Swansea group, sold circa 1907.

The Ronquillo mine shows antigua workings, on a vein up to 40' width, traceable nearly one mile, carrying cuprite, melaconite, malachite and azurite near surface, with an iron-porphyry gangue. Development is by tunnel and 3 shafts, of which No. 1 shaft, 71' deep, shows 40" of ore at the bottom, averaging 13% copper. No. 2 shaft, 32' deep, has given ores assaying up to 35% copper. Both Nos. 1 and 2 shafts were abandoned on account of soft ground. No. 3, the main working shaft, with 2 compartments, is sunk in country rock, and was circa 100' deep at last accounts. Water in this shaft is strongly impregnated with copper, and the ores carry fair gold and silver values.

RONQUILLO MINING CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Ronquillo Copper Co.

ROOIBERG COPPER CO., LTD. **TRANSVAAL.**

Dead. Liquidated, 1907. Formerly in the Transvaal.

ROOIBERG MINERALS DEVELOPMENT CO., LTD. **TRANSVAAL.**

Office: Oceana Bldgs., Johannesburg, Transvaal. Organized May, 1908, under laws of Transvaal with capitalization £150,000. Company has no connection with New Rooiberg Minerals Syndicate, Ltd. Lands, in the Rooiberg district of the Transvaal, were taken over mainly from the Oceana Mineral Co., Ltd., Farrar Bros., and Anglo-French, Ltd.

ROOIPUTS COPPER CO. **CAPE COLONY.**

Office: care of H. Sothcott, secretary, Johannesburg, Transvaal. Mine office: Upington, Cape Colony. Chas. A. O. Bain, chairman; preceding officer, G. H. Poole, Gustav Sonn and W. J. Holmes, directors. Organized August, 1908, under laws of Transvaal, with capitalization £6,000.

Lands are mining rights to the Farm Rooiputs, area 13,400 morgen, equivalent to circa 25,000 acres, adjoining the Areachap property on the north, held under option from June 30, 1908, at £1 per month for first year, and £3 per month for second year, with right to remove all ore at 2s. 6d. per ton, during term of the option, and privilege of purchasing the mineral rights on the Farm Rooiputs for £10,000 and 500 shares in any company floated. Diamonds have been discovered on the farm, and it is supposed to carry the extension of the Areachap ore bodies.

ROOKWOOD COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Idle and apparently moribund.

ROOSEVELT GOLD & COPPER MINING CO. **ARIZONA.**

Office: care of W. G. McDonald, president and general manager, P. O. Box 477, Bisbee, Ariz. Mine office: Ft. Thomas, Graham Co., Ariz. Property, 15 miles from Ft. Thomas, has a 60' shaft showing cuprite, malachite, chalcocite and chalcopyrite, of good assay values. Idle several years.

ROOSEVELT GOLD, SILVER & COPPER MINING CO. **MONTANA.**

Dead. Was organized May, 1906, under laws of Montana, with capitalization $1,000,000; shares $1 par. Directors were Del Amsden, Simon Bank, Swan T. Hogevoll, Daniel McNichol and Wm. Robertson. Formerly at Butte, Silver Bow Co., Mont.

ROOT RIVER GOLD & COPPER SYNDICATE. **ONTARIO.**

Office and mine: Sault Ste. Marie, Algoma, Ont. B. W. Harris, president; F. B. Sullivan, vice-president; Alex McIntyre, second vice-president; T. Robinson, secretary; Wm. Calder, treasurer. Organized under laws of Ontario, with capitalization $1,000,000. shares $1 par. Lands are 40 acres surface rights, and mineral rights to 640 acres, in Section 32, Township of Aweres, 11 miles

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north of Sault Ste. Marie, on the Algoma Central railroad. Lands have a 70′ shaft, showing a vein of 12′ to 16′ width, traceable circa 1,000′, carrying auriferous and slightly argentiferous copper ore, giving average assays of 2.37% copper.

RÖROS KOBBERVAERK. **NORWAY.**

Mine office: Röros, Trondhjem, Norway. Employs circa 700 men. Property is a group of old mines, including the Storvarts, Kongens, Kristian VI, Muggruben and Arvedals Grube, partly owned by the Norwegian government. From A. D. 1646 to 1897, this group of mines produced 73,000 metric tons fine copper, and exported 260,000 tons of pyrites, the aggregate value of this product being upwards of $35,000,000.

The Kongens and Arvedals groups carry chalcopyrite, and ore at the other properties is cupriferous pyrite, the ores ranging in copper tenor from 4.5 to 5% in the Kongens group, about 5% in the Muggruben, up to 6 to 7% in the Storvarts mine, the pyritic ores averaging about 45% sulphur.

Equipment includes a hydraulic power installation. The workmen are treated with great consideration, company running a special train to carry the men from the mine at Saturday noon, and bringing them back again similarly Monday morning.

Ore is matted in water-jacket blast-furnaces to a first-fusion product of about 37% copper tenor, which is resmelted to low grade pimple-metal, averaging 78% copper, which, in turn, is blown up, in Bessemer converters, to black copper of 95.5% tenor.

About 40% of the ore produced is exported for sulphur values only, though slightly cupriferous, and the balance smelted on the ground. Production, 1904, was 18,000 metric tons of ore smelted, averaging a trifle better than 4% copper, and 11,000 tons of pyrites exported, giving a total output of 1,641,920 lbs. fine copper, and in 1907 was 12,700 metric tons of cupriferous pyrite, yielding 1,365,000 lbs. fine copper. This is the second largest copper mine of Norway, and apparently should be able to increase production in the near future.

ROSALIE COPPER CO. **ARIZONA.**

Mine office: Meyer, Yavapai Co., Ariz. Samuel L. Casey, president; Wm. Nellis, first vice-president; Marshall Haddock, second vice-president; W. N. Rynerson, treasurer; E. M. Metcalf, secretary; Geo. C. Meese, general manager; preceding officers, Chas. Schifferdecker and Wm. A. Moses, directors. Organized under laws of Arizona, with capitalization $3,000,000, shares $1 par.

Lands, 9 claims, patented, area 180 acres, in the Copper Creek district, circa 25 miles southeast of Mayer and 18 miles from Cordes Siding, nearest railroad point, with a wagon road between. Mine has numerous pits and shafts, of 10′ to 148′ depth, and a 420′ tunnel, showing a 2′ to 3′ vein carrying native copper, cuprite, azurite, malachite and a little melaconite in the oxidized zone, followed by bornite, chalcopyrite and occasional chalcocite, giving assays up to 23% copper, average assays being 4.15 to 7.3% copper, with small gold and silver values. Has a 50-h. p. gasoline engine and air-compressor, and shipped, 1907, a little ore, returning circa 8% copper. Company's prospectus is filled with misleading general statements regarding the profits of copper mines. Closed down, 1907, but plans resumption.

ROSA AMARILLA COPPER CO. **MEXICO.**

Office: 33 Portland Blk., Chicago, Ills. Mine office: Pueblo Nuevo, Sayula, Jalisco, Mex. A. L. Dewar, president; Danl. Campbell, vice-president; F. W. Harnwell, secretary; L. E. Fuller, treasurer; John Mann, superintendent; John A. Kruse, engineer. Organized July 25, 1904, under laws of Maine, with capitalization $5,000,000, shares $1 par, and is organized under laws of Mexico as Rosa Amarilla Copper Co., Sociedad Anonima.

Lands, 5 groups, area circa 300 acres, including the Rosa Amarilla and

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Ethel copper groups, and the Talpurito silver group, circa 30 miles southwest of Autlán. Company has 3 water rights denounced, and has leased a timber tract of 1,800,000 acres, which can furnish timber at practically cost of cutting.

Lands show 4 ore bodies, probably lenses, averaging 100′ and upwards in width, in a zone of circa 600′ width, with outcrops traceable several miles. Average of upwards of 300 assays gave 7.8% copper, 6 oz. silver and a trace of gold, from oxide, carbonate and sulphide ores. Development is by 2 shafts, deepest 105′, and 4 tunnels, in addition to which some diamond drilling has been done. Property is 26 miles from the Pacific and company controls a harbor known as Puerto de Natividad. A road between the mine and port can be built with a grade not exceeding 4% at any point, and averaging about 100′ per mile.

COMPAÑIA MINERA ROSARIO. **ARGENTINA.**

Mine office: Calamuchita, Córdoba, Argentina. Ore body is iron pyrites, carrying chalcopyrite, with quartz gangue, averaging 5% to 6% copper. Has a smelter with a 36″ blast-furnace, making matte averaging 65% copper and 30 oz. silver per ton, sent to Great Britain for reduction and refining, when mine is working. Idle at last accounts.

MINA ROSARIO. **CHILE.**

Mine office: Tamaya, Ovalle, Coquimbo, Chile. Is owned by the Familia Lecaros. Mine, opened 1850, is 590 meters, or about 1,900′, in depth. Produced, 1866-1888, ore to extent of 64,589 short tons, averaging 17.7 to 29.4% copper tenor. Idle for some years, owing to decreased ore values at depth, and heavy timbering charges, but, with a railroad to Tongoi, and modern equipment, could be worked to advantage.

MINAS ROSARIO i PROVIDENCIA. **CHILE.**

Mine office: Chañarcillito, Caldera, Atacama, Chile. Mine shows 2 parallel ore bodies, averaging 8 to 10 meters width, in diorite and limestone, traceable for some distance, one ore body showing oxidized ores of copper, associated with spathic iron, these averaging about 4% in tenor and requiring concentration. The second vein carries oxidized ores only, to depth opened, these averaging about 5% copper. Ores, which are free smelting, are sent to Tierra Amarilla for reduction. Production, 1903, was about 450 metric tons of ore, averaging 16% in tenor, equivalent to about 160,000 lbs. fine copper.

ROSELLE MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly on Haskins Mountain, Liard River division, Cassiar district, British Columbia.

ROSEMONT COPPER CO. **ARIZONA.**

Office: 42 Broadway, New York, N. Y. Mine office: Rosemont, Pima Co., Ariz. Is controlled by the Lewisohn interests. Geological conditions are said to be similar to those at Bisbee, and ore bodies apparently are large. Idle for some years.

ROSEWOOD CREEK COPPER & GOLD MINING CO., LTD. **AUSTRALIA.**

Office: 7A Upper St. Martin's Lane, London, W. C., Eng. R. K. Evans, secretary. Mine office: Rosewood, Denison Co., Queensland, Australia. Organized July 31, 1903, as a reconstruction of Great Northern Copper & Gold Mining Co. of Queensland, with capitalization £100,000, shares 5s. par. Lands, 265 acres. Idle several years and apparently moribund.

ROSSLAND-GREAT WESTERN MINES, LTD. **BRITISH COLUMBIA.**

Dead. Reorganized, May 17, 1902, as Rossland-Kootenay Mining Co., Ltd. Formerly at Rossland, Trail district, B. C.

ROSSLAND-KOOTENAY MINING CO., LTD. **BRITISH COLUMBIA.**

Office: Salisbury House, London, E. C., Eng. Mine office: Rossland, Trail district, B. C. C. Williamson Milne, chairman; Bedford McNeill, consulting engineer; F. A. Labouchere, secretary. Organized May 17, 1902, under

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laws of great Britain, as a reconstruction of Rossland-Great Western Mines, Ltd., and Kootenay Mining Co., Ltd., with capitalization £150,000, shares £1 par; issued, £148,607. Lands, 171 acres, carrying auriferous and argentiferous copper ores, of low grade, also surface rights to 113 acres additional. Idle since August, 1904.

ROSS MINING & MILLING CO. **COLORADO.**

Office: Ross Bldg., Waynesburg, Pa. Mine and works office: Silverton, San Juan Co., Colo. Gilbert B. Parker, president; Ralph E. Clemson, vice-president and secretary; Frank L. Ross, treasurer; J. B. Ross, general manager; Patrick Lonergan, mine superintendent; E. W. Walter, smelter superintendent. Organized Dec. 13, 1905, under laws of Colorado, with capitalization $2,500,000, shares $1 par. Pittsburg Trust Co., transfer agent and registrar. Annual meeting, second Saturday in September.

Lands, 42 lode claims and 3 placer claims, area 300 acres, also 3 millsites, area circa 80 acres, with miscellaneous lands giving total holdings of 750 acres, in the Animas, Eureka and Red Mountain districts. Lands include groups known as the Champion, Belle Creole and Galtie Boy, held under a working bond and lease, partly paid, from the San Juan Smelting & Refining Co., also the Carbonate King mine, on Red Mountain, held under bond and lease.

The Champion mine, opened circa 1885, has 3 fissure veins, in granite, opened by a 45′ shaft and by tunnels of 150′, 375′, 800′ and 1,700′, with total workings of 2,350′, showing ore giving average assays of 5.5% copper, 25 oz. silver and $10 gold per ton, which assays probably are above the average value of the ore. Equipment of the Champion includes a 75-h. p. steam plant, 5-drill Rand air-compressor and 7 mine buildings.

The Belle Creole mine shows 2 fissure veins, in andesite, of 20′ width and 1,600′ length, slightly developed by shafts of 15′ and 35′, and by tunnels of 75′ and 150′, carrying low grade milling ore estimated to average circa 15% lead, 12% zinc, 15 oz. silver and $4 gold per ton. The property is practically without equipment.

The Galtie Boy shows 3 veins, occurring as fissures in andesite, these being said to average 6′ width and to be traceable 3,000′, opened to a depth of 600′ by a 50′ shaft and by tunnels of 350′ and 2,500′, with total workings of 2,900′. Ore gives average assays of 3% copper, 10% lead, 10 oz. silver and $5 gold per ton. Equipment is a 5-h. p. gasoline hoist.

The reduction plant, known as the Kendrick & Gelder smelter, is at Silverton, 1,500′ from the Champion, 2,000′ from the Galtie Boy and 3 miles from the Belle Creole mine, served by the Denver & Rio Grande and the Silverton, Gladstone & Northern railroads. The plant is a pyritic smelter, not thoroughly modern, having a 125-ton blast-furnace. The smelter does a general custom business, when operated, making matte carrying 45 to 50% copper, circa 200 oz. silver and circa 3 oz. gold per ton.

The company planned extensive development, the construction of a 20-stamp mill at the Galtie Boy mine, and the enlargement of the smelter, during 1906, but property was closed down, October, 1907, on account of financial difficulties, which apparently were adjusted, 1908.

ROUILLARD MINE. **NEW HAMPSHIRE.**

Mine office: Woodsville, Grafton Co., N. H. Property is on Mt. Gardner. Idle since 1902.

ROUSE-GARDNER MINING CO. **COLORADO.**

Dead. Formerly at Central City, Gilpin Co., Colo.

ROUTT COUNTY GOLD & COPPER MINING CO. **COLORADO.**

Office: 635 Seventeenth St., Denver, Colo. Letter returned unclaimed from former mine office, Steamboat Springs, Routt Co., Colo. W. T. Perkins, president; F. E. Coe, secretary and treasurer. Organized March, 1903, under

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laws of Wyoming, with capitalization $1,500,000, shares $1 par. Lands, 5 claims, area 50 acres, 100 miles from nearest railroad, having about 1,000' of tunnels, said to show considerable ore assaying $3.50 to $150 per ton, in gold, silver, copper and lead. Idle some years.

ROWAN GOLD & COPPER MINING CO. NORTH CAROLINA.

Dead. Formerly at Gold Hill, Rowan Co., N. C. Described Vol. VI.

ROYALBERG COPPER MINES, LTD. NORWAY.

Office: 2 Basinghall Ave., London, E. C., Eng. Mine office: Kongsberg, Christiania, Norway. E. T. Evans, secretary; E. C. Plews, manager and engineer; Ingwolf Otterbeck, superintendent. Organized Apr. 24, 1903, under laws of Great Britain, with capitalization £100,000, shares £1 par; issued, £81,600. Debentures, £1,500 at 8% and £7,500 at 5%.

Lands, 18 claims, area circa 50 acres, title by crown grant, also 20 acres timber lands, in the Fiskum district, opened by shafts of 40', 70' and 100', and by tunnels of 120' and 250', showing four 3' fissure veins in volcanic mica-schists, giving average assays of 14% copper, 20% lead, 10% zinc and 24 oz. silver per ton, from sulphide ores, and estimated to show 30,000 tons of ore, with 15,000 tons blocked out for stoping. The West Norway railroad is 2 miles distant, and it is proposed to develop 100 h. p. from a nearby waterfall. A small concentrator has been erected at the mine, and small shipments of concentrates have been made to British works.

ROYAL CONSOLIDATED COPPER CO. NEVADA.

Dead. Organized 1907, under laws of Arizona, with capitalization $2,500,000. L. L. Crisp was president. Apparently was promoted by the late Rev. Col. W. P. Fife. According to printed reports, the company's expert explained that the formation was "dyarite," porphyry and limestone, with large "burns" of iron gossan, ore deposits consisting of copper, gold and silver, lying in a fissure "cutting" a contact of porphyry and lime. The ore body was claimed to be 250' wide. Obviously was merely a bit of stock-jobbery. Former office was at Goldfield, Nev. Former mine office was at Mina, Esmeralda Co., Nev.

ROYAL CONSOLIDATED MINES OF EL COBRE, LTD. CUBA.

Dead. Succeeded, circa 1902, by El Cobre Mines. Formerly at El Cobre, Santiago de Cuba.

ROYAL COPPER CO. NEW MEXICO.

Dead. Property sold, 1901, to Aberdeen Consolidated Gold & Copper Co., also dead. Formerly at Lordsburg, Grant Co., N. M.

ROYAL COPPER MINING CO. UTAH.

Dead. Title changed, 1902, to Cactus Smelting & Copper Co., also dead. Formerly at Frisco, Beaver Co., Utah. Fully described Vol. II.

ROYAL COPPER MINING CO., LTD. MONTANA.

Office: Wallace, Idaho. Mine office: Belknap, Sanders Co., Mont. Chas. D. Johnson, superintendent. Surface trenches show ore, and a 463' crosscut tunnel cuts, at 400', a vein said to average 6% copper and 18% lead, with small silver values.

ROYAL CROWN MINING CO. MEXICO.

Office: Independencia No. 38, Oaxaca, Mex. Mine office: Ocotlán, Oaxaca, Mex. Gustavo Stein, president; Teodoro Meyer, secretary and treasurer; A. Hopley Woolrich, general manager; Martin Aguirre, superintendent. Organized under laws of Mexico, with capitalization 300,000 pesos, shares 1 peso par; paid in, 135,000 pesos.

Lands, 80 acres, also a 10-acre smelter site, in the Ocotlán district, showing 4 contact veins, between quartzite and andesite, of which two are being developed, these averaging 3 meters width and giving average assays of 13% copper, 739 grams silver and $11.50 gold per metric ton, from malachite, azurite and

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chrysocolla in the oxidized zone, and from chalcopyrite in the base zone. Mine is opened by shafts of 122′ and 125′, and is served by the Ocotlán & Ejutla railway, one-half mile distant. Presumably idle.

ROYAL GOLD & COPPER MINING CO. UTAH.

Dead. Apparently merged, circa 1904, in Nevada-Utah Mines & Smelters Corporation. Formerly at Milford, Beaver Co., Utah. Fully described Vol. II.

ROYAL METALS MINING & LEASING CO. NEVADA.

Mine office: Ely, White Pine Co., Nev. Organized circa April, 1907.

ROYAL MINING & INVESTMENT CO. COLORADO.

Mine office: Silverton, San Juan Co., Colo. W. R. Pyke, superintendent. Has argentiferous lead and copper ores, with steam power equipment, employing circa 20 men.

ROYAL MORELOS COPPER CO. MEXICO.

Dead. Was succeeded, 1908, by Occidental Copper Co. Was organized under laws of Arizona or Maine, or both, with capitalization $500,000, shares $1 par, holding lands through the Compañía Cobre de Morelos, S. A., organized under laws of Mexico. Officers were as follows: Hon. Aylett R. Cotton, president; Alfred Courchesne, vice-president; Emlyn Lewys, treasurer; James W. Magoffin, secretary; Edward C. Kemble, assistant secretary; S. W. Ferguson, general manager; D. B. Davison, superintendent. Lands were 13 hectares, in 6 groups, lying one-half mile to 3 miles south of the international boundary line, in the district of Ciudad Juárez, in the extreme northwestern corner of the state of Chihuahua, Mexico, showing slightly auriferous and argentiferous copper ore, giving assays up to 64% copper. Former office was 1300 Golden Gate Ave., San Francisco, Cal. Formerly at Victoria, Donna Ana Co., N. M.

ROYAL THARSIS MINING CO. TASMANIA.

Dead. Lands sold, for £13,347, to Mount Lyell Mining & Railway Co., Ltd. Formerly at North Mount Lyell, Montagu Co., Tasmania.

ROYAL VICTORIA MINING CO. BRITISH COLUMBIA.

Mine office: Grand Forks, Boundary district, B. C. John Fox, superintendent, at last accounts. Property is the Golden Eagle mine, circa 12 miles from Grand Forks, having about 400′ of openings, showing auriferous copper ore of good grade with calcite gangue. Idle at last accounts, awaiting better transportation facilities.

RUBEÑA MINING CO. MEXICO.

Office: 1208-134 Monroe St., Chicago, Ills. Mine office: La Poza, Ures, Sonora, Mex. Wm. E. Jones, president and general manager; Hon. Victor Aguilar, vice-president; R. C. White, secretary; E. J. White, treasurer; Hon. Ricardo P. Cubillas, assistant treasurer; H. F. Wiggin, superintendent. Organized Nov. 26, 1906, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Chicago Title & Trust Co., registrar. Annual meeting, first Monday in November.

Lands, 140 acres, held in trust, by the vice-president, until company is protocolized, or a holding company formed, under the laws of Mexico. Lands show 4 fissure veins, in granite, of which 2, under development, traceable about 1½ miles on company's property, range 30″ to 8′ in width, opened by shafts of 326′, 150′ and 100′ and by tunnels of 225′ and 30′, showing ore averaging about 2.2% copper, 8% lead, some zinc, 15 to 2,550 oz. silver and from a trace to $5 gold per ton, ore being mainly sulphides, with occasional carbonates. Company estimates 5,000 tons of ore on the dumps and 10,000 tons broken in the stopes. Property, opened 1835, was worked intermittently thereafter by Mexican owners. Has steam power, with 6x8″ hoist good for 500′ depth, and 10 mine buildings. Plans building a 100-ton concentrator.

RUBY COPPER & GOLD MINING CO. WYOMING.

Dead. Formerly at Encampment, Carbon Co., Wyo.

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RUBY GOLD & COPPER CO. **MEXICO.**

Dead. Formerly at San Marcial, Sonora, Mex. Fully described Vol. VI.

RUBY HILL COPPER MINING & SMELTING CO. **CALIFORNIA.**

Dead. Formerly at Coppervale, Lassen Co., Cal.

RUBY HILL TUNNEL & MINING CO. **NEVADA.**

Mine office: Eureka, Eureka Co., Nev. A. P. Mayberry, superintendent, at last accounts. Lands, between the Richmond and Connor mines, are opened by a tunnel, said to be 2,200′ long. Presumably idle.

RUBY KING COPPER MINING & TOWNSITE CO. **CALIFORNIA.**

Dead. Formerly in Colusa county, California.

RUBY MINING CO. **WASHINGTON.**

Office: Mansfield, Ohio. Mine office: Nighthawk, Okanogan Co., Wash. Monroe Harman, president; Jas. A. Hauer, vice-president; Chas. B. Bushnell, secretary and treasurer; preceding officers, M. L. Branyan and S. P. Ecki, directors. Organized Nov. 15, 1902, under laws of Washington, with capitalization $1,500,000, shares $1 par; issued, $1,175,000. Annual meeting, second Tuesday in June.

Lands, 7 claims, unpatented, area 136 acres, with 46 acres miscellaneous lands, held in fee, on Mt. Chopaca, near the Similkameen river, 3 miles south of the international boundary, and within 600′ of the Great Northern Railway. Lands show syenite carrying 3 lenticular ore bodies with northwesterly and southeasterly strike, and dip of 47°, one of which, under development, is of about 4′ average width, traceable 1,000′, carrying cupriferous pyrargyrite, assaying 0.5% copper, 2% lead, 1.5% zinc, 5 to 2,000 oz. silver and 80 cents gold per ton. Development is by crosscut tunnels of 226′ and 1,011′, and a 197′ tunnel in ore, with total workings of circa 6,300′, estimated to show 60,000 tons of ore. Property has no equipment. Company shipped 7 carloads of ore, 1907, netting $5,500. Idle since June 1, 1908, but management plans resumption, and the installation of a power plant.

RUDDYGORE MINE. **AUSTRALIA.**

Owned by Chillagoe Co., Ltd.

RUDIANSKI MINES. **RUSSIA.**

Office: care of P. T. Zamiatnin, Perm, Russia. Mine office: Bogoslovsk, Nijni-Tagilsk, Perm, Russia. Property is a group of old mines, including the Miednoroudiansk, famous for its great variety of copper minerals, including oxides, carbonates, silicates and phosphates, with occasional native copper, and especially notable for its production of massive malachite, a single mass weighing 330 tons having been found in 1836. Ore occurs as local enrichments, of good average tenor, in Permian red beds. Latest production officially reported, 1899, was 3,122,112 lbs. fine copper but is estimated at 2,500,000 lbs. fine copper only, for 1907.

RUDOLPH LAND CO. **WISCONSIN.**

Office: care of Rudolph M. Weyerhaeuser, Cloquet, Minn. Mine office: Gordon, Douglas Co., Wis. Organized circa 1905, succeeding the Minong Range Copper Co. Lands are in Sections 11, 12, 13 and 14, Range 43 North, Town 10 west. Property is on the southern fold of the Keweenawan syncline, opened by two 7x10′ shafts, deepest 100′, sunk at 36° in a dark amygdaloidal rock, carrying native copper in small quantities. Property is fully described, under title Minong Range Copper Co., Vol. III.

SOCIEDAD ANONIMA COBRES DE RUESGA. **SPAIN.**

Office: Bilbao, Spain. Mine offices: San Martin de Los Herreros, Palencia, Spain, and Dehesa de Montojo, León, Spain. Don Julio Lazúrtigui, president; Don Augustin Cortina, secretary. Organized 1901, with capitalization 1,500,000 pesetas, shares 500 pesetas par. Property includes the Leonor and adjoining mines. Presumably idle.

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RUMAILLANA TUNNEL CO. **PERÚ.**

Mine office: Cerro de Pasco, Junín, Perú. Development is by the Yauricocha and Mesapeta shafts, suspended 1905, and by the Rumaillana, or Meiggs, drainage tunnel, planned to drain and open the entire Cerro de Pasco district. Tunnel was circa 1,800 meters long, 1906, but had cut none of the expected ore bodies.

RUSH & BROWN. **ALASKA.**

Office and mine: Kasaan, Alaska. U. S. Rush and George E. Brown, owners; John Rigby, mine superintendent. Lands, 8 claims, area 160 acres, also a 15-acre millsite, on Karta Bay, in the Ketchikan district, showing diorite, felsite, quartzite, conglomerate and chloritic schists, with occasional limestone, carrying chalcopyrite, associated with magnetite, in veins and in lenticular masses, in 3 ore bodies, having a generally east and west strike, of which 2, developed by shafts of 20′, 80′ and 80′, and by 3 tunnels, longest 160′, show an average width of 8, giving ore assaying 3.5% copper, 1 oz. silver and $2 gold per ton. Has a small steam hoist and several mine buildings. Mine is served by a tram, taking ore to wharfs at Venus Bay, 3 miles distant, where loaded on vessels and barges, for shipment to smelters. Shipped some ore, 1907, of good average tenor. Suspended operations, late 1907, on account of depression in metal market.

RUSSELL-BALL COPPER CO. **ALASKA.**

Mine office: Valdez, Alaska. Lands, on Dryer Bay, are said to show an 8′ body of copper ore.

RUSSELL GULCH MINING & DEVELOPMENT CO. **COLORADO.**

Dead. Formerly at Russell Gulch, Gilpin Co., Colo.

RUSSELL UNITED COPPER CO. **ARIZONA.**

Dead. Lands sold, circa 1904, to Arizona Consolidated Mining Co. Formerly at Benson, Cochise Co., Ariz.

RUSTLER MINING & MILLING CO. **MONTANA.**

Mine office: Libby, Flathead Co., Mont. Property is the Snowshoe mine, said to have shipped about $800,000 worth of ore, but idle since circa 1906, on account of litigation.

RUTHBURG CONSOLIDATED COPPER CO. **IDAHO.**

Dead. Formerly at Weiser, Washington Co., Idaho. Described Vol. II.

RUTHERFORD COPPER MINING CO. **TASMANIA.**

Mine office: Burnie, Russell Co., Tasmania. Ore is said to average 7.5% in copper tenor. Idle at last accounts.

RYE COPPER CO. **ARIZONA.**

Office and mine: care of Chas. T. Martin, secretary, Globe, Gila Co., Ariz. E. F. Eisenhour, president and general manager. Organized 1905, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 17 claims, well timbered and suitable for grazing, with an available water-power, east of the Mazatzal Mountains, in a slightly explored district, circa 75 miles north of Globe and about the same distance south of Flagstaff. Country rock is diorite, with intrusive porphyry dikes, carrying contact veins showing sulphide ores associated with hematite, near surface. The mine has circa 1,000′ of workings, including shafts, tunnels and trenches. Idle.

SAAVEDRA I BESA. **CHILE.**

Mine office: Quebradita, Freirina, Atacama, Chile. Cornelio Saavedra and Alfsro Besa, owners and managers. Lands, 3 hectares, 27 kilometers from Peña Blanca, showing a fissure vein in granite of about 5′ average width, with strike of N. 42° E., and 66° dip. Mine is opened to depth of 418 meters, with extreme length of 270 meters of horizontal workings, showing an oxidized zone of about 40 meters depth, succeeded by sulphides, mainly chalcopyrite with quartzose gangue, averaging 16% copper. Water is encountered at 110′. Has

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a steam plant with three 70-h. p. boilers, and an electric plant for lighting and to actuate pumps and mill. Employs about 140 men. Production, 1903, was about 2,100 metric tons of ore of 16% average copper tenor, equivalent to about 740,000 lbs. fine copper.

SACAJEWEA GOLD & COPPER MINING CO. **MONTANA.**

Office: 11 Broadway, New York, N. Y. Mine office: Helena, Lewis & Clark Co., Mont. Col. Henry Altman, president and general manager; W. J. Anson, secretary. Capitalization $5,000,000, shares $10 par. Lands, 47 claims, in the Scratch Gravel district, adjoining the Copper-Silver Montana Mining Co. Was said, 1907, to plan sinking 3 shafts. Presumably idle.

SACATON SPRINGS MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Cima, San Bernardino Co., Cal. L. I. Plummer, president and general manager; E. P. Barnes, secretary; Wm. Heath, superintendent. Lands, 17 claims, on the western slope of New York Mountain, carrying circa 3 miles of the strike of a contact deposit between limestone and granite, ranging up to 65′ width, opened by a 100′ shaft and a 300′ tunnel.

SADDLE MOUNTAIN MINING CO. **ARIZONA.**

Office: 902 Chapel St., New Haven, Conn. Mine office: Christmas, Gila Co., Ariz. Lewis S. Welch, president; Clarence Stephens, vice-president; Story B. Ladd, secretary; Wilbur W. Delano, treasurer; Wm. D. South, manager; Jas. H. Myers, smelter superintendent. Organized 1902, under laws of Arizona, with capitalization $1,000,000, increased, later, to $2,500,000, shares $1 par; issued, $1,350,000. Debentures, $1,000,000 first-mortgage 6-year 6% bonds, dated Oct. 31, 1907; issued, $625,000. Floating indebtedness was cared for, Oct. 1, 1908, by issue of 6-month notes, with privilege of 6 months renewal, at option of the company.

Lands, 1,441 acres, patented, with abundant water, on both sides of the Gila river, in Gila and Pinal counties, circa 25 miles due south of Globe and nearly north of Tucson. Property includes copper claims lying north of the river, and gold, silver and coal claims directly opposite, south of the river, all 3 groups lying in a radius of 6 miles.

There are 15 claims, patented, area 266 acres, of gold and silver lands, showing base dry ore, with a little lead and zinc and traces of copper, the average of upwards of 300 assays giving a trifle better than $13 per ton in combined gold and silver values. The gold and silver claims have 3,450′ of workings.

The coal lands, 640 acres, patented, in the lower basin of Deer Creek, show a 3′ vein of low grade bituminous coal, developed by a 175′ incline shaft, with circa 800′ of workings, equipped with a small steam hoist and pump. There is a beehive coke-oven on the property, ready for test, as the coal may or may not prove available for coking, but is adapted to making producer gas.

There are 36 patented copper claims, area 535 acres, the principal group being at the junction of Disappointment Valley with the Gila river, on the north side of the stream, 8 miles from Winkelman, present terminus of the Phoenix & Eastern railroad, which is the nearest shipping point. The mine was opened, 1883, by the San Carlos Copper Co., but was closed, 1884, because found to be located on the San Carlos Indian Reservation, and remained idle until the lands were restored to the public domain, by executive order of the president, Dec. 2, 1902.

The property shows members of the upper Carboniferous limestone in various stages of alteration, near a granite-porphyry contact, ores occurring along the irregular line of contact for circa 6 miles on the company's lands, mainly as replacements in limestone, and principally as carbonate ores, with garnetiferous gangue, on the limestone wall, and sulphides along the porphyry.

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contact at depth. The contact zone has shown copper ore wherever opened, and the porphyry also carries copper ore below workable tenor. Four main ore bodies are under development, these ranging from 4′ to 60′ in width, carrying cuprite, malachite, chalcocite, bornite and chalcopyrite, latter disseminated in pyrite, all slightly auriferous and argentiferous, and self-fluxing throughout. Ore as mined has averaged about 3% copper and 30 to 40 cents per ton in combined gold and silver values, by wet assay.

Development is by shafts of 430′, 340′, 275′ and 175′, all showing oxidized and sulphide ores, and the company has planned a tunnel of circa one mile length, to connect with the 300′ main working shaft. The Christmas shaft, started 1907, has 3 compartments, each 4x5′ in the clear, and is planned for the main working shaft. No. 1 or Hackberry shaft, the deepest, shows good ore on the 120′ level, said to average 3.75% copper, also good ore on the 300′ level, the upper workings showing a blanket vein of about 6′ thickness, said to be proven for 300′ in width and 625′ in length. The 400′ level is said to show ore averaging about 5% copper tenor. The mine has circa 12,000′ of workings, with a large quantity of ore in sight, though very little is blocked out systematically, but considerable ore could be developed for stoping with little effort. The mine also has open-cast workings, of circa 30,000 square feet area, showing carbonate ores.

Equipment includes a 75-h. p. steam plant, with 4 small hoists, good for circa 500′ each, and there are larger hoists on the ground, but not installed. There are 10 buildings for various uses.

The smelter, at the mine, receiving ore therefrom by wagon and tram, has a daily capacity of circa 225 tons. The old smelter, erected, 1884, by San Carlos Copper Co., was torn down and furnaces replaced by a 150-ton Mitchell economic hot-blast furnace, which apparently has been replaced also by a 36x122″ Colorado Iron Works blast-furnace, of circa 225 tons daily capacity. The major part of the material for a 500-ton furnace, 44x200″ in size, is on the ground, but not set up. Ore is self-fluxing, and the slags carry about 36% silica and 23% iron. Product, when smelter is in blast, is matte carrying 60 to 65% copper, 10 to 14 oz. silver and circa 0.35 oz. gold per ton. A little custom smelting was done, when the smelter was in commission, to accommodate neighboring properties. Company was said, September, 1907, to have secured a site for a new smelter, at Christmas, about 1½ miles from the mine.

In addition to the railroad of the Phoenix & Eastern, the Southern Pacific is building a low grade cut-off line, to pass through the smelter site within a mile of the mine. The company did some grading, 1907, for a narrow railroad from Winkelman station to the mines and works at Christmas, having completed grading for 8 miles of line, except 3 or 4 short bridges, with rails, ties and one locomotive on the ground.

Production has been as follows: 450,000 lbs. fine copper in 1905; 2,338,492 lbs. copper, 16,410 oz. silver and 437 oz. gold in 1906; 1,751,264 lbs. copper, 7,453 oz. silver and 254 oz. gold in 1907.

Previous to blowing out of smelter the company made circa $800,000 worth of matte, and, at one time, 1907, it employed nearly 600 men, but closed down Aug. 21, 1907, owing to financial troubles. The property is considered decidedly promising, but the company requires cash for more extensive development of ore, improvement of transportation facilities and enlargement of smelter.

SADO MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

SAGINAW DEVELOPMENT CO. **ARIZONA.**

Dead. Merged, March, 1906, in American-Saginaw Development Co. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. V.

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SAGINAW MINING CO. **WASHINGTON.**

Dead. Formerly at Maple Falls, Whatcom Co., Wash.

SAGINAW VALLEY COPPER MINING CO. **WYOMING.**

Dead. Lands lost, 1905. Formerly at Encampment, Carbon Co., Wyo. Described Vol. V.

SAHUARIPA EXPLORATION CO. **MEXICO.**

Mine office: Sahuaripa, Sonora, Mex. Lands include the Esperitu Santo mine, 12 miles east of Sahuaripa, opened circa 1842, and closed in 1900, owing to striking of water. This has a blanket vein of argentiferous and plumbiferous tetrahedrite, carrying up to 250 oz. silver per ton. Idle several years.

ST. CROIX CONSOLIDATED COPPER CO. **WISCONSIN.**

Office and mine: Superior, Douglas Co., Wis. Organized 1903, under laws of Wisconsin, with capitalization $1,500,000, shares $1 par. Lands, 9 groups, area 22,000 acres, carrying the western extension of the Keweenawan copper belt of Michigan. Idle since organization.

ST. DAVID'S GOLD & COPPER MINES, LTD. **WALES.**

Dead. Succeeded, July 21, 1903, by St. David's Gold mines (1903), Ltd. Formerly at Barmouth, Merionethshire, Wales.

ST. DAVID'S GOLD MINES (1903), LTD. **WALES.**

Office: 29 Cornhill, London, E. C., Eng. Mine office: Barmouth, Merionethshire, Wales. Godfrey C. Isaacs, chairman; E. T. McCarthy, consulting engineer; H. J. Nicholls, mine manager; James Junner, secretary. Organized July 21, 1903, under laws of Great Britain, as a reconstruction of St. David's Gold & Copper Mines, Ltd., with capitalization £60,000, shares 5s. par. Debentures, £40,000 authorized, £10,750 outstanding, at 6%. Old company paid dividends of 40%; present company has paid dividends of 10%. Lands, 800 acres, carrying gold and copper ores. Has a 50-stamp mill and an Elmore oil concentration plant.

ST. GEORGE COPPER & COAL MINES, LTD. **AUSTRALIA.**

Office: Brisbane, Queensland, Australia. Mine office: Laura, Queensland, Australia. Organized 1906, under laws of Queensland, with capitalization £50,000. Lands are leasehold copper claims near Etheridge, in the Cook district, on which exploratory work has given promising results, also copper and coal lands at Little River.

ST. GEORGE COPPER MINING CO. **UTAH.**

Office: care of Clarence K. McCornick, president, Salt Lake City, Utah. Mine office: St. George, Washington Co., Utah. Capitalization $400,000. Grant C. Snyder, secretary and manager; B. L. Cutler, superintendent. Lands, in the Dugway Mountains, have a 100′ main shaft, on a 4′ to 5′ vein, giving assays of 4 to 40% copper. Has gasoline power and a small smelter, and was doing systematic development work and levying assessments, at last accounts. Management considered good, and property well regarded.

ST. HELEN'S COPPER CO., LTD. **ENGLAND.**

Works office: St. Helen's, Lancashire, Eng.

ST. JOE GOLD-COPPER MINING & MILLING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Letter returned unclaimed from former mine office, Saltese, Missoula Co., Mont. Lands, 9 claims, well timbered, on Kelly Creek, circa 3 miles west of the Monitor and one-half mile from a railroad, showing 2 strong ledges.

ST. JOE MINING CO. **UTAH.**

Dead. Property sold, circa 1907, by sheriff, for $25,000, this sum being inadequate to meet company's indebtedness, amounting to about $60,000. Formerly at Bingham Canyon, Salt Lake Co., Utah.

ST. JOE MINING & MILLING CO. **WASHINGTON.**

Office and mine: Latah, Spokane Co., Wash. Employs 5 men. I. H.

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Stockdale, president; J. W. Olney, vice-president; J. A. Adams, secretary and treasurer; E. H. Conrad, superintendent. Organized 1906, under laws of Washington, with capitalization $7,500,000, shares $5 par. Annual meeting, last Monday in December.

Lands, 13 claims, one fractional, area circa 255 acres, well timbered, 15 miles from Chicago, Milwaukee & St. Paul railway, showing quartzite, with shafts of 20′ and 80′. Property has 3 buildings. Company plans continuing tunnel, to cut an expected ore body at depth of circa 250′.

ST. JOE MINING & MILLING CO. **WYOMING.**

Office: Fremont, Neb. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. H. S. Beck, president; J. H. Knowles, treasurer; Thos. Carroll, secretary and general manager. Organized 1905, as successor of Fremont Copper Mining Co. Lands, 5 claims, unpatented, in Purgatory Gulch, opened by a 362′ incline shaft.

ST. JULIAN GOLD MINING CO. **MONTANA.**

Office: care of W. A. Bercry, president, 61 East Warren Ave., Detroit, Mich. Mine office: Chico, Park Co., Mont. Has auriferous and argentiferous copper ores, with steam power and an Elspass mill. Presumably idle.

ST. LAWRENCE MINE. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Lands are near the Richmond and Monitor mines, 6 miles southwest of Saltese, with ore opened on a vein lying parallel to those of the Richmond and Monitor. Idle.

ST. LAWRENCE MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co., at Butte.

ST. LOUIS COPPER CO. **ARIZONA.**

Dead. Formerly at Gila Bend, Maricopa Co., Ariz.

ST. LOUIS COPPER CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Organized under laws of Michigan, with capitalization $1,000,000, shares $25 par. Is controlled, through ownership of 36,400 shares out of 40,000 issued, by Calumet & Hecla Mining Co.

Lands, 800 acres, near Laurium, including the south half of Section 19 and west half of Section 20, Town 56 North, Range 32 West. Lands lie next south of the Old Colony, east of the Laurium and southeast of the Calumet & Hecla.

Property was called originally the New York & Michigan, opened 1844, under permit from the War Department, and later became the Washington, changing that name, eventually, to present title. In olden days a shaft was sunk at the point of junction between the trap belt and the Eastern Sandstone, this showing some fine copper. Long idle.

ST. LOUIS COPPER MINING CO. **ARIZONA.**

Office: 503 Security Bldg., St. Louis, Mo. Mine office: Duquesne, Santa Cruz Co., Ariz. Jas. W. Shaw, president; Silas Cook, vice-president; Geo. Hanlon, secretary; H. W. Herweek, treasurer; S. G. McWade, general manager. Organized circa 1906.

ST. LOUIS GOLD GULCH MINING CO. **NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. G. A. Easton, manager. Has gold and copper ores, and a 50-ton concentrator.

ST. LOUIS UNITED COPPER MINING CO. **NEW MEXICO.**

Dead. Formerly at Jarilla, Otero Co., N. M.

ST. MARIE COPPER CO. **COLORADO.**

Dead. Was a swindle, perpetrated by John Reilly and W. W. Wilson, two notorious confidence men. Formerly at Leadville, Lake Co., Colo.

ST. MARY'S CANAL MINERAL LAND CO. **MICHIGAN.**

Entire stock issue is held by St. Mary's Mineral Land Co.

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ST. MARY'S COPPER CO. **MICHIGAN.**

Dead. Wound up, circa 1899, and lands sold to Arcadian Copper Co. Formerly at Hancock, Houghton Co., Mich. Described Vol. II.

ST. MARY'S MINERAL LAND CO. **MICHIGAN.**

Office: 713-199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Employs circa 50 men. Nathaniel Thayer, president; Chas. J. Paine and J. Henry Brooks, vice-presidents; Chas. J. Paine, Jr., secretary and treasurer; preceding officers, Samuel N. Brown, Albert S. Bigelow, T. Nelson Perkins, Geo. P. Gardiner, Nathaniel H. Stone, Walter Hunnewell and Chas. H. King, directors; Fred W. Nichols, resident agent; Dr. Lucius L. Hubbard, general manager and consulting geologist; Rex R. Seeber, mine superintendent; Wm. Skewes, mining captain.

Organized March 4, 1901, under laws of New Jersey, with capitalization $5,000,000, shares $25 par; issued, $4,000,000. Controls, through ownership of entire stock issue, except founders' shares, St. Mary's Canal Mineral Land Co., organized 1863, under laws of New York, to take over lands given by the state of Michigan for the construction of the first ship canal at Sault Ste. Marie, lands so given being 180,000 acres in Houghton, Ontonagon and Keweenaw counties, Michigan, from which tracts the Calumet & Hecla, Baltic, Trimountain, Champion, Ojibway and other mines have been developed. Company has circa 400 shareholders. Shares are listed on the Boston Stock Exchange. Old Colony Trust Co., Boston, registrar.

Dividends have been as follows: $1 in 1903; $1 in 1904; $2 in 1905; $4 in 1906; $5 in 1907; nothing in 1908, giving a total of $13 per share to end of 1908. The company is in receipt of a large income from dividends of the Champion Copper Co., receiving $500,000 in 1907 and $150,000 in 1908 therefrom, but in 1908 paid over $220,534 to King Phillip Copper Co., hence paid no dividends. The company received, 1908, from lands sold to North Lake Copper Co., $72,000 cash, in addition to a share interest. During 1905 the company sold lands, timber and wood, to the value of $275,292, and during 1907 received $1,800 on land payments, $2,712 for wood and timber, $2,147.72 ground rent, $12,580.45 interest on notes and contracts, $4,843.11 from miscellaneous sources, and $500,000 from dividends of Champion Copper Co. Expenditures for 1907 included $59,000 for the Challenge mine, and $108,456 for stock of King Phillip Copper Co., company ending 1907 with $237,390.94 cash on hand.

From 1863 to 1900 the old company paid cash dividends of $2,200,000, also stock dividends of 1 share Tamarack, 1 share Iroquois, 1½ shares Baltic, ½ share Winona and ½ share Albany & Boston, on each share of stock of St. Mary's Canal Mineral Land Co.

Share assets of the company at end of 1908 were as follows: 50,000 shares Champion Copper Co.; 73,767 shares King Phillip Copper Co.; 25,000 shares Mayflower Mining Co.; 20,165 shares La Salle Copper Co.; 20,000 shares Hancock Consolidated Mining Co.; 20,000 shares Pacific Copper Co.; 9,000 shares North Lake Copper Co.; 2,000 shares Ojibway Mining Co.; 842 shares Winona Copper Co.; 208 shares Copper Range Consolidated Copper Co.; 640 shares St. Mary's Mineral Land Co.; 80 shares Old Colony Copper Co.; 10 shares Amphidrome Co. These holdings in various corporations were worth about $6,000,000, at end of 1908.

Lands, Jan. 1, 1908, were 95,158 acres freehold, also mineral rights to 14,323 acres additional, lands being scattered along the Lake Superior copper belt, with principal holdings on the South Range, southwest of Houghton, in Houghton and Ontonagon counties.

The Challenge mine, owned outright by the company, is in Section 22, T. 53 N., R. 35 W., circa 5 miles south of the Champion. This property works

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4 power drills, and, during 1907, made 2,859′ of openings. Extensive diamond drill borings having located what supposedly is the southern extension of the Baltic amygdaloidal bed. Sinking was begun, Sept. 10, 1904, and a vertical shaft, in the footwall, was 846′ deep at end of 1907. Workings show considerable faulting, the Baltic bed having displacements of about 100′, equal to a horizontal movement of 400′. The bed is 20′ to 35′ wide, showing some heavy copper, in small pockets, at rare intervals.

In addition to the Baltic lode, a number of other cupriferous beds have been opened by crosscuts from the Challenge shaft. Bed No. 2 is an amygdaloidal conglomerate, apparently without workable values. Beds 3 and 4 are amygdaloids, showing a little copper. Bed No. 5 is an epidotal amygdaloid, showing copper in promising quantities. Bed No. 6, circa 25′ in width, carries no workable values. Bed No. 7, of 18′ width, carries considerable stamp-rock. Bed No. 8 is 47′ wide, where cut, carrying some fine copper. Bed. No. 9 gives a fair showing of copper. Bed No. 10 apparently is of small promise.

Equipment at the Challenge includes a 12x20″ Nordberg duplex hoist, good for 1,500′ depth, and an 8-drill Nordberg air-compressor. The Challenge property is considered promising, though developments to date have proven disappointing.

Beginning with the new century, the company refused to sell its mineral lands outright, preferring to join its lands with other holders in the formation of new companies, taking pay therefor in shares, on a pro rata basis, or partly in shares and partly in cash. This policy involves heavy outlays for exploratory and development work, but has resulted in giving the company a half interest in a magnificent new mine, the Champion, which is capable, alone, of furnishing funds to St. Mary's company for both dividends and development work elsewhere, and a continuance of this policy must result, eventually, in making St. Mary's Mineral Land Co. the part or sole owner of a number of fine mines. Owing to the great extent of its lands, mainly located on the Keweenawan copper belt, and stretching along the mineral range for scores of miles, the landed holdings of the company are of vast potential value. The management is vigorous and far-seeing, and no small share of the credit for the present wise and successful policy is due to Mr. Rufus R. Goodell, who resigned, 1908, after 43 years of continuous and able service as the company's resident agent.

ST. MICHAEL'S MINING, MILLING & REFINING CO. **NEW MEXICO.**

Mine office: Tres Piedras, Taos Co., N. M. Long idle.

ST. PAUL & BUTTE MINING CO. **MONTANA.**

Dead. Was in business circa 1896. Formerly at Butte, Silver Bow Co., Mont.

SAINT PAUL MINING & REDUCTION CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. D. M. Cleamon, Norwood Johnson, Geo. T. Braden, J. B. Ross and Frank L. Ross, directors. Organized circa March, 1908, under laws of Colorado, with capitalization $100,000, shares $1 par. Property is an old mine, in the Red Mountain district, formerly a producer, which shipped some ore netting $1,000 per carload.

ST. REGIS COPPER MINING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Mine office: St. Regis, Missoula Co., Mont. Organized circa March, 1906. Lands, bought for $35,000, show auriferous copper ore. Presumably idle.

ST. REGIS COPPER MINING & MILLING CO. **MONTANA.**

Office: Missoula, Mont. Mine office: St. Regis, Missoula Co., Mont. Employs 5 men. S. J. Wilson, president; F. W. Wilson, secretary and treasurer; Louis C. McHeffey, general manager; preceding officers, W. H. Houston and A. M. Stevens, directors. Organized May, 1901, under laws of Montana, with capitalization $300,000, shares $1 par, in half preferred and half common stock.

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Lands, 5 claims, also a 15-acre millsite and miscellaneous lands, giving holdings of 180 acres, on the Northern Pacific railway, in an unorganized district of Sanders county, Montana. Property shows quartzite and shale, having 2 ore bodies under development, of 6′ estimated average width, traceable circa 2,000′, carrying chalcopyrite giving average assays of 8% copper and $1.50 gold per ton. Property has shown ore assaying 16 to 37% copper. Development is by tunnels of 60′, 380′, 800′ and 350′, estimated to show 5,000 tons of ore.

SALERO MINES CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Patagonia, Santa Cruz Co., Ariz. Prof. Wm. P. Blake, general manager; W. E. Balcom, superintendent. Is not incorporated. Lands, in the Salero and Tyndall districts, circa 12 miles northwest of Patagonia, include the old Salero and Tumacacori properties, showing veins, traversing diorite, carrying galena, gray copper and native silver, in a gangue of manganese, spar and quartz, opened by a crosscut tunnel.

The Constitution or Darwin claim has a vein of 10′ to 20′ width, carrying chutes of high grade copper ore, including stromeyerite and its derivative minerals, with quartz gangue, opened by a vertical shaft and crosscut.

A third group is Moctezuma's Daughter and extensions, showing a wide ore body that has yielded high grade copper ore, mainly chalcocite and stromeyerite, from the Empress of India and Queen of Sheba claims. Property has steam power.

SALIDA GOLD & COPPER MINING CO. **COLORADO.**

Dead. Formerly at Salida, Chaffee Co., Colo. Described Vol. V.

SALIDO GOLD-COPPER CO. **MEXICO.**

Office: 824-356 South Spring St., Los Angeles, Cal. Letter returned unclaimed from former mine office, Alamos, Sonora, Mex. Dr. Finis E. Yoakum, president and general manager; N. N. Dietz, secretary. Organized under laws of Arizona, with capitalization $3,000,000, shares $1 par. Apparently is a twin of Los Alamos Mining & Milling Co. Lands, 30 pertenencias, in the Alamos district, said to show a 60′ vein. Stock of the company is "insured" and "guaranteed," hence the company is looked upon as a mere stock-jobbing scheme. Any stock either "guaranteed" or "insured" is dangerous, and one that is both almost of a certainty must prove a very addled egg.

SALISBURY COPPER CO. **NORTH CAROLINA.**

Office: P. O. Box 33, Salisbury, N. C. Mine office: Gold Hill, Rowan Co., N. C. T. B. Brown, president; W. S. Blackmer, secretary and treasurer; Richard Eames, Jr., general manager. Organized 1904, under laws of Arizona, with capitalization $100,000, shares $100 par.

Lands, 50 acres, freehold, on the line of the Southern railway, showing altered slate, carrying a fissure vein with NE. and SW. strike, formerly estimated at 15′ average width, but now estimated at 4′ width, developed by a 100′ shaft, showing chalcopyrite, formerly reported as giving average assays of 15% copper, 2 oz. silver and $5 gold per ton, but now reported to average 5% copper and $5 gold per ton. Idle, but plans resumption and deepening shaft to 150′.

SALMON RIVER MINING CO. **NEVADA.**

Mine office: Contact, Elko Co., Nev. Ores carry gold, silver and copper. Has gasoline power and a small smelter. Idle several years.

SALMON RIVER MINING & MILLING CO. **WASHINGTON.**

Mine office: Conconully, Okanogan Co., Wash. Wm. McDaniel, manager. Lands, on Peacock Mountain, are said to give a fair showing of copper. Development by tunnel was planned, at last accounts.

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SALTESE CONSOLIDATED COPPER MINING & MILLING CO. **MONTANA.**

Office: 107 Second St., Moscow, Idaho. Mine office: Saltese, Missoula Co., Mont. C. H. Williams, vice-president and manager; Fred Willard, secretary; C. B. Merwin, treasurer. Capitalization $1,500,000, shares $1 par. Lands, 9 claims, showing 3 veins, including 6 claims on Deadman's Gulch, in the St. Regis district, near the National Mining Co., 6 miles from Saltese, having a 468' crosscut tunnel cutting a 4' vein, with 2' paystreak showing ore assaying up to 22.3% copper, 2.4 oz. silver and $1 gold per ton.

COMPAÑIA MINERA DE SALTILLO. **MEXICO.**

Office: 9a de Hidalgo, Saltillo, Coah., Mex. Letter returned unclaimed from former mine office, Concepción del Oro, El Oro, Zacatecas, Mex. Antonio Rodriguez, president; Ramón Rodriguez, manager. Property is the Jesús Nazareno mine, having auriferous and argentiferous lead and copper sulphides. Has steam power, employing circa 150 men, and, first half of 1907, was producing, monthly, circa 1,000 metric tons of silver-lead ore, of good average tenor.

SALT LAKE COPPER CO. **UTAH.**

Office: 11 Broadway, New York, N. Y. Operating office: Herald Bldg., Salt Lake City, Utah. Mine office: Lucin, Box Elder Co., Utah. J. H. Susmann, president; Frederick Lewisohn, vice-president; E. C. Westervelt, treasurer; preceding officers, Adolph Lewisohn, Alfred Lewisohn, O. B. Van Sant, Andrew Sakes and J. E. Shoenberg, directors; J. Parke Channing, consulting engineer; E. G. Tuttle, superintendent. Organized circa December, 1906, under laws of Maine, with capitalization $2,200,000, shares $10 par. Debentures, $236,000, at 6%, payable only out of net earnings. Net profits, 1907, are said to have been circa $120,000.

Lands, 108 acres, on Copper Mountain, in the Newfoundland district, also 100 acres within the limits of Salt Lake City. Mine has upwards of 2 miles of workings, and was estimated, 1908, to have in sight and blocked out, 75,306 tons of copper ore of 1.1% average tenor, 27,960 tons of 3.13% average tenor, and 138,370 tons of 7.2% copper tenor. Production, 1907, was circa 24,000 tons of ore, shipped to Salt Lake smelters, yielding 2,234,446 lbs. fine copper. Property considered promising and management good.

SALT LAKE & ELY COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Ely, White Pine Co., Nev. Jas. T. Finlen, president; G. L. Rickard, vice-president; W. W. Byrne, secretary and treasurer; preceding officers, Ernest E. Campbell and John A. Kirby, directors. Organized 1906, with capitalization $5,000,000, shares $1 par. Lands, 11 claims, said to be in the vicinity of the Cumberland-Ely. Presumably idle.

SALT LAKE MINING & MILLING CO. **UTAH.**

Letter returned unclaimed from former office, Provo, Utah. Mine office: Callao, Juab Co., Utah. W. B. Hughes, president; D. B. Hughes, secretary and treasurer. Organized 1907, with capitalization $100,000, shares 10 cents par. Lands are in the Detroit district. Presumably idle.

COMPAÑIA MINERA SALVADORA DEL HUANACO DE TALTAL. **CHILE.**

Office: Iquique, Chile. Mine office: Taltal, Antofagasta, Chile. Organized March 17, 1905, under laws of Chile, with capitalization £12,000, shares £5 par.

SAMPO MINING & DEVELOPMENT CO. **FINLAND.**

Dead. Was succeeded, December, 1906, by Finnish American Mining Co. Formerly at Kisko, Abo, Finland. Fully described Vol. VI.

COMPAÑIA MINERA DE SAN ACASIO y ANEXAS. **MEXICO.**

Mine office: San Juan de Guadalupe, Durango, Mex. Property includes

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the San Acasio and Tres Rosas mines, carrying gold and copper ores. Has steam power, employing circa 50 men.

COMPAÑIA MINERA DE SAN ANTONIO. **MEXICO.**

Dead. Formerly at La Cruz, Centro, Tamaulipas, Mex.

SAN ANTONIO COPPER CO. **MEXICO.**

Office: Iron Mountain, Mich. Mine office: San Antonio de la Huerta, Ures, Sonora, Mex. O. C. Davidson, president; preceding officer, D. G. Kerr, John Uno Sebenius, C. D. Frazer, Col. Louis W. Powell and Richard C. Flanagan, directors. Organized circa October, 1908, under laws of Arizona, with capitalization $2,500,000, shares $10 par; issued, $2,000,000.

Lands, 9 groups, area circa 2,000 acres, near the Yaqui river, showing a mineralized zone of approximately 200′ to 500′ width.

Development, which has been in progress since circa 1906, is by tunnels, which can be driven to give backs of about 1,100′, and considerable ore of good average copper tenor has been blocked out, ores including high grade oxides and carbonates, and sulphides of good average tenor. The management is composed of strong, experienced and thoroughly capable mining men.

SAN ANTONIO MINING CO. **COLORADO.**

Office: 312 Century Bldg., Denver, Colo. Mine office: Red Mountain, Ouray Co., Colo. Employs circa 50 men. M. T. Chestnut, president and general manager; Otto Koehler, vice-president; Wm. L. Stephens, secretary and treasurer; preceding officers, E. B. Morgan and Wilbur M. Warnock, directors; John F. Roper, mine superintendent. Organized Feb. 5, 1908, under laws of Colorado, with capitalization $500,000, shares $1 par. Annual meeting, last Tuesday in February.

Lands, 30 claims, area circa 200 acres, a 20-acre millsite and 10 acres miscellaneous lands, one mile from a railroad, in the Red Mountain district of Ouray and San Juan counties. Property shows porphyry, carrying several ore bodies, estimated at 20′ to 30′ width, said to be traceable more than 3,000′, reported by company to carry enargite averaging 12% copper, 10% lead, 10 oz. silver and $3 gold per ton, which estimate is considered high. Development is by shafts of 37′ and 200′, and by the 200′ Koehler tunnel and 625′ Camp Robber tunnel, with a total of 1,200′ of workings, reported to give 1,000 tons of ore blocked out for stoping.

Equipment includes a 5-h. p. air-compressor and 3 power drills. There are 10 mine buildings and dwellings. Company plans extending the Koehler tunnel 2,300′, and installing a more powerful mining plant.

SAN ANTONIO MINING & EXPLORATION CO. **MEXICO.**

Mine office: Tapalpa, Sayula, Jalisco, Mex. John P. Johnson, president; José Gonzalez Brizuela, secretary; B. S. Dewey, treasurer. Has surface ores assaying 6% copper, 750 grams silver and 15 grams gold per metric ton.

SAN BALTAZAR COPPER CO. **MEXICO.**

Office: 508 Germania Bank Bldg., Pittsburg, Pa. Mine office: Tlacolula, Oaxaca, Mex. J. Albert McKay, president; Hon. Pembrook B. Fliteraft, vice-president; Oscar A. Rogers, secretary; Andrew B. Berger, treasurer; Guillermo W. Thompson, general manager; Frank M. Lehmer, superintendent. Organized Dec. 14, 1904, under laws of Maine, with capitalization $1,000,000, shares $10 par; issued, $780,000.

Lands are several groups, area 700 acres, and a 40-acre millsite, in the Tlacolula district, 8 miles south of the ruins of Mitla. Country rocks are porphyry and limestone, carrying numerous contact veins or lenses, of which 6, under development, are reported to have an average width of 8′, outcropping for 2 miles. At last accounts mine had a 50′ shaft, showing selected oxide and carbonate ores of 44% copper tenor, while assays of outcrops give 1 to 15%

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copper, 15 to 20 oz. silver and from nothing to 16% lead. It is planned to develop mainly by tunnels. Property considered promising.

SOCIEDAD MINERA DE SAN BARTOLO. **CHILE.**

Office: Santiago de Chile. Mine office: Gatico, Antofagasta, Chile. Organized Aug. 8, 1905, under laws of Chile, with capitalization £120,000, shares £1 par. Lands show 5 sandstone beds carrying disseminated native copper. Early 1908 was building a 200-ton mill, of modern design and equipment, with a view to beginning regular production on a considerable scale.

SAN BARTOLO COPPER MINES, LTD. **CHILE.**

Dead. Voluntarily liquidated, 1903. Formerly at Gatico, Antofogasta, Chile.

SAN BERNARDINO COPPER CO.

Dead. West Virginia charter forfeited, 1902. Formerly in San Bernardino Co., Cal.

SAN BERNARDINO GOLD, COPPER & LIME CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, San Bernardino, San Bernardino Co., Cal. F. G. Stickney, president; W. H. Miller, secretary and treasurer; preceding officers, I. F. Swarthout, Sydney Swarthout and H. M. Swarthout, directors. Organized circa June, 1907, under laws of Arizona, with capitalization $1,000,000. Lands, in Badger Cañon, on Little Mountain, 7 miles north of San Bernardino, show a body of auriferous and argentiferous copper ore with limestone hanging, said to be 100′ wide at point of exposure. Has an incline shaft and a 300′ tunnel. Idle and apparently moribund.

SAN BERNARDINO MINING CO. **MEXICO.**

Office and mine: Schalk Bldg., La Cananea, Arizpe, Sonora, Mex. A. S. Judd, president; J. L. Stroyick, vice-president and superintendent; J. M. Gibbs, general manager; B. N. Norton, consulting engineer. Organized under laws of United States and Mexico, with capitalization $500,000, shares $5 par.

Lands, 144 pertenencias, 18 miles southeast of Cananea, 2 miles west of a railroad, in the Sierra Manzanal, developed by a 100′ shaft, showing a 6′ vein carrying auriferous copper ores giving assays up to 30% copper, 70 oz. silver and $8 gold per ton. Small shipments, to El Paso smelter, netted $93 per ton. Was worked, circa 1876, for silver, but suspended, owing to raids of Apaches. Property is considered promising, but is idle.

SAN BERNARDINO MINING CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. J. M. Gibbs, manager. Property shows auriferous and argentiferous copper ore. Presumably idle.

SAN BERNARDINO MINING & MILLING CO. **ARIZONA.**

Dead. Formerly at Douglas, Cochise Co., Ariz. Fully described Vol. VII.

SAN BERNARDO MINING CO. **MEXICO.**

Office: 920 Merchants' Loan & Trust Bldg., Chicago, Ills. Mine office: Aduana, Alamos, Sonora, Mex. Mine, known as the Santo Domingo, has a shaft sunk between two veins, known as the Balvanera and Santo Domingo, which are expected to unite at depth. Ores give assays of 46 oz. silver, with small copper and lead values. Idle and apparently moribund.

SAN BERNARDO MINING CO. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Is the Mexican incorporation of the Southern Sonora Development Co., and is controlled by Sonora Central Mines Co.

SANCA CONSOLIDATED MINING CO. **IDAHO.**

Office: Detroit, Mich. Mine office: Priest River, Kootenai Co., Idaho. Jacob Haarer, president; Lou Burt, first vice-president; O. R. Baldwin, secretary and treasurer. Organized under laws of Arizona, with capitalization $3,500,000, shares $1 par.

Lands, 540 acres, in the Priest River district, in the extreme northern part of Idaho, lacking rail transportation. Camp No. 1 has seven 20′ pits, with

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several hundred feet of development. Camp No. 2 has several hundred feet of development, said to show a 35′ vein giving ore assaying well in copper, silver and gold. Camp No. 3 has eight 10′ pits. Camp No. 4 has several hundred feet of crosscut tunnels, said to develop 2 veins, with a back of 600′.

SAN CARLETANO MINING & SMELTING CO. **ARIZONA.**

Letter returned unclaimed from former office, 121 Geary St., San Francisco, Cal. Mine office: Calabasas, Santa Cruz Co., Ariz. Lands, 12 claims, in 2 groups, in Santa Cruz and Pima counties, from which selected samples have given assays up to 9% copper, 400 oz. silver and $2.50 gold per ton. Idle and apparently moribund.

SAN CARLOS COPPER CO. **ARIZONA.**

Dead. Lands sold to Saddle Mountain Mining Co. Formerly at Christmas, Gila Co., Ariz.

SAN CARLOS COPPER CO. **MEXICO.**

Office: 1747-25 Broad St., New York, N. Y. Mine office: Linares, Sexto, Nuevo León, Mex. Works office: San José, Centro, Tamaulipas, Mex. W. H. Nichols, Jr., president; S. H. Steele, secretary and treasurer; Edw. D. Self, general manager. Organized 1896, under laws of New York, with capitalization $100,000, shares $1 par.

Mining lands, 6 square miles, are in the San Carlos district of Tamaulipas. Also owns 6,400 acres of timber lands. Has contact veins between limestone and porphyry, carrying oxide, carbonate and sulphide ores, mainly latter. Development is by upwards of 50 shafts and about 7 miles of tunnels, with total workings of circa 10 miles. Has a 38-mile railroad connecting with the Gulf branch of the Mexican Central Railway, which, in addition to handling company's own traffic, enjoys a very satisfactory general business. Closed down, early 1907, laying off circa 500 men.

SAN CARLOS DEVELOPMENT CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. W. C. Duncan, general manager. Lands, known as the Cobre Verde group, include the Annie Rooney mine, once held by the Spenazuma swindle. Has shafts of 43′ and 82′, showing 2 veins, 1 about 3′ wide. Was developing at last accounts.

SAN CRISTOBAL COPPER CO. **NEW MEXICO.**

Office: 616-116 Broad St., New York, N. Y. Mine office: Arroyo Seco, Taos Co., N. M. Richard Hopkins, president; B. F. Shakespeare, secretary; J. K. Turner, manager; Geo. Oates, superintendent. Organized circa 1901, as successor of Rio Hondo Copper Mining Co. Lands, 1,850 acres, also sundry water-rights and a railroad franchise. Mine has an 80′ ore body, carrying copper, gold, silver and lead, opened by a 1,000′ tunnel. Is said to have bought the Hawkeye group, near Amizett, Taos county. Has a smelter and cyanide plant. Original development was for copper, but later operations have been confined to developing a big ledge of gold-bearing quartz.

COMPAÑIA MINERA SAN DIEGO. **MEXICO.**

Letter returned unclaimed from former mine office, Parras de la Fuente, Parras, Coahuila, Mex. Has auriferous and argentiferous copper ore. Idle.

SAN DOMINGO GOLD & COPPER CO. **ARIZONA.**

Dead. Merged, circa 1903, in Picacho Blanco Mining Co. Formerly at Morristown, Maricopa Co., Ariz.

MINA SAN DOMINGOS. **PORTUGAL.**

Owned by Mason & Barry, Ltd.

SAN FELIPE MINING CO. **MEXICO.**

Office: Philadelphia, Pa. Mine office: Hostotipaquillo, Ahualulco, Jalisco, Mex. Col. N. Z. Seitz, president and general manager; Geo. P. Roux, superintendent. Organized 1902, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Development is by a tunnel, planned to be driven 3,000′, to

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cut the San Felipe veins at depths of 1,600′ and 3,200′. Has a mill, rated at 50 tons daily capacity, planned to be remodeled. Paid dividends from stock sales, hence is viewed with much suspicion.

COMPAÑIA MINERA DE SAN FERNANDO. **MEXICO.**

Mine office: Zimatlán, Oaxaca, Mex. Muñoz Gomez, manager. Has auriferous copper and argentiferous lead ores, employing circa 40 men, at last accounts.

SAN FERNANDO COPPER MINING & SMELTING CO. **MEXICO.**

Office: 3637 Fourth St., San Diego, Cal. Mine office: Ensenada, Norte, Baja California, Mex. F. M. Woods, president; H. E. Woods, vice-president; Warren Woods, treasurer; E. C. Humphrey, manager.

Lands, 180 pertenencias, area 445 acres, in the San Fernando district, circa 240 miles below the California line, 25 miles east of San Carlos Landing, on the Pacific, and 80 miles southeast of the harbor of San Quintín, with a good wagon road from mine to the landing. Mine, discovered by the San Franciscan friars, early in the Nineteenth Century, is said to have produced upwards of $500,000, from ore shipped, via San Francisco, to Liverpool, ore ranging as high as 50% in copper tenor, with good gold and silver values. Property shows numerous veins of 3′ to 5′ width, carrying carbonate ores at surface, changing at depth to chalcopyrite. Shipments by present owners have averaged circa 20% copper. Equipment includes a hoist, pumps and laboratory. Has steam power and a 50-ton smelter, employing circa 30 men at last accounts.

SOCIEDAD ANONINA INDUSTRIAL DE MINAS DE COBRE SAN FERNANDO y SANTA ROSA. **CUBA.**

Dead. José F. Santa Eulalia, was president. Property was the Finca San Joaquin, circa 30 miles northeast of Cienfuegos and about 12 miles west of Manicaragua. The mine, 4 miles north of the Rio Mayo, was worked on a considerable scale, beginning circa 1865, and shipped, 1868, to Swansea, 3,258 tons of ore of 19.7% average copper tenor. Was last worked 1883-1885, suspending because of a revolution. The vein ranges up to 30′ in width, carrying cuprite, melaconite, azurite and chalcopyrite. Property has been idle for some years. Company's office formerly was at Havana, Cuba. Formerly at Santa Clara, Santa Clara Province, Cuba.

COMPAÑIA MINERA DE SAN FRANCISCO DEL AZUL. **MEXICO.**

Mine office: Matehuala, Catorce, San Luis Potosí, Mex. W. B. A. Dingwall, manager. Property includes the San Francisco and San Miguel mines, carrying gold, silver and copper ores. Has steam power, lixiviation plant and a 50-ton mill, employing circa 100 men.

SAN FRANCISCO DEL ORO MINES, LTD. **MEXICO.**

Office: 65 London Wall, London, E. C., Eng. Mine office: Parral, Hidalgo, Chihuahua, Mex. Earl of Denbigh, chairman; James E. Hyslop, manager; Harold A. Searle, secretary. Organized Apr. 18, 1903, under laws of Great Britain, with capitalization £375,000, shares £1 par; issued, £330,000. Lands, 253 acres, 14 miles southwest of Parral, carrying gold, silver, copper, lead and zinc ores, undergoing development. Shipments are made to nearby smelters, and profits earned in first 18 months are given by company as in excess of £22,000. Was building a 200-ton mill, 1907.

SAN FRANCISCO MINING CO. **MEXICO.**

Office: care of J. G. Pritchard, vice-president and general manager, Bisbee, Ariz. Mine office: San Felipe, Arizpe, Sonora, Mex. H. M. Whitney, president; Fred C. Hagen, secretary; W. E. Tester, assistant secretary; J. W. Wood, treasurer; Peter Pitz, superintendent. Organized Oct. 23, 1905, under laws of Arizona, with capitalization $60,000, shares $10 par. Lands, 16 pertenencias, also exploratory rights over 4 square miles of adjacent lands. Prop-

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erty shows several veins of 30″ to 9′ width, giving good assay values, mainly in gold and silver, with from a trace to 7.19% copper, and up to 50% lead. Presumably idle.

SAN FRANCISCO MINING CO. **MEXICO.**

Mine office: Autlán, Jalisco, Mex. L. E. Fuller, president. Organized 1905. No trace of operations.

NEGOCIACION MINERA SAN FRANCISCO y ANEXAS. **MEXICO.**

Dead. Formerly at Asientos, Ocampo, Aguascalientes, Mex.

SAN JAVIER COPPER CO. **MEXICO.**

Office: 800-189 La Salle St., Chicago, Ills. Mine office: San Javier, Alamos, Sonora, Mex. Jacob J. Smith, president; Chas. F. Sollars, vice-president; Chesley R. Perry, secretary; W. Schellinger, mine manager. Organized April, 1907, under laws of South Dakota, with capitalization $5,000,000, shares $1 par, and is incorporated under laws of Mexico with same title. Lands, said to be 3 groups, are said to carry high grade argentiferous copper ore. In advertisements, October, 1907, promised a dividend within 6 months, but apparently dividend failed to materialize. Is not regarded favorably.

FINCA SAN JOAQUIN. **CUBA.**

Owned by Sociedad Anonima Industrial de Minas de Cobre San Fernando y Santa Rosa.

MINA SAN JOSÉ. **CHILE.**

Office and mine: care of Silva y Rivas, owners, Tamaya, Ovalle, Coquimbo, Chile. Mine, opened 1844, is 517′ deep. Idle at last accounts.

SAN JOSÉ CONSOLIDATED MINING CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. Organized under laws of Arizona and protocolized in Mexico. Lands, circa 100 acres, lying near the Moctezuma Copper Co., showing a vein of 5′ to 12′ width, carrying values mainly in silver and lead, with small gold and copper values. Presumably idle.

SAN JOSÉ MINING CO. **CUBA.**

Dead. Succeeded, circa 1902, by El Cobre Mines. Formerly at El Cobre, Santiago de Cuba.

MINAS SAN JOSÉ y OTRAS. **SALVADOR.**

Office and mines: care of Luna Hermanos, owners and managers, Melapán, Santa Ana, Salvador. Has auriferous and argentiferous copper ores, with steam power, and a small and antiquated smelter, employing circa 250 men, at last accounts.

COMPAÑIA MINERA SAN JUAN. **MEXICO.**

Mine office: Muleje, Sur, Baja California, Mex. Presumably idle.

MINA SAN JUAN. **SPAIN.**

Mine office: Paimogo, Huelva, Spain. D. José De Soto, manager. Lands, 102 hectaras, including 4 old mines. Idle.

SOCIEDAD MINERA SAN JUAN. **CHILE.**

Office: Calle Prat, 55, Valparaiso, Chile. Mine office: Higuera, La Serena, Coquimbo, Chile. Employs 170 men. Guillermo Lyon, president; José Maria Muñoz, managing director; preceding officers, E. A. Sandiford, Ruperto Alvarez and Cirilo Armstrong, directors; Miguel Scantlebury, general manager; Ricardo Spargoe, mine superintendent; Ricardo Everett, smelter superintendent. Organized Feb. 17, 1906, under laws of Chile, with capitalization 1,000,000 pesos, in 300,000 pesos preferred and 700,000 pesos common shares, par 20 pesos, 10 pesos paid in. Semi-annual meeting, March and September.

Lands, 29 claims, area 66 hectares, also a 9-hectare millsite. Country rocks are granite and diorite, showing 8 strong parallel veins, opened by a large number of tunnels and by the following shafts: Casas, 70′; Ajo, 500′; Aguilas, 240′; Rosario, 300′; Cocinera, 240′; Capriciosa, 700′; San Juan, 1,200′;

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Ierma, 200'; San Pablo, 600'. Mines are estimated to have 20,000 tons of ore blocked out for stoping.

Mines, opened 1820, have been in continuous operation since. Power plant includes 6 hoists, good for 1,000' depth each, 7 driving engines, and a Siemens & Halske electric plant for lighting purposes and for driving 4 electric rock drills, of the same make. Buildings include a 100x100' machine-shop, a 30x30' carpenter shop and a 30x30' smithy, all of wood, and about 50 dwellings for employes.

Company has two smelters, one at Las Casas mine, and the other, which is the more important, in a valley below and about one mile distant from the mines, from which ore is received in carts. The two smelters have a combined capacity of 230 tons daily. Equipment includes 12 kiln calciners, a 120-ton rectangular blast-furnace and seven 16-ton reverberatory furnaces. Product is a matte of 50% average copper tenor, sent to the works of the Sociedad Chilena de Fundiciones, at Guayacán, for refining. Nearest shipping point is the port of Potoralillo, distant 9 miles from the smelter. Fuel is soft coal, costing 30 pesos per ton, and coke, costing 35 pesos per ton, Chilean. Average cost of mining is 3 pesos per long ton, and of smelting, 10 pesos per ton. Ores treated average 8% copper. Production, first 5 months of 1906, was circa 1,000 tons fine copper, and for 1907 is estimated at 4,000,000 lbs. fine copper.

SAN JUAN BAUTISTA MINING CO. **MEXICO.**

Office: 513 Ouray Bldg., Washington, D. C. Mine office: Moctezuma, Sonora, Mex. Dr. F. S. Chamberlain, president; A. G. Drake, secretary and manager; Wm. Carter, treasurer; Geo. F. Woodward, general manager; Wm. M. Reese, superintendent; A. J. Klide, assistant superintendent. Organized March, 1906, under laws of Arizona, with capitalization $5,000,000, shares $10 par.

Lands, 19 claims, on El Cerro Rosario, including antiguas showing large slag piles remaining from ancient smelting operations. Property carries a mineralized zone circa 1,000' wide, traceable about 1,500', between limestone and porphyry. Development is by a 2-compartment 100' shaft on the Rosario claim, also shafts of 50' and 126' on other claims. La Bronzosa mine carries argentite, stephanite and chalcopyrite, associated with pyrite, and La Cobriza mine is said to show 30' of ore carrying highly argentiferous cuprite. Property has yielded ores assaying up to $300 gold per ton.

MINA SAN JUAN DE MALAJA. **CUBA.**

Mine office: Santa Clara, Santa Clara, Cuba. Lands, 6 miles northeast of Santa Clara, showing a 100' gossan, are but slightly developed, and have been idle many years.

SAN JUAN MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

SAN JUAN SMELTING & REFINING CO. **COLORADO.**

Office: Exchange Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Silverton, San Juan Co., Colo. Wm. Oliver, president; W. F. Kendrick, vice-president; John B. Humphrey, secretary; preceding officers, Wm. F. Ford, John Colquhoun, Geo. P. Peck, C. L. Gagnier and John M. Braley, directors; Samuel H. Dresbach, superintendent.

Organized 1903, under laws of Colorado, with capitalization $3,000,000, shares $1 par, as a consolidation of Kendrick & Gelder Smelting Co., Oliver Mining Co. and Paradox Copper-Gold Mining Co. Bonds, $250,000 authorized; issued, circa $100,000. Interest rate on bonds is variously reported as 6% and 10%. In March, 1907, was offering $100,000 of 10% bonds, at par. On June 27, 1908, authorized an issue of $300,000 ten-year refunding bonds, at 6%, secured by mortgage, but a shareholder secured a court order preventing the issue of these bonds, because property was in hands of a receiver when bond

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issue was authorized, illegally. Interest on the $100,000 bond issue was defaulted March 1, 1908, and receivers appointed, the foreclosure proceedings brought by reason of default in interest apparently being in the nature of a friendly action, at the start, but becoming unfriendly later on. At last accounts, June, 1908, property was held, under tax-title, by E. C. Drew, as trustee.

Lands, circa 40 claims, 10 patented, including a millsite one mile below the Henrietta mine, lying mainly on Eureka Mountain, with 3 claims in Cinnamon Gulch, on the line of the Silverton, Gladstone & Northern Railroad, 7 to 10 miles from Silverton. Part of company's former landed holdings were under bond and lease, partly paid, to Ross Mining & Milling Co., at last accounts.

The principal property is the Henrietta mine, carrying auriferous and argentiferous copper ores, opened by a long crosscut tunnel, estimated by company to show circa 400,000 tons of ore, of about $15 average value, blocked out for extraction, which figures are considered exaggerations. The Henrietta is said to show occasional chutes of high grade smelting ores, up to 20 and 30% in copper tenor, with smelting ore averaging about 7% in copper tenor, and milling ore averaging circa 3.5% copper. The mine has gasoline and electric power.

The smelter, said to have been renovated, 1905-1906, is held under bond and lease by Ross Mining & Milling Co. The reduction plant included a 400-ton concentrator and 200-ton smelter. The Henrietta mine does not seem to impress the people at Silverton as an especially remarkable property, and the company is in exceptionally bad shape, with every prospect of a total smash.

SAN LUCAS COPPER CO. **MEXICO.**

Mine office: Choix, Fuerte, Sinaloa, Mex. Entire stock issue is owned by El Magistral Copper Co.

COMPAÑIA MINERA SAN LUIS. **MEXICO.**

Dead. Formerly at Tepezalá, Ocampo, Aguascalientes, Mex.

SAN LUIS MINING CO. **MEXICO.**

Office: 1104-27 William St., New York, N. Y. Mine office: Gabriel, Durango, Mex. John G. Gibbons, president; W. J. Robinson, vice-president; Myra B. Martin, secretary and treasurer; Col. Britton Davis, managing director; preceding officers, Seymour W. Tulloch, Angel L. Negrete, J. Edward Layne, Walter S. Perry and Hollister S. Logan, directors.

Organized Nov. 16, 1900, under laws of West Virginia, and capitalization increased, 1905, to $3,000,000, shares $1 par. First dividend, 1%, was paid January, 1906, and a second dividend was paid July, 1906, both unearned. Annual meeting, second Wednesday in April.

Lands, 506 pertenencias, area 1,241 acres, in 64 groups, also a 25-acre millsite, in the San Lucas and Pánuco de Coronado districts of Durango. Company also claims to hold El Cura ranch, area 35,000 acres.

The mineral property shows limestone and porphyry, carrying fissure veins and contact deposits, company reporting 64 ore bodies, of which 6, under development, were estimated, by company, to average 3% copper, 12% lead, 1% zinc, 35 oz. silver and $4 gold per ton, mainly from sulphide ores, the company claiming, at end of 1905, to have 17,314′ of workings estimated to show 300,000 tons of ore, with 200,000 tons blocked out, which figures are not credited, because of the phenomenal untruthfulness of some of its officers. The mines were discovered circa A. D. 1650, and worked, more or less irregularly, until 1830, when closed, on account of water and Indian troubles, remaining idle until reopened, 1901, by present company.

The San Luis mine shows a considerable body of copper ore, of low average tenor, with some high-grade silver ore.

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The Potosina mine, with 1,994′ of workings, is said to show, at the western end, a considerable body of ore of smelting grade, and a large quantity of milling ore.

The San Gonzalo mine, 350′ deep, shows low-grade ores, carrying mainly silver values above, with copper on the lower levels.

The Castillana mine, adjoining the San Gonzalo on the east, with a continuation of the vein of the latter, is said to have been proven for a distance of 1,600′, by trenches and pits of 10′ to 60′ depth, and has an idle 120′ shaft.

The Sidney mine has a shallow shaft, showing a 2′ vein of galena, giving assays up to 45% lead, 40 oz. silver and 3 grams gold per ton, but has been idle for some years, on account of a heavy inflow of water.

The San Lucás mine, area 19 hectares, 35 miles northwest of Gabriel, is an old property, claimed to have nearly 2 miles of workings, carrying mainly lead and zinc.

The Aventura mine, adjoining the San Lucás, shows a heavy gossan, with an old shaft opening a 3′ vein of carbonate ore, said to give assays of 32% copper and 12 grams gold per ton.

The San Pablo mine shows parallel veins said to carry 6″ to 36″ pay-streaks of sulphide ore, giving assays up to 16% copper, 360 oz. silver and 14 grams gold per ton. Development is by an abandoned incline shaft, and a 175′ vertical shaft, latter equipped with gallows-frame and hoist.

Equipment includes steam plants, said to aggregate 750 h. p., with 6 hoists and 2 Ingersoll-Sergeant air-compressors, of 12 drills combined capacity.

Buildings are said to include a 25x150′ stone machine-shop, 25x150′ wooden carpenter-shop, stone smithy, offices, 4 general stores and a large number of dwellings for workmen, with a total of 175 buildings.

The 60x180′ mill, of adobe and iron, is equipped with 2 crushers, 1 jig and 4 Bartlett tables. Concentration seems to have proven more satisfactory than leaching.

The Trinidad leaching mill, of 120 tons claimed daily capacity, has 2 calcining furnaces, for roasting ore before leaching, and apparently treated only about 40 tons daily, when in operation.

Production, 1905, was reported as 30,725 tons of ore, of which 5,845 tons were shipped to smelters, 6,481 tons were leached, and 15,118 tons were concentrated. Production, 1905, was reported as circa 450,000 lbs. fine copper, and net earnings, 1905, were claimed to be 277,530 pesos.

John G. Gibbons, a director, brought suit, 1907, in the Supreme Court of Mexico, to recover $500,000, alleged to have been lost or wasted by the late "Gen." Walter S. Logan, a notorious shyster lawyer, who died July 19, 1906, the title boasted by the "general" having been acquired as former president of the "Sons of the American Revolution," which is greatly to the credit of that body of patriots, who permitted their ancestors to bleed for the cause of liberty. The suit of Mr. Gibbons includes proceedings against Myra B. Martin and the Logan Estate, also including Hon. Geo. B. Agnew and Col. Britton Davis.

The debts of the company were claimed, in 1905, to have been paid, notwithstanding which the capitalization of the company was increased, and the payment of dividends begun, simultaneously with the selling of treasury stock, which was a deliberate and intentional swindle on the part of the management, which has been connected with some of the most notorious mining frauds dividends of fabulous size, and Miss Martin and the balance of her gang now of the United States, including the George A. Treadwell and Copete companies. The company promised, over the name of the notorious Myra B. Martin, accuse Louis Ross, formerly general manager in Mexico, of bad management and making misleading reports that caused the company to pay dividends.

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As a matter of fact, Mr. Ross is one of the few honest men ever connected officially with this company, and his management, instead of being bad, was exceptionally good—in fact, his conduct of the company's mining affairs was so unexpectedly capable that the Logan gang, which obviously started the San Luis as a mere bit of stock-jobbery, came to the conclusion that the mine was valuable, hence wrecked the company, in accordance with the piratical methods employed by this outfit in all of its mining deals.

Despite the efforts of Mr. Ross and a few other honest men, the company borrowed money, 1906, or at least is supposed to have borrowed money, according to the records, from some of the parties connected with the outfit, and October, 1908, judgment was taken, by default, for $51,000, in favor of Hon. Geo. B. Agnew, on 2 notes, made 1906, running for 18 months, payable to Myra B. Martin.

The newspapers that accepted the putrid advertising of this rotten concern, well knowing it to be a swindle, are now foremost in their denunciations of the company, there being no further revenue derivable from the printing of the company's lies. Property considered valuable, but the company is a swindle.

SAN MARCUS-SALOME DEVELOPMENT CO. **ARIZONA.**

Office: Pittsburg, Pa. Mine office: Salome, Yuma Co., Ariz. Lands are about 4 miles from the Socorro mines, in the Harqua Hala Mountains. Presumably idle.

COMPAÑIA MINERA SAN MARTIN y ANEXAS, S. A. **MEXICO.**

Office: Oaxaca, Mex. Mine office: San Martín de los Cansecos, Oaxaca, Mex. Employs 124 men. Frank M. Leonard, president and general manager; Jesús Acevedo, vice-president; Ranulfo Bravo, secretary, treasurer and superintendent; Jesús Linares, mine superintendent. Organized Jan. 15, 1907, under laws of Mexico, with capitalization 400,000 pesos, shares 10 pesos par, in 35,000 full paid shares and 5,000 assessable shares; issued, 37,995 shares.

Lands, 5 groups, area 55 hectares, circa 10 miles from Ocotlán, including an antigua said to have been worked by Aztecs before the Spanish conquest. Property shows diorite, carrying a vein of 10' to 12' average width, traceable one mile, with strike of 11° West, carrying ore returning, from shipments, 2% copper, 2% lead, 6% zinc, 5 kgs. silver and 100 grams gold per metric ton. Equipment includes a mill, built by former owner, having 3 stamps and 3 Wilfley tables, now idle because of poor location. Property, in development stage, supported itself from sales of shipping ore, and company has no indebtedness. Property considered promising and management good.

MINA SAN MIGUEL. **PERÚ.**

Mine office: Morococha, Junín, Perú. Mine has 2 tunnels, lower circa 500 meters in length, developing mainly enargite, with some tetrahderite and a little tennantite, associated with pyrite. Mine, opened 1894, in 10 years produced, from ore averaging 20% copper and 333 grams silver per ton, 6,476,400 kgs. fine copper and 10,794 kgs. fine silver. Mine was said, 1905, to be producing about 800 tons monthly, of ore averaging circa 22% copper and 10 oz. silver per ton. Production, 1907, estimated at 1,400,000 lbs. fine copper.

NEGOCIACION MINERA SAN MIGUEL. **MEXICO.**

Mine office: Matehuala, Catorce, San Luis Potosí, Mex. Wm. R. Boggs, Jr., general manager. Has argentiferous copper ore and gold. Equipment includes steam power and a 100-ton leaching plant. Employs circa 300 men.

SOCIEDAD DE MINERALES DE SAN MIGUEL. **SPAIN.**

Dead. Was succeeded, Oct. 12, 1904, by San Miguel Copper Mines, Ltd. Formerly at Almonáster, Huelva, Spain.

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SAN MIGUEL COPPER CO. **NEW MEXICO.**

Mine office: Tecolote, San Miguel Co., N. M. Frank J. Buck, superintendent, at last accounts. Presumably idle.

SAN MIGUEL COPPER MINES, LTD. **SPAIN.**

Office: 23 Queen Victoria St., London, E. C., Eng. Mine office: Almonáster, Huelva, Spain. H. Schmidtz, chairman; Geo. Emdin, secretary; Adolph E. Eberbach, managing director; F. O. Harvey, consulting engineer. Organized Oct. 12, 1904, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, £140,007. A former debenture issue, of £75,000, at 6%, was fully redeemed from the share premium on a new stock issue, emitted, 1905, at £2 10s. per share. Company is said to have a reserve fund of £60,000. Regular dividend rate is 25% per annum, paid quarterly.

Lands, 1,900 acres, including the San Miguel and adjoining mines of cupriferous pyrites. The property was worked, for some years, by a Portuguese company, the Sociedad de Minerales de San Miguel, until taken over, 1904, by present owners. In 1907 the lower levels of the mine caved in, since which time production has been limited to open-cast ore extraction. The property has circa 450,000 tons of partly leached ore, on surface, in teleras and tereros, and the mine was said to show circa 500,000 long tons of ore averaging 2.5% copper, before underground workings were lost, in whole or part, by caving.

Property includes a 19-kilometer private railway, costing £40,000, from the mine, at Almonáster, to El Cerro, where connection is secured with the Ferrocarril Zafra y Huelva.

Production, 1904, was 588 long tons precipitate and 13,487 long tons cupriferous pyrites, with copper contents of 1,612,800 lbs. fine copper. Production, 1905, was 933 tons precipitate and 3,168 tons cupriferous pyrites, but, 1907, was only 797,440 lbs. fine copper, owing to mine troubles, and, because of these troubles, management was changed, 1907.

SOCIEDAD MINEIRA DE SAN MIGUEL DE HUELVA. **SPAIN.**

Dead. Succeeded, Oct. 12, 1904, by San Miguel Copper Mines, Ltd. Formerly at Almonáster, Huelva, Spain.

COMPAÑIA MINERA DE SAN MIGUELITO. **MEXICO.**

Mine office: Cumpas, Moctezuma, Sonora, Mexico. Long idle.

COMPAÑIA MINERA SAN PABLO. **MEXICO.**

Mine office: San Pedro de las Colonias, Parras, Coahuila, Mex. Juan Cuyas, superintendent. Has gold, silver and copper ores, employing circa 20 men.

SOCIÉTÉ ANONYME DES MINES DE SAN PEDRO. **SPAIN.**

Office: 39 Rue de Chateaudun, Paris, France. Mine office: Zalamea La Real, Huelva, Spain. Don Carlos Marchal, agent. Capitalization, 450,000 francs. Lands include the Barránco de los Buyes group of 10 old mines, area 167 hectares. Idle.

SAN PEDRO COPPER CO. **NEW MEXICO.**

Mine office: San Pedro, Santa Fé Co., N. M. Idle since circa 1899.

SAN PEDRO COPPER CO., S. A. **MEXICO.**

Mine office: La Cananea, Arispe, Sonora, Mex. Is controlled, through stock ownership, by Cananea Central Copper Co., which is a subsidiary corporation of the Greene Cananea Copper Co. Property consists of the American, Copper Belt, Bryan, Seguro, Square and eastern part of Massey No. 2 and El Oriente claims. Property is described under title of Greene Cananea Copper Co.

COMPAÑIA MINERA SAN PEDRO DE NOLASCO. **CHILE.**

Mine office: San Pedro de Nolasco, Victoria, Santiago, Chile. Property is the Carlotta mine, opened A. D. 1796, which is developed by a 700' tunnel. Presumably idle.

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COMPAGNIE DES MINES DE CUIVRE DE SAN PLATON. **FRANCE.**

Office: 7 Rue Pillet-Will, Paris, France. Mine office: Almonáster, Huelva, Spain. Guillermo Sundheim, manager. Organized Oct. 18, 1906, under laws of France, with capitalization 3,000,000 francs, shares 100 francs par. In 1907 net earnings were 393,568 francs, 69 centimes, and, with allowance for amortization, there was left a net balance of 238,211 francs, 16 centimes. Paid 5% dividends in 1907 and 1908.

Lands, 46 hectares, including the San Platon, Segunda San Platon and Aumento de San Platon mines. Production, 1907, was 26,116 metric tons of cupriferous pyrites.

SAN POIL MINING & EXPLORATION CO. **WASHINGTON.**

Office: care of S. L. Boyer, manager, Spokane, Wash. Mine office: Republic, Ferry Co., Wash. Organized 1907, under laws of Washington. Lands are 9 groups of claims, carrying gold and copper ores.

SAN RAFAEL COPPER MINING CO. **MEXICO.**

Office: Cleveland, Ohio. Mine office: Terrazas, Chihuahua, Mex. B. B. Hutchinson, manager; Capt. M. D. Murray, superintendent. Supposedly is controlled by the firm of Corrigan, McKinney & Co. Lands, known as the Columbia group, formerly were held by Federal Copper Co., of El Paso, and Dragoon Mining Co.

SAN RAFAEL COPPER MINING CO. **MEXICO.**

Dead. Formerly at Hermosillo, Sonora, Mex. Described Vol. VI.

SAN RAFAEL MINING CO. **MEXICO.**

Dead. Succeeded by Mercer-San Rafael Mining Co. Formerly at Ameca, Jalisco, Mex.

COMPAÑIA MINERA SAN RAMÓN DE FREIRINA. **CHILE.**

Office: Santiago de Chile. Mine office: San Juan, Freirina, Atacama, Chile. Organized Nov. 22, 1904, under laws of Chile, with capitalization 160,000 pesos, shares 100 pesos par.

SAN REMO COPPER CO. **ARIZONA.**

Dead. Was merely a ghost, when in existence. Formerly haunted Gleeson, Cochise Co., Ariz. Described Vol. V.

SAN SIMON COPPER CO. **ARIZONA.**

Office: Marquette, Mich. Mine office: Paradise, Cochise Co., Ariz. Nathan M. Kaufman, president; Hon. Norman W. Haire, vice-president; S. R. Kaufman, secretary and treasurer; preceding officers, Thos. F. Cole, John A. Duncan, W. G. Rice and Thos. H. Collins, directors; Marshall Estes, superintendent. Organized circa January, 1907, under laws of Arizona, with capitalization $2,500,000, shares, $10 par, as a reconstruction of Chiricahua Development Co.

Lands, 40 claims, area circa 750 acres, 16 miles from nearest railway, at Rodeo, taken over, April, 1903, by predecessor of present company, and previously operated by Capt. Thos. Burns as a silver mine. Has a 750′ crosscut tunnel, with a 100′ winze 700′ from portal, cutting circa 50′ of leached ore, apparently the apex of a sulphide ore body. The 400′ Mars shaft, sunk on a vein having a 150′ gossan, passed through leached ore, and is bottomed in chalcopyrite of 2 to 4% copper tenor. The 400′ Planet shaft has drifts on the fourth level. Equipment includes two 150-h. p. boilers, two 2,000′ Lake Shore double-drum hoists, and a 16-drill Sullivan air-compressor. Has several mine buildings. Management is good. Practically idle, except for annual assessment work.

SANTA ANA-ARIZONA MINING CO. **ARIZONA.**

Office: P. O. Box 1715, Bisbee, Ariz. Mine office: Middlemarch, Cochise Co., Ariz. A. W. McPherson, president; Geo. H. Neale, vice-president; A. F. Gressler, secretary and treasurer; Wm. Goar, general manager; preceding

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officers and E. J. Bennett, directors. Organized April, 1906, under laws of Arizona, with capitalization $2,500,000, shares $1 par; issued, $1,400,000. Annual meeting, second Tuesday in February.

Lands, 14 claims, unpatented, area 280 acres, on Dragoon Mountain, in the Black Diamond district, 8 miles from Southern Pacific railway, at Pearce, showing limestone and porphyry, with 5 ore bodies, of which 2, under development, show argentiferous carbonates and sulphides, latter mainly chalcopyrite, estimated by company to carry an average of 10% copper, 15% lead and 6 oz. silver per ton. Development is by tunnels of 70′ and 80′, and by shafts of 56′, 110′ and 300′.

Property has steam power, with a 10-h. p. hoist, good for 500′ depth, and 2 buildings. Company plans continuous development.

SANTA CASILDA COPPER CO. **MEXICO.**

Letter returned unclaimed from former mine office, La Lombardia, Uruapán, Michoacán, Mex. Hon. M. G. Horner, president; R. A. Mills, secretary; preceding officers, Rafael R. Velad, Pablo Kosidowsky and Alberto Worn, directors. Organized under laws of Mexico, with capitalization 1,500,000 pesos. Lands are well watered, and include a concession for development of 1,000 hydraulic horse power from a near-by river. Oxidized zone is superficial, sulphide zone carrying mainly chalcopyrite. Mine is developing considerable bodies of 5% concentrating ore, and has small quantities of ore of 15 to 18% copper tenor. Is said to plan a 200-ton concentrator.

SANTA CRUZ COPPER CO. **MEXICO.**

Mine office: Santa Cruz, Magdalena, Sonora, Mex. Idle and apparently moribund.

SANTA CRUZ MINING CO. **ARIZONA.**

Office: 51st St. and Allegheny River, Pittsburg, Pa. Mine office: Patagonia, Santa Cruz Co., Ariz. W. W. Hall, president; W. B. Barnes, vice-president; R. D. McDonald, secretary; Wm. M. Schwartz, general manager; J. A. Tustín, superintendent. Organized Oct. 5, 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 6 claims, area 124 acres, 2 miles east of Patagonia, in the Harshaw district, showing several fissure veins, of about 20′ average width, said to give a general average assay of 8.5% copper, 20 oz. silver, 5% nickel and $25 gold per ton, mainly from chalcocite. Development is by 2 shafts, deepest circa 350′.

SANTA EMILIA COPPER CO. **MEXICO.**

Office: 69 Wall St., New York, N. Y. Mine office: Coapa, Michoacán, Mex. John A. Kennedy, president; A. J. Peyton, vice-president and general manager; Manual L. Ward, secretary and treasurer; J. R. Crum, superintendent. Organized 1899, under laws of Delaware, with capitalization $1,000,000, and reorganized, March 27, 1905, under laws of Maine, with capitalization $2,000,000, shares $1 par. Of the increased capitalization, $500,000 was given shareholders, as a stock dividend, and balance placed in the treasury, part going to the general manager for lands turned in by him. Is controlled, through ownership of majority of stock, by Mexican Development Co.

Lands, 113 acres, in the Tacambaro district, 24 miles from Mexican National Railway and circa 40 miles southwest of Morelia, including a 30-acre property, adjoining the original tract, taken over from the general manager and former president, paid for in shares from the new treasury stock.

The mine is developed by the 1,200′ Napoleon tunnel, and by a 625′ two-compartment shaft. The property is said to have circa 3,000′ of workings, and management is said to plan deepening shaft to 1,000′ and crosscutting, circa 800′, to intercept the Guadalupe vein. At last accounts the mines had not shown ore in payable quantities, but the management was said to consider the situation encouraging.

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Equipment includes a steam plant, and there are various mine buildings, and dwellings for workmen.

The Santa Emilia is controlled by the same people as promoted the Natividad Mining Co., which was a swindle, and the Dona Louisa Copper & Gold Mining Co., which is not regarded favorably, hence the Santa Emilia is viewed with suspicion.

SANTA EULALIA MINING & MILLING CO. **MEXICO.**

Dead. Formerly at Velardeña, Cuencamé, Durango, Mex. Described Vol. VI.

COMPAÑIA MINERA LA SANTA FÉ. **MEXICO.**

Office: Monterey, N. L., Mex. Mine office: Galeana, Octavo, Nuevo León, Mex. Organized 1907, under laws of Mexico, with capitalization 36,000 pesos. Property, known as the Santa Fé mines, carries copper ore.

MINA SANTA FÉ. **MEXICO.**

Mine office: Salto de Agua, Palenque, Chiapas, Mex. This property, formerly held by the Chiapas Mining Co., is developed by a 1,560′ tunnel and a 200′ main shaft, showing a mineralized zone of circa 100 meters width, between diorite and limestone, apparently formed by contact metamorphism. Values are mainly in argentiferous and auriferous copper ore, but the ore is very complex, carrying cuprite, malachite, bornite, chalcopyrite, tetrahedrite, chrysocolla, sphalerite, galena, and free gold, associated with pyrite, with a gangue that is mainly wollastonite. The best grade of concentrating ore is mainly bornite, disseminated in a gangue of wollastonite and garnet. Property has water power, a 30-stamp mill, 100-ton concentrator and 75-ton smelter, and in 1903 made 370,483 lbs. fine copper. Idle.

SANTA FÉ DEVELOPMENT CO. **MEXICO.**

Office: care of D. M. Simpson, secretary, Bisbee, Ariz. Mine office: Ysabel, Moctezuma, Sonora, Mex. Organized Oct. 25, 1906, under laws of Arizona, with capitalization $1,000,000, shares $10 par. Holds title to lands through Santa Fé Mining Co., S. A., organized under laws of Mexico. Lands, 120 hectares, are north and east of El Tigre mine, circa 30 miles from Ysabel, the nearest railroad station, and are connected therewith by a good wagon road. Shaft, at depth of 50′, gave ore assaying 11% copper and 17 oz. silver per ton, and at depth of 70′ gave ore assaying 23.8% copper and 10.8 oz. silver per ton. Employed 50 men at last accounts.

SANTA FÉ GOLD & COPPER MINING CO. **MEXICO.**

Office: 920 Merchants Loan & Trust Bldg., Chicago, Ills. Mine offices: Alamos, Sonora, Mex., and El Fuerte, Sinaloa, Mex. Is controlled, through stock ownership, by International Copper & Gold Co., which is controlled, through stock ownership, by Sonora Central Mines Co. Lands are 8 groups, in the states of Sonora and Sinaloa. Owing to the company being merely a stepping-stone for the Sonora Central Mines Co., and the further fact that the Sonora Central claims direct ownership to all properties actually owned by the Santa Fé, the various properties, described in detail under this title in Vol. VII, are listed, in the present volume, under title of Sonora Central Mines Co.

SANTA FÉ GOLD & COPPER MINING CO. **NEW MEXICO.**

Office: 334-11 Broadway, New York, N. Y. Mine office: San Pedro, Santa Fé Co., N. M. Employs 350 men, when operating. Julius H. Susmann, president; E. H. Westlake, secretary and treasurer; preceding officers, C. S. Henry, J. De Smet Maguire, O. B. Van Sant, E. C. Westervelt, Ernest Brown and Chas. N. King, directors; Richard F. McCaffery, general manager; B. H. Case, superintendent. Organized Jan. 20, 1899, under laws of New Jersey, with capitalization $2,500,000, shares $10 par, as a reconstruction of the original Santa Fé company, organized 1888, which became bankrupt, 1892,

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present company beginning business with $500,000 cash. State Street Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent. Shares are listed on the Boston stock exchange. Annual meeting, fourth Tuesday in January.

Company began business with $500,000 cash, and ended 1907 with a cash balance of $170,750 and $3,000 accounts receivable, also having $22,296 in coke and miscellaneous supplies on hand. Receipts for year were $230,920 from sale of metals produced, and $106,613 received from sale of 19,095 shares of treasury stock.

Lands, 3,400 acres of mineral property and 46,000 acres miscellaneous lands, latter including coal areas of promise, all in the old San Pedro land grant, and including the San Pedro mine, which is opened by a single shaft, on a blanket vein of circa 150′ average thickness, dipping at an angle of less than 15°, about half the ore body being workable, though low in average grade. The ore is chalcopyrite, with garnet and quartz gangue, ore being highly silicious and requiring heavy iron and lime fluxes. The mine has about 100,000 tons of ore in sight, with 30,000 tons blocked out. Ore smelted, 1901, is said to have given average returns of circa 4.25% copper, 3 oz. silver and $1.50 gold per ton, but ores smelted, 1907, gave average returns of 2.4% copper, 0.8 oz. silver and 75 cents gold per ton.

Equipment includes a steam plant with a 15-drill air-compressor. Labor is largely Mexican.

The mill treats second class ore, of about 2% copper tenor, making 15% concentrates, and the management has planned the installation of a Wetherill magnetic separator, for treating low-grade carbonate ores.

The smelter, at the mine, blown in Jan. 1, 1901, has two 125-ton blast-furnaces, burning Colorado coke, and producing matte of about 60% average copper tenor, shipped to New Jersey for refining.

Production was suspended, Novemer, 1901, after which nothing was done, except diamond drilling, until the smelter was blown in Feb. 10, 1907, and blown out Oct. 12, 1907, during which time 21,298 tons of ore were smelted, yielding 1,223,457 lbs. fine copper, 17,625 oz. silver and 786 oz. gold, giving an average extraction of 54.4 lbs. fine copper, 0.8275 oz. silver and 0.0369 oz. gold per ton. Product is said to have been secured at an average cost of circa 14 cents per found finished copper, deducting gold and silver values.

The property is low in grade, though possessing an immense tonnage of ore, but, to be operated profitably, a considerable portion of the ore should be concentrated and railroad connections are absolutely necessary, property being 21 miles from the Santa Fé railway. Property considered promising and management good.

SANTA FÉ MINING CO., S. A. **MEXICO.**

Mine office: Ysabel, Moctezuma, Sonora, Mex. Is the Mexican incorporation of the Santa Fé Development Co.

SANTA FÉ MINING CO. **NEVADA.**

Dead. Was controlled by Pittsburg capital and was operating in 1907. Formerly at Luning, Esmeralda Co., Nev.

SANTA FÉ MINING & REDUCTION CO. **NEW MEXICO.**

Dead. Formerly at Santa Fé, Santa Fé Co., N. M.

COMPAÑIA SANTA INES y MOROCOCHA. **PERÚ.**

Office: 193 Calle de Aparicio, Lima, Perú. Mine office: Morococha, Junín, Perú. Employs circa 125 men. Roberto Pflucker, president; Leopoldo Pflucker, vice-president; Porfirio Silva, secretary and treasurer; Vicente Pazos y Sacio, general manager; León Torres, mine superintendent. Organized under laws of Perú, with capitalization 1,200,000 sols.

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Lands, 120 claims, area 240 hectares, also the Hacienda Morococha, area 6,000 hectares, in the Tuctu district. Mineral lands are in the Morococha Basin, which has 4 large lakes, connected by streams having waterfalls available for power purposes. Mining property includes the San Francisco and San Miguel mines, carrying fissure veins and contact deposits between diorite, limestone and quartz-porphyry, these averaging one meter in width, and carrying sulpho-arsenide copper ores, ranging in tenor up to 25% copper and 16 oz. silver per ton.

The mines, opened 1898, are developed by the 300-meter Ausiliar tunnel, the 600-meter Media Falda tunnel and the 800-meter Laguna tunnel, with about 3,000 meters of workings, estimated to show circa 20,000 metric tons of ore blocked out for stoping. Ore, as produced, is divided into 2 grades, averaging 44.18% and 13.86% copper, respectively, and, for first 6 years, ore produced averaged 25.78% copper and 330 grams silver per ton, after hand-selection. The mine is served by the Ferrocarril Central del Perú.

Equipment includes a hydro-electric installation, with a 40-kw. Siemens & Halske generator for light and power, and 3 electric drills. Fuel is domestic coal, costing about 9 pesos per ton, and cost of mining is given by company as averaging circa $2.50 per ton, ore being dressed to an average copper tenor of circa 25%, and sold to the Casapalca smelter for reduction.

Production, 1905, was circa 3,600 metric tons of ore, carrying about 2,000,000 pounds fine copper. At last accounts property was under option to Messrs. Haggin and McKim, apparently for the Cerro de Pasco company.

SANTA INEZ MINING CO., LTD. **PERÚ.**

Office: 5 Fenchurch St,. London, E. C., Eng. Mine office: Morococha, Junín, Perú. Capt. W. B. McTaggart, J. P., chairman; A. Turner, secretary. Organized June 30, 1906, under laws of Great Britain, with capitalization £150,000, shares £1 par; issued, at last accounts, £8. Apparently abortive.

COMPAÑIA MINERA SANTA JOVITA DE COLLAHUASI. **CHILE.**

Office: Valparaiso, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized March 31, 1906, under laws of Chile, with capitalization £110,000, shares £1 par.

MINA SANTA MARIA. **HONDURAS.**

Letter returned unclaimed from former mine office, Comayagua, Honduras. According to the story, which is a monument to the colossal genius of the liar who invented it, the mine, which has but slight development, is a mountain of solid ore, ten miles in circumference, assaying 10 to 75% copper. Idle.

COMPAÑIA MINERA SANTA MARIA DE LA PAZ. **MEXICO.**

Office: 10 Cinco de Mayo, San Luis Potosí, Mex. Mine office: Matehuala, San Luis Potosí, Mex. Pedro Barreneachea, president; Rafael G. Barreneachea, secretary; W. B. A. Dingwall, manager; José Torres, superintendent. Mines, extensively developed, carry auriferous and argentiferous lead and copper ores. Has steam, electric and gas power, Chilean mills, Blake crushers, smelter with two 40-ton furnaces, and a 300-ton concentrator. Employs circa 1,500 men, and is a considerable producer of lead and silver, with smaller by-products of gold and copper.

SANTA MARIA MEXICO MINING ASSOCIATION. **MEXICO.**

Office: Merrill Bldg., Milwaukee, Wis. Mine office: Parral, Chihuahua, Mex. Wm. G. Gruber, president and general manager; Arthur H. Gruber, secretary and treasurer; preceding officers and Rt. Rev. Mgr. Alois Plut, directors; Dr. Chas. Yetmar, vice-president; A. S. Mitchell, consulting engineer; Henry Bitsch, superintendent. Organized under laws of Wisconsin, with capitalization $250,000, shares $1 par. Lands, 50 claims, in 3 groups, known as

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La Lolita, La Viola and Santa Clara, located in the San Blas mountains of the Sierra Madre, midway between and 25 miles from the Mexican Central and Sierra Madre Pacifico railways. Principal development is on La Lolita group, which has shafts of 75′ and 150′, showing rich oxidized ores, assaying up to 70% copper, shipments from which have averaged 15% copper.

SOCIEDAD MINERA SANTA RITA DE ARQUEROS. **CHILE.**

Office: Santiago de Chile. Mine office: Arqueros, Coquimbo, Chile. Organized Dec. 12, 1905, under laws of Chile, with capitalization 400,000 pesos, shares 50 pesos par.

SANTA RITA COPPER MINING & SMELTING CO. **ARIZONA.**

Letter returned unclaimed from former office, 1509 Chemical Bldg., St. Louis, Mo. Mine office: Arivaca, Pima Co., Ariz. Geo. P. Meyers, R. J. Adams and C. T. Sharn, vice-presidents; N. C. Wilson, secretary; J. M. Wyatt, treasurer; C. F. Elliott, general manager. Organized June, 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par.

Lands, 40 claims, area 630 acres, also 4 timber claims and a 20-acre smeltersite, in the Tyndall district, Santa Rita Mountains, 13 miles from Arivaca, said to show 10 veins, of which 4, under development, are claimed to average 8′ to 30′ in width, and are claimed to give average assays of circa 18% copper, 6 to 10% lead, 1 to 3% zinc, 40 to 68 oz. silver and $2 to $8 gold per ton, from sulphide ores, these figures being utterly preposterous. Mine has 5 pits and shafts, of 20′ to 110′ depth, and 5 tunnels, of 40′ to 260′ length, with circa 1,000′ of workings. Company changed officers repeatedly, was a mere stock-jobbing scheme under former managements, and is regarded with suspicion.

SANTA RITA MINING CO. **NEW MEXICO.**

Office: 85 Ames Bldg., Boston, Mass. Mine office: Santa Rita, Grant Co., N. M. Albert C. Burrage, president; B. B. Thayer, consulting engineer; John Deegan, superintendent. Capitalization $5,000,000, shares $25 par. Is said to contemplate reduction of capitalization to $2,000,000. Paid, 1904, a $100,000 dividend.

Lands, 79 claims, 46 patented, area circa 640 acres. Is the oldest copper mine in New Mexico, and one of the oldest in the United States, having been opened A. D. 1800. Mine was abandoned, circa 1820, owing to the Mexican revolution, and was reopened, circa 1860. Development is by numerous shallow shafts. No. 8 shaft, with two compartments, is 214′ deep, carrying stopes on 8 drifts. No. 9, a 2-compartment shaft, started 1906, is to be sunk to 300′. A new shaft, of 1,000′ projected depth, was started 1907. Equipment includes a 100-ton concentrator, having rolls and Wilfley tables.

Company is exceedingly secretive, for reasons best known to the management, and is supposed to be closely allied with the Amalgamated Copper Co. Production, 1907, is estimated at 2,500,000 lbs. fine copper, largely secured by leasers.

COMPAÑIA MINERA SANTA ROSA. **CHILE.**

Office: Santiago de Chile. Mine office: Arqueros, Coquimbo, Chile. Organized May 29, 1905, under laws of Chile, with capitalization 200,000 pesos, shares 1,000 pesos par.

SANTA ROSA COPPER CO. **ARIZONA.**

Dead. Lands sold, circa 1905, to Detroit Copper Mining Co., of Arizona. Formerly at Metcalf, Graham Co., Ariz. Described Vol. V.

SANTA ROSA DEVELOPMENT CO. **MEXICO.**

Dead. Lands sold, 1907, to Cabullona Development Co. Formerly at Fronteras, Arizpe, Sonora, Mex. Described Vol. VI.

SANTA ROSA DE MAZAPIL MINING CO. **MEXICO.**

Letter returned unclaimed from former office, 20 Broad St., New York,

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N. Y. Mine office: Mazapil, Zacatecas, Mex. Has gold, silver, lead and copper ores, opened by shafts and a 1,500′ tunnel. Presumably idle.

SANTA ROSALÍA MINING CO. **MEXICO.**

Mine office: Tejupilco, Temascaltepec, Mexico, Mex. Property carries auriferous and argentiferous copper and lead ores, and has steam power, employing, 1906, circa 40 men.

SANTIAGO CONSOLIDATED MINING, MILLING & TUNNEL CO. **COLORADO.**

Mine office: Georgetown, Clear Creek Co., Colo. S. K. Davis, superintendent, at last accounts. Has gold, silver, lead and copper ores, and a 75-ton concentrator.

SANTIAGO COPPER MINING CO. **CUBA.**

Dead. Formerly at El Cobre, Santiago de Cuba.

SANTIAGO MINING CO. **MEXICO.**

Office: 517 Francis St., St. Joseph, Mo. Mine office: Parral, Hidalgo, Chihuahua, Mex. Geo. J. Greene, president; Geo. Roche, vice-president; T. G. Travis, secretary and treasurer; Nat P. Wilson, general manager; preceding officers and Henry Roach, directors. Organized March 7, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Annual meeting, third Thursday in February.

Lands, 6 claims, area 79 acres; also 1 claim, area 20 acres, in Otero county, New Mexico. Chihuahua lands show limestone and porphyry, carrying 6 ore bodies, said to be fissure veins of 12′ average width, giving average assays of 3.5% copper, 15% lead, 22 to 25 oz. silver and $6 gold per ton, from oxide and sulphide ores. Has 7 shafts, of 55′ to 150′ depth, with total of 755′ of workings, estimated to show 150,000 tons of ore blocked out for stoping, which is excessive. Has a 250-h. p. electric plant, with 3 hoists, good for 1,000′ each, 7-drill air-compressor, 60x85′ machine-shop of frame and adobe, and other mine buildings. Plans building a concentrator. Employs circa 25 men.

SANTO DOMINGO GOLD & COPPER CO. **SANTO DOMINGO.**

Mine office: San Cristobal, Santo Domingo. Sly Dorsey, vice-president; Con O'Connor, secretary; E. F. Buchanan, treasurer. Organized Sept. 17, 1906, under laws of Maine, with capitalization $64,000,000, shares $100 par.

Lands claimed are alleged mining rights to 400 square miles of the Jaina Valley, in the Province of San Cristobal, estimated, with due modesty, by the company, to carry seven billion dollars' worth of gold, to be had for merely digging it out. Notwithstanding the alleged possession of $7,000,000,000 worth of gold, the property was bought for $50,000 and the company spent only $40,000 for development and equipment, never employing more than 10 men.

A. O. Brown & Co., stock brokers of New York, voluntarily redeemed a considerable portion of the stock of this company placed by them, with the explanation that they had learned that the property was not as represented, and were considered entitled to commendation for an honest act, but this firm failed, under discreditable circumstances, a few months later, and apparently Brown & Co. refunded but part of the money, as shareholders instituted a suit, circa October, 1908, for restitution of $543,000, alleged to have been paid for stock. Peter Whitney, former president of the company, apparently was not responsible for the company's misrepresentations, and is said to be himself a sufferer, but apparently Whitney was mixed up very closely with some of the peculiar transactions of A. O. Brown & Co. The company is a swindle, and, to all practical intents and purposes, is dead.

SANTO DOMINGO SYNDICATE. **SANTO DOMINGO & HAITI.**

Office: care of E. A. Blanton, Jr., general manager, The Bourse, Philadelphia, Pa. Mine office: San Cristobal, Santo Domingo. Capt. J. R. De Lamar,

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E. P. Earle, G. P. Lindermann, L. H. Taylor, Jr., W. T. White, Geo. R. Radford, T. C. Hall and E. T. Lavino, directors. Organized under laws of New Jersey, with capitalization $100,000.

Lands, 100 square miles, in the republics of Haiti and Santo Domingo. The San Francisco Hills mine, near San Cristobal, is said by Mr. Blanton to show a body of chalcopyrite of 500′ width, carrying 5 to 20% copper, and $1 to $12.50 gold per ton. A 42″ gauge railway was under construction early 1906. Presumably idle.

SOCIÉTÉ ANONYME DES MINES ET USINES DE SANTOMERA. SPAIN.

Office: 27 Rue Mogador, Paris, France. Mine office: Santomera, Murcia, Spain. A. Foques-Duparc, J. Foques-Duparc, J. L. Baille and R. Canat de Chizy, directors. Organized May 2, 1905, under laws of France, with capitalization 300,000 francs, shares 500 francs par. Was endeavoring, July, 1908, to reorganize, with capitalization 1,100,000 francs, shares 100 francs par.

SANTO NIÑO MINING CO. MEXICO.

Dead. Formerly at Symón, San Juan de Guadalupe, Durango, Mex.

SAN XAVIER COPPER CO. MEXICO.

Office: care of Wm. Foster, secretary, Tucson, Ariz. Mine office: San Javier, Hermosillo, Sonora, Mex. C. C. Rountree, president; George Grunig, vice-president; Max Muller, treasurer. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Mexican incorporation is the Compañía Minera de Cerro Verde, S. A. Lands, 1,440 pertenencias, 80 miles east of La Colorada, also 300 pertenencias lying 24 miles to the southward, and circa 4 miles north of the Yaqui river. Presumably idle.

SAPHO MINING CO. NEVADA.

Mine office: Ely, White Pine Co., Nev. John Webber, superintendent. Capitalization $1,000,000, shares $1 par. Development is by a tunnel, having a back of 250′ at last accounts, said to show auriferous oxidized ores assaying 6 to 22% copper, with a paystreak carrying about $30 gold per ton. Has steam power.

SARATOGA DEVELOPMENT CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. John Owen, manager. Has gold, silver and copper ores, with steam power. Was developing, with circa 15 men, at last accounts.

SARATOGA PYRITIC SMELTING CO. COLORADO.

Dead. Formerly at Ironton, Ouray Co., Colo. Described Vol. VI.

SARATOGA SMELTING & REFINING CO. COLORADO.

Dead. Succeeded, 1903, by Continental Smelting & Refining Co. Formerly at Ironton, Ouray Co., Colo.

SASAGATINI MINE. JAPAN.

Mine office: Hatazako-mura, Kanoashi-gori, Iwami, Japan. Property carries slightly argentiferous chalcopyrite, associated with sphalerite, galena and arsenopyrite, with quartz and limestone gangue, in numerous contact veins ranging up to 50′ in width. Production has been as follows: 274,412 lbs. fine copper and 62,961 momme silver in 1900; 324,183 lbs. copper in 1903; 308,358 lbs. copper and 109,215 momme silver in 1907.

SASCO SMELTER. ARIZONA.

Owned by Southern Arizona Smelting Co.

SATER COPPER CO. NEW MEXICO.

Dead. Lands sold under foreclosure Dec. 12, 1906. Practically succeeded by Fort Pitt Copper Co. Formerly at Kenton, Oklahoma, with lands in Union Co., N. M. Fully described Vol. VI.

SAUK RIVER MINING CO. WASHINGTON.

Letter returned unclaimed from former office, 327 Pacific Blk., Seattle,

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Wash. Mine office: Darrington, Snohomish Co., Wash. Harold G. Price, president and treasurer; Wm. Van Waters, secretary. Organized 1898, under laws of Washington, with capitalization $200,000, shares 50 cents par. Lands, 9 claims, area 180 acres, in three groups, carrying 3 veins of auriferous and argentiferous copper ore. Vein at Blue Bird group is claimed to be 98′ wide, between porphyry and slate, carrying 3 paystreaks, of 2′, 4′ and 6′, balance of vein being a low-grade self-fluxing concentrating ore. Idle several years and apparently moribund.

SAULT GRAY COPPER CO. **ONTARIO.**

Dead. Absorbed, circa 1903, by Copper Queen Mining Co., Ltd. Formerly at Bruce Mines, Algoma, Ont.

SAULT PROSPECTING & DEVELOPMENT CO. **ONTARIO.**

Dead. Succeeded, circa 1903, by Copper Queen Mining Co., Ltd. Formerly at Bruce Mines, Algoma, Ont.

SAUX HEAD COPPER MINING CO., LTD. **MICHIGAN.**

Office: 36 Home Bank Bldg., Detroit, Mich. Mine office: Marquette, Marquette Co., Mich. Employs 8 men. Chas. A. Stringer, president and general manager; Frank M. Moore, vice-president; J. G. Krieg, secretary; Chas. M. Miller, treasurer; preceding officers and Geo. R. Purdon, directors. Organized Aug. 13, 1902, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Lands, 360 acres, freehold, in the Sauk's Head district, northwest of Marquette, 2 miles from Lake Superior & Ishpeming railway, showing 2 ore bodies, said by company to occur as impregnations in granite and diorite, but stated by other authorities to be gash veins in granite, these ranging 4′ to 8′ in average width, giving assays of 1 to 4% copper and $2 to $200 gold per ton. Has shafts of 50′ and 170′, and tunnels of 30′, 40′ and 70′. Has steam power with 2 donkey hoists, a 5-drill Ingersoll air-compressor and 4 power drills. Has 7 buildings, including a 15x20′ machine-shop, store, office and dwellings. Idle.

SAVAGE GOLD & COPPER CO. **ARIZONA.**

Office: 625 Noble St., Chicago, Ills. Operating office: Douglas, Ariz. Mine office: Paradise, Cochise Co., Ariz. F. M. Wajtalewicz, president; J. A. Lewandowski, vice-president; P. Dryzmalski, secretary; A. P. Behnke, treasurer; preceding officers, J. Kosinski, A. Spetz, J. Z. Wierzchowski, A. Czajor, J. C. Hess, Jr., and Albert Hindera, directors; Jas. Reay, general manager. Organized Jan. 6, 1904, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Annual meeting, first Tuesday in November.

Lands, 53 claims, area circa 1,000 acres, in the California district, lying in the eastern foothills of the Chiricahua Mountains, next the San Simon valley, 10 miles from Rodeo, the nearest railroad station. The property shows 5 irregular ore bodies, apparently lenses, of which 4, under development, are of 2′ to 36′ width, giving assays of 5% copper, 1% lead and from nothing to 30 oz. silver per ton, lead values being from occasional galena.

Development is by 5 shafts, mainly shallow, the 710′ Snowball incline shaft showing an ore body ranging up to 23′ in width. There also is a 350′ tunnel, with circa 3,000′ of workings.

Equipment includes a 60-h. p. Otto gasoline engine and a 75-kw. electric generator, 2 motors, an electric hoist and electric drills.

A much-talked-of 50-ton smelter failed to materialize, though it was said, at one time, that the material therefor was on the ground. Company was said, January, 1908, to plan beginning shipments to the Copper Queen smelter.

SAVANIC MINE. **ARIZONA.**

Office: care of Col. H. L. Pickett, St. George, Utah. Is a partly developed mine, in the northern part of Mohave county, Arizona, nearest town being

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St. George. Has shipped 14 carloads of ore to Salt Lake smelters, averaging 39% copper, this being hauled 140 miles by wagon and 300 miles by rail. Property is promising, but almost inaccessible, at present. Idle several years.

SAVANNA COPPER CO. **NEW MEXICO.**

Office: 616 Lonsdale Bldg., Duluth, Minn. Mine office: Tyrone, Grant Co., N. M. Works office: Silver City, Grant Co., N. M. H. B. Hovland, general manager; E. A. Wayne, superintendent. Organized circa September, 1908, under laws of Arizona, with capitalization $2,000,000, shares $10 par, as a merger of the Copper Gulf and Comanche companies, properties of which are separately described, under their respective titles, in this work. Property considered valuable and management good.

SAWATARI MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

SCANLAND MINE. **ARIZONA.**

Office and mine: Paradise, Cochise Co., Ariz. F. S. Douglas, general manager; L. H. Scanland, mine superintendent and owner. Lands, 12 claims, unpatented, area 240 acres, also a 10-acre millsite, in the California district, showing limestone, quartzite and porphyry, with 4 ore bodies, of 4′ to 30′ width, of which one, under development, traceable circa 4,500′, carries some oxides and carbonates, but mainly chalcopyrite, galena and sphalerite, estimated to average 5% copper, 20% lead and 23% zinc, with a trace of gold. Development is by a 175′ shaft and 450′ tunnel, with circa 700′ of workings. Idle, except for annual assessment work.

SCANTIC GOLD MINING & MILLING CO. **COLORADO & MEXICO.**

Office: 206 Continental Bldg., St. Louis, Mo. Mine offices: White Cross, Hinsdale Co., Colo., and Charcas, Moctezuma, San Luis Potosí, Mex. Henry Leschen, president; A. D. Grant, secretary. W. F. Smith, superintendent of Colorado property, which has steam power, and is developing ores of gold, silver, copper and lead. Joseph T. Murphy, manager of Mexican property, which includes the San Sebastian and extensions, carrying silver, lead and copper, equipped with a 25-ton concentrator.

KUPFERKIESBERGBAU SCHATTBERG. **AUSTRIA.**

Mine office: Schattberg, Tyrol, Austria. Was a very small copper producer at last accounts.

GEWERKSCHAFT SCHLESISCHE NICKELWERKE. **GERMANY.**

Dead. Formerly at Gläsendorf, Schlesien, Germany. Described Vol. VI.

SCHULL COPPER MINING CO., LTD. **IRELAND.**

Office: 16 Great Winchester St., London, E. C., Eng. Mine office: Schull, County Cork, Ire. Thos. V. Anthony, W. F. Ladenburg, and Sir Thos. Selby Tancred, Bart., directors; W. S. Pearless, mine manager; F. C. Vernon, secretary. Organized Apr. 6, 1906, under laws of Great Britain, with capitalization £9,000, in 5,000 ordinary shares of £1 par, and 40,000 deferred shares of 2s. par. Property is a 60-year mining license, dated Dec. 25, 1902, covering lands on Coney Island and Long Island, said to have been bought for a consideration of £3,500. Is not regarded favorably.

SCHUYLER COPPER CO. **PENNSYLVANIA.**

Mine office: Phoenixville, Chester Co., Pa. Property is the Jones mine, in Caernarvon township, Berks county, Pennsylvania. Company operated the mine, 1869-1878, and built a small smelter. Idle since 1878.

SCHULYKILL COPPER CO. **ARIZONA.**

Dead. Formerly at Chloride, Mohave Co., Ariz.

SCOTIA MINING & MILLING CO. **WASHINGTON.**

Dead. Formerly at Bossburg, Stevens Co., Wash.

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SCOTTISH-AUSTRALIAN COPPER CORPORATION, LTD.

Office: Guernsey, Great Britain. Organized Jan. 14, 1904, under laws of Guernsey, with capitalization £200,000, shares £1 par. Location of lands, if any, unknown. Not regarded favorably.

SCOTTISH-CAUCASIAN COPPER SYNDICATE, LTD.

Dead. Formerly had an office at 55 West Regent St., Glasgow, Scotland.

SCOTTISH CHIEF MINE. **UTAH.**

Mine office: Park City, Summit Co., Utah. Wm. J. Lawrence, manager. Mine, opened by a 325′ shaft, shows mainly silver-lead ores, assaying up to 60% lead and 21 oz. silver per ton, but has made several small shipments of ore averaging circa 14% copper and 20 to 50 oz. silver per ton, and has ores assaying 7.5% copper, 6% lead, 32 oz. silver and $1.80 gold per ton.

SCOTTISH COPPER MINES SYNDICATE OF BRITISH COLUMBIA, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Kamloops, Yale district, B. C.

SEABOARD COPPER CO. **VIRGINIA.**

Office: 77 South Market St., Boston, Mass. Mine office: Virgilina, Halifax Co., Va. M. A. Packard, president; H. J. Sampson, vice-president; Edward L. Pond, secretary; C. C. Merritt, treasurer; L. W. Tucker, general manager. Organized July, 1902, under laws of New Jersey, with capitalization $300,000, shares $1 par. Lands, 135 acres, including the Dorothy and Bailey mines, in the Virgilina district, 3 miles from the Southern Railroad, showing slate, traversed by a fissure vein of 8′ estimated width, carrying cuprite, malachite and azurite in the upper part, with bornite below, giving estimated values of 3 to 4% copper, with combined gold and silver values of $1 to $1.20 per ton. Development is by shafts of 30′, 265′ and 115′, and by 2 tunnels, of 165′ each, with a total of 840′ of underground workings, estimated to show 40,000 tons of ore, with 10,000 tons blocked out for stoping, and with 3,000 tons on the dumps, ready for milling. Equipment includes a 275-h. p. steam plant, with a 25-h. p. Lidgerwood hoist, good for 500′ depth, and a 5-drill Ingersoll-Sergeant air-compressor. Buildings include an office, bunk-house and engine-house. Idle several years.

SEAGER-CORYELL GOLD & SILVER MINING CO., LTD. **IDAHO.**

Office: Phillipsburg, N. J. Mine office: Custer, Custer Co., Idaho. John Eilenberg, president; Reginald Coryell, secretary and general manager. Organized January, 1900, under laws of New Jersey, with capitalization $100,000, shares $1 par. Lands, 9 claims, area 170 acres, in the Yankee Fork district, showing several veins, with about 1,500′ of underground openings, one claim showing melaconite, azurite, malachite and chalcopyrite, assaying 3% copper, with fair gold and silver values. Idle several years.

SEA ISLAND COPPER CO. **ALASKA.**

Mine office: Kasaan, Alaska. F. A. Barrette, superintendent. Lands, 6 claims, about 1 mile from the Rush-Brown property, on Kasaan Bay, showing chalcopyrite assaying up to 20% copper.

SEARCHLIGHT COPPER-GOLD MINING CO. **NEVADA.**

Office: 402 Stimson Bldg., Los Angeles, Cal. Mine office: Searchlight, Lincoln Co., Nev. Samuel T. Graham, president; R. P. Pierce, vice-president; John G. Davis, treasurer; V. A. Brewer, secretary; preceding officers, Robt. D. Reed, J. W. Cornick and C. Rauber, directors; John Howe, superintendent. Organized Nov. 27, 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $880,000. Annual meeting, first Monday in November.

Lands, 7 claims, surveyed for patent, area 140 acres, showing 6 ore bodies, in granite and porphyry, of which 3, under development, of 6″ to 5′ width, carry oxidized and sulphide ores estimated to average 12.8% copper and up to

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$140 gold per ton. Development is by the 100′ Oom Paul shaft, and by tunnels of 20′, 65′ and 100′. Hand power is employed. Old management did badly by the property, but new directorate seems an improvement.

SEARCHLIGHT GOLD & COPPER CO. **ARIZONA.**

Dead. Property was 11 claims and water rights, in the Wrightson district, circa 2 miles west of Patagonia, on the Sonora Railroad. Lands showed a mineralized dyke of 250′ claimed width, with a capping of hematite and manganese, opened by three 40′ shafts, said to give ore assaying $4 to $70 per ton in combined gold and silver values. M. S. Moore was superintendent. Formerly at Patagonia, Santa Cruz Co., Ariz.

SEATCN MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Idaho Springs, Clear Creek Co., Colo.

SEATTLE-ALASKA COPPER CO. **ALASKA.**

Office: Seattle, Wash. Mine office: Latouche, Latouche Island, Alaska. Jas. Bjorn, secretary, treasurer and general manager. Capitalization $1,000,000, shares $1 par. Lands, 10 claims, with a water power available, said to give a fair surface showing of argentiferous and auriferous chalcopyrite, having a 65′ shaft in ore. Has steam power and employs circa 15 men.

SEATTLE-BOSTON COPPER CO. **WASHINGTON.**

Office: 419 Alaska Bldg., Seattle, Wash. Mine office: Skyhomish, King Co., Wash. Chas. E. Crane, president and general manager; Dr. F. A. Churchill, vice-president; Geo. H. Law, secretary; Martin B. Crane, treasurer; preceding officers and A. M. Brooks, directors; A. J. Walters, superintendent; Jas. Cosgrove, mine superintendent. Organized Sept. 19, 1905, under laws of Washington, with capitalization $2,000,000, shares $1 par, divided into $600,000 preferred 8% stock and $1,400,000 common stock, latter issued in payment for the property, and held in escrow at last accounts, 1906.

Company apparently controls the Dutch Miller Mining & Smelting Co., through lease, and creditors of latter asked, 1907, for a receiver, alleging mismanagement on the part of officers of the Seattle-Boston Copper Co.

Lands, 20 claims, area 400 acres, also a 120-acre millsite, in the Burns district, 11 miles south of the Great Northern Railway. A water-right, owned by the company, is claimed to be capable of developing 40,000 h. p. Property shows syenite, carrying 12 fissure veins, of which 3, under development, are reported as of 18′ average width, opened by tunnels of 70′, 35′ and 60′, estimated to show 20,000 tons of ore, with 5,000 tons blocked out for stoping, which figures are considered excessive, in view of the extremely limited development secured, with 1,500 tons of ore on the dump, formerly estimated to carry average values of 16% copper, 3% zinc, 6 oz. silver and $3 gold per ton, which figures are considered excessive, but ore was said, February, 1907, to average only about 7% copper and 4 to 11 oz. silver per ton, with small gold values, which figures probably are amply high.

Improvements include 5 small mine buildings, and company was said, 1906, to have ordered a 500-ton Bleichert aërial tramway, a 250-kw. Westinghouse electric generator, a 100-h. p. hoist and a 10-drill air-compressor, but none of this machinery seems to have materialized. Company also reported that it was building a 6½-mile private line, to be known as the Seattle-Boston Railroad, to have a 200-h. p. Westinghouse electric locomotive, but apparently was unable to sell sufficient stock to build the road. The property may be valuable, as claimed, but the company cannot be regarded favorably, in the light of excessive claims made at the time when stock was being sold. Presumably idle.

SEATTLE GOLD & COPPER MINING CO.

Dead. Formerly had an office at Seattle, Wash.

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SECRET COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Illewong, N. S. W., Australia. Organized December, 1907, under laws of New South Wales, with capitalization £1,200, shares £10 par.

SEDALIA COPPER CO. **COLORADO.**

Mine office: Salida, Chaffee Co., Colo. Capitalization is 90,000 shares, of which 75,000 shares are under option, and in escrow, at $2 per share, until May, 1909. Lands are leased for 10 years to Salida Gold & Copper Mining Co. Option presumably is to Shawmut Consolidated Copper Co.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE DU SEIBAL. **BRAZIL.**

Office: 40 Rue de Chabrol, Paris, France. Mine office: Camaquam, Cacapava, Rio Grande do Sul, Brazil. Al. Fluert, president. Organized May 5, 1903, under laws of France, with capitalization 415,000 francs, shares 100 francs par. Property, near the Camaquam mine, carries argentiferous and auriferous copper ore, and associated minerals.

SELATI COPPER SYNDICATE, LTD. **TRANSVAAL.**

Letter returned unclaimed from former office, Johannesburg, Transvaal. Organized August, 1907, under laws of Transvaal, with capitalization £3,000. Location of lands, if any, unknown. Apparently moribund.

SELBY SMELTING & LEAD CO. **CALIFORNIA.**

Office: Merchants Exchange Bldg., San Francisco, Cal. Works office: Selby, Contra Costa Co., Cal. A. J. Ralston, president; Eugene E. Braden, vice-president and general manager; H. B. Underhill, Jr., secretary; Alfred von ver Ropp, superintendent. Organized 1875, under laws of California, and is controlled, through stock ownership, secured 1905, by American Smelters Securities Co., a subsidiary corporation of the American Smelting & Refining Co. The works represent an investment of about $4,000,000.

Property consists of an extensive smelting and refining plant, equipped with steam and electric power, at Vallejo Junction, near Carquinez Strait, the site of the smelter being somewhat circumscribed. Ore is received by rail and water, the works drawing supplies from all of the Pacific states, with a greater portion of the ore supply coming from Nevada and California.

The works include a 400-ton smelter, with both lead and copper stacks, a 200-ton lead refinery, a refinery for parting gold and silver, and a plant for the manufacture of bluestone. Fuel is coal, coke and petroleum.

An injunction was secured, 1907, by the authorities of Solano county, because of damage to agricultural interests from smelter smoke, which the company endeavored to do away with, by installing a fume precipitation plant, on the Cottrell system, said to have been used successfully elsewhere, which was planned to eliminate dust and carbon and sulphur compounds, including sulphurous acid and sulphur anhydride, this process including the installation of a sulphuric acid plant. Notwithstanding the attempts of the company to do away with fumes, the efforts were not entirely successful, and the works were closed, August, 1908, by a permanent injunction, and apparently are out of business permanently, to the great detriment of the mining interests of California and Nevada.

SELKIRK MOTHER-LODE COPPER MINES, LTD. **BRITISH COLUMBIA.**

Dead. Formerly had an office at 5 Laurence Pountney Hill, London, E. C., Eng.

SEMINOLE COPPER MINING CO. **GEORGIA.**

Dead. Property sold, 1904, by the sheriff, to Carl Henrich, for $33,000. Practically succeeded by Lincoln Gold & Copper Mining Co. Formerly at Metasville, Wilkes Co., Ga. Fully described Vol. III.

SEMINOLE MINE. **GEORGIA.**

Owned by Lincoln Gold & Copper Mining Co.

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SEMINOLE MINING CO. **UTAH.**

Office: 208-69 East Third South St., Salt Lake City, Utah. Mine office: Callao, Juab Co., Utah. Clyde H. Wilson, president; W. F. Wilson, vice-president; Frank L. Wilson, secretary and treasurer; preceding officers, W. R. Wilson and N. R. Wilson, directors. Organized, circa 1907, under laws of Utah, with capitalization $125,000, shares 25 cents par. Lands, in the Clifton district, near the Lucy L. Mining & Milling Co., are said to show ores carrying copper, silver, gold, lead, tin and nickel.

SENATOR MINES CO. **COLORADO.**

Office: 1209 Association Bldg., Chicago, Ills. Mine office: Black Hawk, Gilpin Co., Colo. Chas. Kingsley Ray, president; John G. McConnell, vice-president; Dr. M. H. Brown, secretary; W. J. Blake, superintendent; preceding officers and H. A. Hicks, directors. Organized 1906, under laws of Colorado, with capitalization $1,500,000, shares $1 par. Lands, 2 claims, having a 550′ shaft with about 2,000′ of workings, showing veins of 5′ to 7′ width, with a 2′ paystreak, carrying mainly ore of concentrating grade, with values in silver, copper and gold, mainly the latter. Has a hoist good for 1,500′, and plans an electric power installation.

SENECA MINING CO. **MICHIGAN.**

Office: 301-199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Allouez, Keweenaw Co., Mich. Albert S. Bigelow, president; Wm. J. Ladd, secretary and treasurer; Hon. Norman W. Haire, general manager; S. Russell Smith, superintendent. Organized circa 1866, under laws of Michigan, with capitalization $500,000, shares $25 par.

Lands originally were 3,240 acres, reduced, 1880, by setting off the Ahmeek, to 1,880 acres. The tract, which is just north of the Mohawk and Ahmeek mines, is very irregular and somewhat awkward in outline, heavily covered with drift, and a considerable portion is swampy. Lands carry the Calumet, Kearsarge and Allouez conglomerates, and the Osceola and Kearsarge amygdaloidal beds, dependence being placed mainly on the latter, of which the tract carries about 1¾ miles of the strike, the bed outcropping on the northeastern corner of the lands. Property is served by the Keweenaw Central Railway.

A little exploratory work was done, 1865, on the Kearsarge conglomerate, and again, 1880, when 2 shafts were sunk thereon, to a depth of circa 200′ each, but work was abandoned, and this part of the tract was set off, as the Ahmeek.

Diamond drilling, begun 1907, will require several seasons to give a complete cross-section of the property, operations having been started on the northwestern part of the tract. The diamond drill borings are said to have given good cores, and some trenching was done, a test-pit being bottomed, December, 1907, in the ledge.

No. 1 shaft, started July, 1908, is located about 3,000′ north of No. 1 shaft of the Gratiot mine, and is of 3 compartment size, sunk 60′ in the footwall of the Kearsarge amygdaloid, which, where exposed, carries epidote. This shaft, circa 175′ deep at the end of 1908, is concreted through 14′ of overburden, with an anchorage of 44′ in the rock, giving 58′ of concrete, from the collar, and is perfectly water-tight against surface seepage. The shaft-rockhouse has an 18x24″ crusher.

There is room on the tract for a second shaft, on the outcrop of the Kearsarge lode, but this amygdaloidal bed must be reached, on the balance of the property, by vertical shafts, unless adjoining lands carrying the outcrop are secured.

Equipment includes a small power plant building having a 15-drill air-

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compressor, a Lake Shore duplex hoist, good for 1,500′ depth, and a locomotive firebox boiler. Buildings include a boarding-house and bunk-house. Property considered very promising.

MINA DA SENZA. **ANGOLA.**

Mine office: Senza do Itombe, Angola. Lands, 2 kilometers from Senza do Itombe and 192 kilometers from Loanda, show a 5-meter bed of calcareous sandstone, dipping at about 20°, said to carry about 5% copper. Idle at last accounts.

SOCIEDAD MINERA LA SERENA. **CHILE.**

Mine office: Higuera, La Serena, Coquimbo, Chile. Presumably idle.

SERRANO GOLD & COPPER MINING CO. **MEXICO.**

Office: Main St., Danville, Pa. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. J. X. Grier, president; C. E. Yorks, secretary; M. I. Low, treasurer; D. H. Collins, general manager. Organized February, 1903, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 112 pertenencias, south of Cananea, carrying auriferous copper ores. Idle.

SERRAZANO COPPER CO., LTD. **ITALY.**

Dead. Was a Guernsey promotion, formed to operate in Italy.

SEVEN DEVILS MINING & DEVELOPMENT CO. **IDAHO.**

Dead. Formerly at Weiser, Washington Co., Idaho.

SEVILLE SULPHUR & COPPER CO., LTD. **SPAIN.**

Office: 30 George Square, Glasgow, Scotland. Operating office: Patio de Banderas, Sevilla, Spain. Mine office: Aznalcóllar, Sevilla, Spain. Jas. Pipe, chairman; John Munro, secretary; John S. Macdougall, general manager; Robert Andrew, mine manager. Organized August, 1877, under laws of Great Britain, with capitalization £120,000, shares £10 par.

Lands, at the eastern end of the Sierra Morena, in the province of Sevilla, carry iron pyrites having good values in both copper and silver. Property has been worked, by present company, for many years, with marked success. Production was 2,867,200 lbs. fine copper in 1905; 4,569,600 lbs. in 1906, and 5,152,000 lbs. in 1907.

SEYMOUR COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Office: 41 John Dalton St., Manchester, Eng. H. J. Challoner, secretary. Organized June 25, 1900, under laws of Great Britain, with capitalization £2,000, shares 5s. par, to acquire copper properties at Seymour Narrows, Vancouver Island, British Columbia. Moribund.

SHAFTER MINING CO. **COLORADO.**

Office: 1 Broadway, New York, N. Y. Mine office: Idaho Springs, Clear Creek Co., Idaho. Employs 20 men. Thos. Peyton, president; M. S. Peyton, vice-president; Chas. D. Ross, secretary and treasurer; Arthur H. Roller, general manager; Edmund Leet, mine superintendent; F. L. Stout, mill superintendent. Organized 1880, under laws of New York, with capitalization $100,000, shares $100 par.

Lands carry auriferous and argentiferous copper ores, values apparently being mainly in gold. There is an 80-ton mill having 20 gravity stamps, and equipment includes steam and electric power.

SHAMBLÜRGSKI WORKS. **RUSSIA.**

Office and works: Tiflis, Russia. A. A. Broli, owner and manager. Property includes sundry small copper mines and a small smelter in Transcaucasia. Produced about 150,000 lbs. fine copper yearly, at last accounts.

SHAMROCK COPPER CO. **NEW MEXICO.**

Letter returned unclaimed from former mine office, Nogal, Lincoln Co., N. M. W. A. McIvers, who died May 8, 1908, was manager. Lands, 7 miles

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from a railroad, show a contact vein of 27′ estimated width, between porphyry and quartzite, with a paystreak of about 4′ average width, carrying cuprite, with limestone gangue, giving assays of 20% copper, 8 oz. silver and $4.80 gold per ton, the porphyry wall carrying copper impregnations. Idle and apparently moribund.

SHANGO COPPER MINING SYNDICATE. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Has a 72′ shaft. Presumably idle.

SHANNON COPPER CO. **ARIZONA.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. Employs 900 men. Nathan L. Amster, president; A. B. Clough, vice-president; David A. Ellis, secretary; R. Townsend McKeever, treasurer; preceding officers, Wm. A. Paine, B. Hochschild, Col. Chas. Hayden, Archibald McNeil and Jas. Virdin, directors; C. R. Jeffers, assistant secretary and treasurer; J. W. Bennie, general manager; H. H. Dyer, superintendent; Rollo B. Watson, engineer.

Organized Nov. 13, 1899, under laws of Delaware, with capitalization $3,000,000, shares $10 par. Bonds, originally $600,000, at 7%, reduced, Sept. 1, 1908, to $179,000. Company has a sinking fund of $60,000 annually, for bond redemption. Boston Safe Deposit & Trust Co., transfer agent. National Shawmut Bank, Boston, registrar. Has 4,620 shareholders. Shares are listed on the Boston Stock Exchange. Annual meeting, third Wednesday in November.

The company controls the Coronado Mining Co., through ownership of 51% of stock issue, and held the property 4 years, under a lease expiring Oct. 8, 1908. Company was said, 1906, to have taken a $1,500,000 bond and lease on the property of the Copper Belle Mining Co., of Gleason, Cochise Co., Arizona, which property, sold, 1907, was bid in by interests closely connected with the Shannon.

Lands, 43 claims, area circa 400 acres, at Metcalf, in the Greenlee district. Company formerly held 400 acres in mill and smelter sites, but a 300-acre millsite, adjoining the smelter, was sold, 1907, to Arizona Copper Co., Ltd. The Shannon also owns limestone claims, on the Frisco river. The company has a side-line agreement with the Arizona Copper Co., Ltd., by which extra-lateral rights are mutually waived, obviating all possibility of future litigation over apexes.

Ore occurs between limestone and porphyry, under heavy gossans of fairly good hematite, the oxidized ores favoring the limestone, while ores of the porphyry side are mainly silicious sulphides, latter predominating. The ore occurs in very irregular deposits, some up to 300′ in the greatest dimension. Many of the ore bodies are large, and while the ore is low in grade, and bunchy, the quantity is very great, and it is probable that the ore bodies continue considerably deeper than once thought, as it was believed, until recently, that ore did not continue workable below the 400′ level, below which some ore of 4% copper tenor was found, 1908. The mine shows oxide and carbonate ores, of 4 to 10% copper tenor, in the upper levels, and sulphide ores of 3 to 7% tenor in the lower workings, the sulphide ores being mainly chalcopyrite, with a little chalcocite. The mine, as a whole, is deficient in sulphide ores, and about one-third of the production is silicious ore, too low in grade to smelt, yet too highly oxidized to concentrate well.

Development is by shafts, tunnels and open pits, underground workings reaching a depth of 1,100′ below the crest of the mountain. The mine has about 10 miles of workings, with considerable ore reserves, the Little Coronado mine showing ore of 3 to 5% copper tenor, while the Hanson tunnel is said

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to show an ore body of 180′ width, averaging up to 6% copper. Considerable trouble has been had from caving ground, and it was planned, 1906, giving a trial to the caving system of mining. The property is timbered with 12x12″ square sets. In addition to underground workings, there are 4 open pits, giving cheap extraction, some of the open-cuts showing iron ore, carrying an average of 2.5% copper, available for fluxing silicious sulphides produced from underground workings. Extraction is by 2 double-track working tunnels, of which one is7x8′ in size, connecting with a 1,400′ double-track incline tram, leading to the Coronado Railroad, with 6 ore-bins at either end, the tramway having an incline of 36°. The incline has 10-ton cars, operated in counterbalance, with a retarding engine, the steel cable passing around a 13′ double drum at the top, which runs a small air-compressor that generates power, while serving as an auxiliary brake.

Petroleum has been subsituted for coal, wherever possible, about the mine and works. The company maintains general stores at Morenci and Clifton, and owns a number of dwellings for employes.

Freight charges are about 35 cents per ton on ore from the mine to the mill, and the company plans building a 10-mile standand gauge railroad, to be known as the Shannon & Arizona, to handle its own ore. The surveys have been made for this new high-line railway, which it is planned to complete at a cost of $400,000, with an estimated saving of about $80,000 yearly, on ore transportation, the company planning to issue bonds and keep the stock of the railway. The new line, in addition to the saving in freight charges, will give immunity from the annual floods, which now cause yearly suspension of shipments, for indefinite periods, with consequent heavy damage. The company also is said to have secured a controlling interest, 1908, in the Clifton Northern Railway.

The concentrator, on the San Francisco river, 8 miles from the mine, is of steel, in 2 connected sections, the 64x95′ upper section having a 9x15″ Blake crusher at the ore-bin, Huntington mills and a 220′ Robins belt conveyer, trommels and jigs. The 57x144′ lower section has 33 Frue vanners, 1 Wilfley and 2 Standard tables. The 32x50′ steel power-house has two 250-h. p. Stirling water-tube boilers, and a 300-h. p. Nordberg tandem compound engine. Water is taken from wells near the river by a 600-gallon electric triplex pump. The concentrator treats about 400 tons of ore daily, this averaging 3.5 to 5.5% copper, and puts about 5 into 1, effecting a saving of about 75% of contained values. In 1906 tailings carried up to 1.2% copper, due to highly oxidized condition of ores, but tailings are being stored and may be leached later. Formerly there was much trouble from acid waters eating the iron screens, while brass or copper screens in the jigs were worn out too rapidly, by abrasion. This trouble was overcome by a simple but ingenious application of the principle of electrolysis, a low-voltage electric current being applied to the jigs, by which the screen became a cathode in the circuit. This attracted hydrogen from the water, which in turn attacked the metallic salts, and the copper freed was deposited on that portion of the screens formerly eaten away.

The smelter, at Clifton, 7 miles from the mines, designed originally for 5 furnaces, had two 350-ton water-jacket blast-furnaces, each 42x170″ at the tuyeres. These 2 furnaces were thrown into one large furnace by a new section between, built on the plan first used at the Washoe works, making a single blast furnace of 1,000 tons daily capacity, which is the largest in Arizona. Above the charging floor are 23 ore-bins, each 20x20x16′, with chutes. Fumes from the blast-furnace pass through a 10′ dust-flue to a 20x20x100′ dust-chamber with hopper bottom, discharging dust periodically into cars on a railroad track in a tunnel beneath, fumes passing from the

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dust-chamber, through a 170′ flue, to a 150′ steel smokestack. Slag losses are said to be only 0.515%. Slags are handled by an electric locomotive. The converter plant, added 1906, has 2 stands, making blister copper. The briquetting plant, for flue dust and fines, has a daily capacity of 60 tons, and there is a small sampling mill, in connection with the smelter.

A 60x80′ powerhouse, of steel on stone foundations, has a 300-h. p. tandem compound condensing engine, direct-connected to blowers, and converter blast is supplied by a 250-h. p. Nordberg air-compressor.

Production has been as follows: 11,899,920 lbs. fine copper in 1904; 11,027,453 lbs. in 1905; 11,892,960 lbs. in 1906; 10,874,619 lbs. fine copper, 35,491 oz. silver and 1,250 oz. gold in 1907. For fiscal year ending Aug. 31, 1907, production was 13,418,126 lbs. fine copper, 94,745 oz. silver and 1,257 oz. gold, from 211,857 tons of ore smelted, giving an average extraction of 48 lbs. fine copper per ton, in addition to which circa 2,600,000 lbs. fine copper were produced from 15,338 tons of custom ore smelted. For fiscal year ending Aug. 31, 1908, production was 15,207,768 lbs, fine copper, from 281,449 tons of ore smelted, giving an average extraction of 53.4 lbs. fine copper per ton, in addition to 1,458,000 lbs. fine copper produced from custom ores smelted. Production, October, 1908, was 1,636,000 lbs. fine copper. Costs, as figured by company, were 13.46 cents per pound for fiscal year 1906, 13 cents per pound for fiscal year 1907, and only 11.09 cents per pound for fiscal year 1908.

For fiscal year ending Aug. 31, 1908, receipts were $2,249,294 from copper, $63,508 from silver and $33,626 from gold, with operating expenses of $2,574,191, leaving a net profit of $88,841, compared with net profits of $695,916 for fiscal year 1907 and $333,324 for fiscal year 1906. The company ended the fiscal year 1907 with quick assets of $424,744, and current liabilities of $197,407, giving excess of quick assets of $227,337. The property is valuable and well managed, and made a better record, during the period of depression, than the average of copper producers.

SHASTA COPPER CO. **CALIFORNIA.**

Office and mine: 502 California St., Redding, Cal. J. W. Girdner, president; Simeon D. Furber, secretary; Sherman P. White, treasurer. Organized Apr. 20, 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 2 groups, including the Pit River group of 25 claims, circa 1 mile south of Heroult, showing a good gossan, and the Arizona Consolidated group, 25 claims, 4 miles from Redding, formerly worked for placer gold, showing a mineralized zone of circa 600′ width, carrying auriferous and argentiferous copper ores of low average tenor.

SHASTA COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Shasta, Shasta Co., Cal.

SHASTA GOLD & COPPER CO. **CALIFORNIA.**

Dead. Was a stock-jobbing scheme promoted by "Baron" W. E. von Johannsen. Formerly at Redding, Shasta Co., Cal. Described Vol. VI.

SHASTA-KENNETT COPPER CO. **CALIFORNIA.**

Mine office: Kennett, Shasta Co., Cal. Organized 1907, under laws of Colorado, with capitalization $2,500,000, by W. R. Girdner, M. J. Jordan and L. E. Dabold. Lands, near Kennett, have a 600′ tunnel, showing considerable bodies of low to medium grade copper ore.

SHASTA MAY BLOSSOM COPPER CO., CONSOLIDATED. **CALIFORNIA.**

Office: 6-410 Kearny St., San Francisco, Cal. Mine office: Winthrop, Shasta Co., Cal. Morton Lindley, president; Lucius A. Booth, vice-president; S. Peter, secretary and treasurer; Sumner S. Smith, superintendent. Organized 1903, under laws of Arizona, with capitalization $10,000,000, shares $1 par, as a reconstruction of Shasta May Blossom Mining & Smelting Co.

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Lands, 18 claims, area 300 acres, 800′ from holdings of the Bully Hill, in the Pittsburg or Copper City district, circa 37 miles northeast of Redding, and 16 miles from Terry, the nearest railroad point. Property shows prominent outcrops, the main outcrop being said to be traceable 500′, along a slate and rhyolite contact, carrying ore said to give assays of 6% copper and circa $11.50 per ton combined gold and silver values. Property shows 5 or more contact deposits, having porphyritic footwalls and slate hangings. The middle vein, ranging 5′ to 40′ in width, and said to be traceable 9,000′, carries chalcocite, bornite and chalcopyrite, and is opened by tunnels of 200′, 300′ and 450′, with circa 1,500′ of workings, showing a considerable body of sulphide ore, of fair average tenor. The west vein is said to be 40′ wide.

Equipment includes an air-compressor and there is a 20x90′ machine-shop and 2 other mine buildings.

SHASTA MAY BLOSSOM MINING & SMELTING CO. CALIFORNIA.

Dead. Reorganized, 1903, as Shasta May Blossom Copper Co., Consolidated. Formerly at Winthrop, Shasta Co., Cal.

SHATTUCK-ARIZONA COPPER CO. ARIZONA.

Office: Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Employs circa 60 men. Thos. Bardon, president; A. Guthrie, vice-president; Archibald M. Chisholm, secretary and treasurer; Lemuel C. Shattuck, managing director; preceding officers and Martin Pattison, directors; Jos. Walker, superintendent; Arthur Houle, consulting engineer. Organized March, 1904, under laws of Minnesota, with capitalization $3,500,000, shares $10 par. Is closely connected, in ownership and management, with Denn-Arizona Mining Co. Annual meeting, third Saturday in February.

Lands, 6 claims, patented, area 120 acres, bought for $1,022,500, lying in the northeastern portion of the Bisbee camp, about one-half mile from the original workings of the Copper Queen, and to the north of the Calumet & Arizona.

The property shows Carboniferous limestone, with intrusive porphyry dykes and a big fault, covered with a silicious iron capping of 30′ to 50′ width. Owing to the rugged typography of the lands tunnelling is impracticable, neighboring properties holding all tunnel sites, hence development is by shaft. The property has large bodies of oxidized and sulphide ores, apparently averaging 5 to 6% copper tenor, with much ore of better grade, ores carrying up to 8 oz. silver and $3 gold per ton.

Development is by a 935′ shaft, enlarged, 1906, to 3 compartments, 4′ 6″x15′ in size, connected underground with the Cuprite shaft of the Copper Queen. The shaft was damaged somewhat, late 1907, by fire, but was promptly retimbered. The mine has about 18,000′ of workings, with much ore available for extraction, principal ore bodies being developed on the 700′ and 800′ levels. In October, 1908, a large and promising ore body, of medium copper tenor, was encountered on the 500′ level, about 400′ from the shaft. The 600′ level shows a 60′ body of oxidized ore, said to average about 9% copper tenor. The 700′ level has large ore bodies developed, and the 800′ level has an ore body, in No. 1 stope, circa 100x300′ in size, this level showing much high grade ore, with considerable native copper. The 900′ level shows a considerable body of sulphide ore, of about 4% copper tenor. Mining work was begun August, 1904, and ore shipments were begun September, 1906.

Equipment includes a 600-h. p. steam plant, with 5 boilers, 9-drill Ingersoll-Sergeant, 6-drill straight-line Sullivan and 25-drill Sullivan cross-compound air-compressors. There are 6x10″ and 10x30″ auxiliary hoists, and an Allis-Chalmers duplex double-drum hoist, working under 125 lbs. steam pressure, capable of handling, continuously, a 15,000-lb. unbalanced load, at a vertical

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hoisting speed of 2,000′ per minute, having two 7′ drums, each carrying 1,500′ of 1⅛″ round steel cable. Fuel is petroleum, with a normal yearly consumption of 2,500 barrels.

There are 10 mine buildings, including a 16x24′ carpenter-shop, 15x30′ smithy, boiler-house, engine-house and warehouse, and a changing-house with accommodations for 200 men.

Property is served by the El Paso & Southwestern Railway, and has a 500-ton aërial tram of 2,300′ length, with an average grade of 18%, supported by 14 towers, of 12′ to 40′ height, built of 12″ timber, set on concrete foundations, the tram leading from the shaft to a 1,000-ton shipping bin, on the El Paso & Southwestern railway.

The smelter site, at Douglas, 26 miles from the mine, is just south of the Calumet & Arizona smelter and west of the Copper Queen works, with water supply available from artesian wells. The company has made plans for a 1,000-ton smelter with 2 blast-furnaces, to cost about $400,000, but certain strong interests in the company, being desirous that smelting be done by the Copper Queen, have held up the construction of the plant.

Production was begun Aug. 28, 1906, and ended Nov. 7, 1907, on account of the refusal of the Copper Queen to take custom ore, but daily shipments of 75 to 100 tons, to the Copper Queen smelter, were resumed Dec. 14, 1908. For a time during 1907 the mine shipped about 400 tons of ore daily, about half oxidized ores and half sulphides, former going to the Douglass smelter and latter to Globe. Production, 1907, was 5,091,542 lbs. fine copper, with considerable gold and silver values. The mine, as developed, is capable of making a monthly production of about 1,000,000 lbs. fine copper, and is a valuable property, of very great promise.

SHAW-GIBSON MINING CO. **NEW MEXICO.**

Dead. Formerly at Lordsburg, Grant Co., N. M.

SHAWMUT CONSOLIDATED COPPER CO. **COLORADO & UTAH.**

Office: 62-16 State St., Boston, Mass. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Salida, Chaffee Co., Colo. Lester C. Wead, president; Wm. Rotch, vice-president; Robt. A. Jackson, secretary; Wm. Tudor, treasurer; Herbert Williams, managing director; preceding officers, Alex. Chandler, B. W. Currier, Col. E. J. Mayo, Hon. Samuel S. Powers and John R. Thayer, directors; E. Philbrick, superintendent Colorado mine; Elmer Durfee, superintendent Utah mines.

Organized 1905, under laws of Maine, with capitalization $2,500,000, shares $5 par. Has an old outstanding bond issue of $19,500, and was said, February, 1908, to be negotiating with a French syndicate for the sale of new bond issue, of $500,000, at 80, but apparently the latter did not furnish the expected funds. The new bond issue was said to be planned for the purchase of additional properties. Company controls the Colorado property through an option, expiring May, 1909, at $2 per share, on 65,000 shares of the 90,000 shares capitalization of the Sedalia Copper Co., stock being in escrow. The Shawmut pays 15% royalty on ore extracted from the Salida property, such royalty applying pro rata on the purchase price of the stock in escrow, if same is taken. American Loan & Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agent.

Lands, in Utah, 13 fractional claims, patented, area 152 acres, on the north side of Carr Fork, near the center of the Bingham or West Mountain district, showing limestone, porphyry and quartzite, carrying contact deposits between limestone and quartzite, of which 2, under development, are of 5′ estimated average width, carrying sulphide ores, mainly auriferous and argentiferous chalcopyrite and galena, having an estimated average tenor of 5% copper,

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26% lead, 2 to 16 oz. silver and $2,50 to $5 gold per ton, which figures are considered excessive. Development is by a 230′ shaft and 8 tunnels, longest 225′, with upwards of 7,000′ of workings. On the Cuba claim a 5′ ore body has been developed on 2 levels. The company hopes to secure cupriferous porphyry on the Mirror claim.

Equipment of the Utah property includes a 200-h. p. steam plant and a 6-drill Rand air-compressor, with several mine buildings.

The concentrator, at Bingham, of 100 tons rated daily capacity, is of wood, having a 100-ton Gates centrifugal crusher, 2 rolls, 5 Hartz jigs, a Chilean mill and Wilfley tables. The mill is somewhat antiquated in design, and requires remodeling for use.

Lands, in Colorado, 1 claim, area 20 acres, known as the Sedalia mine, and a millsite, circa 6 miles from Salida. The property shows a 35′ to 40′ vein, carrying, near surface, oxide, carbonate and silicate ores, low in copper tenor, and mainly below smelting grade. At depth the ore is sulphide, said to average 3 to 4% copper and circa $1.40 per ton in combined gold and silver values, but carrying an average of 4.5% zinc, which renders it difficult to treat. The mine has an extreme depth of circa 700′, with about 2½ miles of workings.

The Colorado mill is connected with the Sedalia mine by a 1½-mile tramway. The mill is 76x119′ in size, with 4 stories, including a concentrator and leaching plant. The lixiviation plant, which is idle, is said to show a loss of 23% in extraction, as against 15% loss of assay values in smelting.

The Bingham property is idle, work being concentrated at Salida. Production of the Sedalia mine was 5,408 tons of ore, averaging 5.21% copper, yielding 563,513 lbs. fine copper, in 1906, and was 4,209 tons of ore, averaging 6.85% copper, equivalent to 576,696 lbs. fine copper, in 1907.

SHAWMUT GOLD, SILVER & COPPER MINING & MILLING CO. **COLORADO.**

Office: 430 Symes Bldg., Denver, Colo. Mine office: Bonanza, Saguache Co., Colo. G. C. Moore, president; Chas. E. Eckles, vice-president; H. Astor Bush, secretary; E. E. Humes, treasurer. Organized May 8, 1905, under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands, 22 claims, area 320 acres, on Kerber Creek, said to have about 9,000′ of workings. Company in debt and planned liquidation, at last accounts.

SHAWMUT MINING CO. **UTAH.**

Dead. Succeeded, 1905, by Shawmut Consolidated Copper Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

SHAWNEE COPPER CO. **COLORADO.**

Office: 424 Central Bldg., Los Angeles, Cal. Mine office: McCoy, Eagle Co., Colo. O. D. Mansfield, president; Chas. J. Price, honorary vice-president; W. R. Price, vice-president and general manager; J. C. McClintock, treasurer; C. W. Dolph, secretary; J. T. Willard, assistant secretary. Organized under laws of Colorado, with capitalization $500,000, shares $1 par. Lands, 7 claims, area circa 71 acres, just north of the Price Copper Mines, in the Red Gorge district, reported to show a blanket vein of 5′ to 7′ width, with quartzite gangue, giving assays of 20% copper, 6 oz. silver and 0.16% gold, which obviously is an error, and probably should be 0.16 oz. gold per ton. Development is by several pits and a 2-compartment 101′ shaft, not yet in ore.

SHAWNEE COPPER MINING CO. **WYOMING.**

Dead. Was merged, 1908, in Shawnee-Wyoming Mining Co. Formerly at Encampment, Carbon Co., Wyo. Fully described Vol. VI.

SHAWNEE-WYOMING COPPER MINING CO. **WYOMING.**

Office: 122½ East Main St., Shawnee, Okla. Letter returned unclaimed

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from former mine office, Encampment, Carbon Co., Wyo. John H. Aydelotte, president; Hon. G. F. Hinton, first vice-president; A. M. Coffin, secretary and general manager. Organized 1908, as a merger of the Shawnee Copper Mining Co. and Kyhaco Mining Co.

Lands, 10 claims, area 200 acres, 6 miles from the New Rambler mine, in the French Creek district of the Medicine Bow Mountains, showing sundry fissure veins in granite and contact deposits between schist and quartzite, of which one vein of bog ore, under development, has a 2-compartment 115′ shaft showing copper stains.

Company also holds the property formerly owned by Ak-Sar-Ben Copper Co., which had a strong gossan capping of hematite and limestone, opened by an 80′ shaft. Company is said to have found some ore giving good assays in copper, silver and gold.

Equipment includes a 45-h. p. steam plant and 4 mine buildings. Idle, but said to plan early resumption.

SHEEP MOUNTAIN MINING & TUNNEL CO. **COLORADO.**

Dead. Formerly at Crystal, Gunnison Co., Colo.

SHELDEN & COLUMBIAN MINE. **MICHIGAN.**

Office and mine: care of J. H. Rice, Houghton, Houghton Co., Mich. Lands lie next north of the Isle Royale Copper Co. Idle since 1870. Fully described Vols. I and II.

SHINONOME SMELTER. **JAPAN.**

Owned by Furukawa Mining Co.

SHOSHONE COPPER CO. **WASHINGTON.**

Office and mine: Latah, Spokane Co., Wash. J. O. Adams, secretary; preceding officer, J. B. Conard, D. H. Conard, J. H. Stockdale, J. W. Olney, A. B. Shelton and Frank Hosier, directors. Organized circa 1908, under laws of Washington, with capitalization $1,500,000, shares $1 par.

SHOSHONE MINE. **NEW MEXICO.**

Office and mine: care of Alex Gusdorf, owner, Taos, Taos Co., N. M. Lands, 4 claims, developed by a 175′ shaft, with drifts on the 100′ and 150′ levels, showing an 8′ vein with a 2′ paystreak, carrying 5% copper, 10 to 12 oz. silver and $60 to $80 gold per ton, balance of vein being claimed to average 5 to 8% copper, 4 to 5 oz. silver and $10 to $12 gold per ton. Property considered promising. Idle.

SHOSHONE MOUNTAIN MINING CO. **WYOMING.**

Mine office: Meeteetse, Big Horn Co., Wyo. P. W. Gates, manager. Lands, on Sparr Mountain, show a wide vein, carrying values mainly in silver-lead, opened by a 560′ tunnel, on the Smuggler claim. Idle.

SHOTWELL TRI-MOUNTAIN COPPER CO. **ARIZONA.**

Dead. Was absorbed, Feb. 19, 1907, by Cornelia Copper Co. Formerly at Gila Bend, Pima Co., Ariz.

SHUTTLETON MINE. **AUSTRALIA.**

Dead. Merged, December, 1906, in Crowl Creek-Shuttleton Copper Mining Co.

SIEGEL CONSOLIDATED MINING CO. **NEVADA.**

Mine office: Siegel, White Pine Co., Nev. H. L. Siegel, manager. Lands, in the Silver Cañon district, show oxidized ores, carrying values mainly in silver, and sulphide ores of copper and lead, carrying values mainly in copper. The best grade of silver-lead ore ranges 80 to 200 oz. in silver tenor per ton. Development is by 2 tunnels, showing sulphide ores in No. 2 tunnel, at 250′ vertical depth. Ore is hauled by wagon to Curry, 60 miles, but, with the building of a few miles of mountain road, could be brought within 50 miles of

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Warm Springs station, on the Nevada Northern railway. Property has been a producer, on a small scale, since 1901.

SIERRA-ALTO COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Phœnix, Maricopa Co., Ariz. Described Vol. II.

SIERRA CO., LTD. **SPAIN.**

Office: 32 Nicholas Lane, London, E. C., Eng. Mine office: 10 Plaza del General Santacildes, Burgos, Burgos, Spain. T. Evens, secretary. Organized Apr. 2, 1898, under laws of Great Britain, with capitalization £400,000, shares £10 par; debentures, £478,100, at 5%. Lands, sundry mines of iron, copper, silver and coal, in the provinces of Burgos and Logroño, Spain. Idle and apparently moribund.

SIERRA DE COBRE MINE. **MEXICO.**

Owned by Indiana-Sonora Copper & Mining Co.

SIERRA DE ORO GOLD MINING & MILLING CO. **ARIZONA.**

Office and mine: Clifton, Graham Co., Ariz. F. T. Eldredge, president; W. H. Waite, secretary and treasurer; L. P. Potter, manager; Benj. M. Crawford, superintendent. Lands, 15 claims, near the Clifton Consolidated, also a 5-acre millsite, on the San Francisco river. Development is by tunnels, showing 4 parallel blind veins. A 550′ crosscut tunnel shows a 10′ vein, giving assay values of 14% copper and up to $10 gold per ton, and a 4′ vein giving assays of 14% copper and $48 gold per ton. Idle.

SIERRA GOLD & COPPER CO. **NEVADA.**

Letter returned unclaimed from former office and mine, Reno, Washoe Co., Nev. C. A. Poage, president; DeWitt C. Turner, vice-president; W. B. Dunlap, secretary; W. V. Irwin, treasurer. Organized Apr. 7, 1906, under laws of Nevada, with capitalization $750,000, shares $1 par. Lands, 8 claims, area 140 acres, in the Peavine district, circa 20 miles north of Reno, developed by a crosscut tunnel and several shallow shafts. Presumably idle.

SIERRA GOLD & COPPER MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Loyalton, Sierra Co., Cal. Is said to have high grade auriferous and argentiferous copper ore. Idle.

SIERRA MADRE EXPLORATION, LTD. **MEXICO.**

Office 708 Salisbury House, London, E. C., Eng. J. Keatinge Pollock, chairman; J. W. Gallienne, secretary. Organized Nov. 21, 1900, under laws of Great Britain, with capitalization £60,000, shares 5s. par; issued, £40,000. Debentures, £1,000 authorized, £900 outstanding. Had options on gold and silver properties in the state of Chihuahua, Mexico, which were forfeited. Present landed holdings said to be 200 pertenencias, area 494 acres, in the state of Sonora, supposedly carrying auriferous and argentiferous copper ores. Idle.

SIERRA MORENA COPPER MINES, LTD. **SPAIN.**

Office: 2 Basinghall Ave., London, E. C., Eng. Letter returned unclaimed from former mine office, Peñaflor, Sevilla, Spain. R. Stanton, mine manager; J. E. G. Hadath, secretary. Organized Apr. 17, 1900, with capitalization £80,000, shares £1 par; issued, £60,007. Lands, 215 acres, including La Preciosa and adjoining mines. Idle.

SOCIÉTÉ ANONYME MINIÈRE ET MÉTALLURGIQUE LA "SIERRA NEVADA." **SPAIN.**

Office: 102 Blvd. du Nord, Brussels, Belgium. Mine office: Guejar Sierra, Granada, Spain. Chas. de France, president; preceding officer, Emile Toussaint, Victor-Grégoire Bock and E. LeFevre, directors. Organized March 6, 1895, under laws of Belgium, with capitalization 1,500,000 francs, shares 500 francs par, in 100,000 francs 6% preferred and 1,400,000 francs common shares. Presumably idle.

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SIERRA NEVADA COPPER CO. **NEVADA.**

Mine office: Luning, Esmeralda Co., Nev. Development is by a shallow shaft, said to show ore averaging 15% copper, with small silver and gold values. A little ore was shipped, 1907. Presumably idle.

SIERRA NEVADA COPPER MINING CO. **IDAHO.**

Mine office: Wardner, Shoshone Co., Idaho.

SIERRA DE OAXACA MINING & MILLING CO. **MEXICO.**

Office: Nashville, Tenn. Mine office: Ixtlán de Juárez, Oaxaca, Mex. Geo. Clark, superintendent. Mine, known as Santa Catarina, has auriferous and argentiferous copper ores, with steam power, employing circa 50 men at last accounts.

SIERRA PACIFIC SMELTING CO. **MONTANA.**

Dead. Formerly at Butte, Silver Bow Co., Mont.

SIERRA-SONORA SMELTING CO. **MONTANA.**

Dead. Title changed, 1903, to Sierra-Pacific Smelting Co., also dead. Formerly at Butte, Silver Bow Co., Mont.

SIERRITA MINING & MILLING CO. **ARIZONA.**

Office and mine: care of J. P. Owen, general manager, Tucson, Ariz. Gerrit B. Linderman, president. Long idle and apparently moribund.

COMPAÑIA MINERA SIETE AMIGOS. **MEXICO.**

Office: 4 Great Winchester St., London, E. C., Eng. Mine office: Topia, Tamazula, Durango, Mex. Thos. J. Lawrence, president and general manager. Property includes the Comstock, Galena, Guadalupe and other mines, carrying auriferous and argentiferous copper and lead ores. Has steam power and employed circa 50 men, at last accounts.

SIGNAL COPPER CO. **ARIZONA.**

Dead. Lands sold, circa 1906, to Western Mining & Development Co. Formerly at Planet, Yuma Co., Ariz. Described Vol. VI.

SIGNET GOLD & COPPER MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, American Fork, Utah Co., Utah. W. H. McConahy, president; J. H. Rothwell, vice-president; W. S. Zehring, secretary; W. H. Young, treasurer; preceding officers and H. A. Hoppaugh, directors. Organized, November, 1903, under laws of Utah, with capitalization $75,000, shares 25 cents par. Lands, 4 claims, in process of patenting, known as the Signet group, in American Fork Cañon, slightly developed. Idle several years.

SILERS MEADOWS COPPER CO. **NORTH CAROLINA.**

Mine office: Bushnell, Swain Co., N. C. Lands, circa 1,900 acres, in the Smoky Mountains, on the Tennessee copper belt. Has 11 shafts and tunnels, all showing ore, said to give average assays of 5.5% copper and $1.80 per ton in combined silver and gold values. Idle several years.

SILVER BAR COPPER MINING CO. **NEW MEXICO.**

Dead. Property sold, circa 1902, to Mogollon Gold & Copper Co. Formerly at Cooney, Socorro Co., N. M. Described Vol. II.

SILVER BELL COPPER CO. **ARIZONA.**

Dead. Title changed, 1903, to Imperial Copper Co. Formerly at Silver Bell, Pima Co., Ariz. Described Vol. III.

SILVER BELL SMELTER. **ARIZONA.**

Owned by Southern Arizona Smelting Co.

SILVER BOW MINE. **MONTANA.**

Owned by Butte & Boston Consolidated Mining Co.

SILVER BOW MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. G. E. DeSnell, E. H. Renish, D. S. Mack, David J. Charles and Thos. Stephens, directors. Organ-

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ized Sept. 28, 1905, under laws of Montana, with capitalization $20,000, shares $1 par. Property apparently was the Metz claim, relocated January 1, 1904, as the Compromise claim, by forbears of the company, but apparently title was lost to Jos. J. Culbert.

SILVER CITY COPPER CO. **ARIZONA.**

Office: Silver City, N. M. Mine office: Santa Rita, Grant Co., N. M. C. C. Shoemaker, president; E. A. Layne, vice-president; A. F. Kerr, secretary and treasurer; preceding officers, O. C. Hinman, Max Schutz, W. B. Walton, Chas. A. Farnsworth and Saml. Allen, directors; Harry Kline, manager. Organized February, 1907, with capitalization $2,500,000, shares $10 par. Lands, circa 290 acres, near the Santa Rita mine, having several shafts, showing lead and copper ores. Is said to have a small concentrator.

SILVER CLIFF GOLD & COPPER MINING CO., LTD. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Jas. D. Young, president and general manager; Ed. P. Young, secretary and treasurer. Lands, 18 claims, 7 miles from Mullan, developed by 3 tunnels, longest 1,315′, showing chalcocite, bornite and chalcopyrite, giving assays up to 43% copper, with some lead and fair gold values. Has a Pelton wheel, operating under a head of 240′, and an 8-drill air-compressor.

SILVER CLIFF MINING CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Chas. A. Selby, president; Herbert S. Wright, vice-president; John W. Carlson, secretary and treasurer. Organized circa January, 1908, under laws of Utah, with capitalization $130,000, shares $1 par.

SILVER CREEK GOLD & COPPER MINING CO. **WASHINGTON.**

Office: care of Hugh Clemens, president, Manchester, Iowa. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. Organized 1896, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, in the Silver Creek district, having 2 short tunnels. Idle and apparently moribund.

SILVER CREEK GOLD MINING CO. **WASHINGTON.**

Office: Everett, Wash. Letter returned unclaimed from former office, Index, Snohomish Co., Wash. A. J. Westland, president; W. B. E. Edwards, secretary. Capitalization $1,000,000, shares $1 par. Lands, 6 claims, circa 10 miles from Index, opened by about 500′ of tunnels, said to show a vein of fair size, carrying small copper values and fair gold and silver values. Idle some years and presumably moribund.

SILVER CREEK MINING & MILLING CO. **WASHINGTON.**

Office: 804 East Washington St., Greensburg, Ind. Mine office: Keller, Ferry Co., Wash. R. L. Boyle, president and general manager; Harry A. Dentor, vice-president; Ira J. Hollensbe, secretary and treasurer; John S. Badger, superintendent; preceding officers and R. Ray Hamilton, directors. Organized December, 1900, under laws of Washington, with capitalization $75,000. Company is closely connected with the Keller & Indiana Smelting Co. Lands, 4 claims, patented, area 80 acres, including the Gold Cord mine, in the San Poil district, 5 miles northeast of Keller, well timbered and watered. Silver Creek, near by, is capable of producing considerable water power. Lands show a fissure vein, in diorite, of 3′ to 8′ width, with a 30″ paystreak carrying cuprite, azurite, malachite, bornite and chalcopyrite, with quartz gangue, opened by a 304′ shaft and by tunnels of 130′ and 620′, with tunnels connected by a 195′ winze. Plans installing electric power, and beginning production when Keller & Indiana smelter is blown in.

SILVER FISSURE MINING CO. **MONTANA.**

Office: 377 Broadway, New York, N. Y. Mine office: Polaris, Beaver-

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head Co., Mont. Henry H. Armstead, general manager; Jas. B. Ford, mine manager; J. F. C. Wells, smelter superintendent. Property is the Polaris mine, carrying silver, gold and copper ores, latter produced in small quantities as a by-product. Has steam and electric power, with a 100-ton smelter, employing about 100 men.

SILVER FLAT MINING & MILLING CO. **UTAH.**

Office: care of Abel John Evans, Lehi, Utah. Mine office: American Fork, Utah Co., Utah. Capitalization $50,000, shares 10 cents par. Lands, 5 claims, in the Silver Lake district, carrying auriferous and argentiferous copper and lead ores. Idle some years and apparently moribund.

SILVER HILL CONSOLIDATED COPPER CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Silver Bell, Pinal Co., Ariz. Col. Wm. Herring, president; T. M. Smith, secretary; preceding officers and John N. Ross, directors. Capitalization, $3,000,000, shares $1 par. Lands, 6 patented claims, area 120 acres, in the Silver Bell Mountains, 3 miles from Silver Bell, opened by tunnel, with about 1,000′ of workings, having an extreme depth of 200′, showing copper carbonates and sulphides, apparently occurring as contact deposits between limestone and granite.

SILVER HILL MINING CO. **NORTH CAROLINA.**

Mine office: Silver Hill, Davidson Co., N. C. J. M. Prim, superintendent, at last accounts. Has auriferous and argentiferous lead, copper and zinc sulphides. Has a mill with crusher, rolls and 5 stamps. Idle several years.

SILVER KING GOLD & COPPER MINING CO. **IDAHO.**

Mine office: Mackay, Custer Co., Idaho. Development is by tunnel, with a shallow shaft. Presumably idle.

SILVER LEAF MINING CO. **NEVADA.**

Mine office: Luning, Esmeralda Co., Nev. Property is said to show highly argentiferous copper ores. Employed 12 men at last accounts.

SILVERMAN-ALASKA MINING CO. **ALASKA.**

Office: 11 Broadway, New York, N. Y. Mine office: Ketchikan, Alaska. Supposedly organized under laws of New Jersey. Lands, on Prince of Wales Island, are said to show auriferous copper ores, of good grade, with considerable development. Idle several years.

SILVER MOUNTAIN MINE & MILL CO. **COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. F. G. Bishop, superintendent. Property has auriferous and argentiferous copper ores, with water power and a 25-ton concentrator.

SILVER MOUNTAIN MINING CO. **COLORADO.**

Dead. Succeeded by Silver Mountain Mine & Mill Co. Formerly at Empire, Clear Creek Co., Colo.

SILVER MOUNTAIN MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Lands, 4 claims, patented, west of the Morning mill, opened by a 450′ tunnel showing high grade copper ore.

SILVER PEAK MINING CO. **WASHINGTON.**

Office: care of Gale Smith, secretary, Spokane, Wash. Mine office: Chewelah, Stevens Co., Wash. Conrad Wolfe, president; F. R. Clark, first vice-president; Capt. Hugh James, second vice-president and general manager. Lands, circa 200 acres, having a 90′ shaft, showing a 4′ vein carrying oxidized ores, mainly azurite, assaying 4.7 to 22.7% copper.

SILVER QUEEN MINING CO. **ARIZONA.**

Office: 446 Pearl St., New York, N. Y. Mine office: Superior, Pinal Co., Ariz. Wm. D. Fisk, general manager. Organized 1880, but inactive until a recent change in management. Apparently succeeded by Copper Queen Mining Co.

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SILVER SHIELD MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Hon. Harry S. Joseph, manager. Property shows a 4′ ore body, said to give selected ores assaying about 6% copper, 27 oz. silver and $2.40 gold per ton, also an ore body said to average about 1% copper, 8% lead, 10 oz. silver and $1 gold per ton, in addition to which there is a considerable body of low grade concentrating ore.

Equipment includes a 5-drill air-compressor and a 15-ton mill, near the mouth of the Silver Shield tunnel. A proposed consolidation with the United Bingham was not effected.

SILVER SPUR COPPER MINE. **AUSTRALIA.**

Mine office: Stanthorpe, Queensland, Australia. Property, formerly known as the Texas mine, reopened 1906, has a 5′ vein, developed by shaft to shallow depth, giving assays said to average 21% copper. Production, June, 1907, was 43 tons, 18 cwts., 1 quarter, 4 lbs. of copper ore, ounces, unfortunately, being omitted from the returns.

SILVER SPUR MINING CO., N. L. **AUSTRALIA.**

Office and mine: Silver Spur, Stanthorpe Co., Queensland, Australia. Employs 200 men. Robt. Thos. Vyner, chairman; Edgar Hall, secretary, treasurer and general manager; Harry Wann, mine superintendent. Organized 1879, under laws of Queensland, with capitalization £24,000, shares £1 par, fully issued; 15s. paid in. Has paid dividends, to end of 1906, of £19,650. Annual meeting, in March.

Lands, 49 acres, leasehold from the crown, and a 3-acre millsite, 51 miles from the State Railway. Lands show Gympie beds, with slate and Carboniferous limestone, having 4 fissure veins in slate, carrying lenticular ore bodies, all under development, ranging 4′ to 30′ in width, the main ore body being 6′ to 30′ wide on the 300′ level. Ore is exclusively sulphide, and complex, rendering it difficult to mill, averaging about 1.25% copper, 12% lead, 15% zinc, 26 oz. silver and 2s. gold per long ton, values being mainly in silver. Development is by shafts of 180′, 420′, 80′ and 80′, and deepest level is at 400′. Mine was opened 1892, and has been worked continuously since.

Equipment includes a 350-h. p. steam plant, with a hoist and a 5-drill straight-line air-compressor. Fuel is coke and wood, latter costing 12s. per cord. The company has a sawmill and brickyard.

The company controls a coal mine, near Ashford, New South Wales, and is erecting coke ovens.

The concentrator, having a Krupp ball mill, replacing a Chilean mill, and 2 jigs, was rebuilt, 1908. Ore is received by tram-line from the mine.

The smelter, rated at 35 tons daily capacity, has a Ropp calciner, a 42x100″ Austin water-jacket pyritic blast-furnace, of 60 tons rated daily capacity, which is incomplete, and two 18-ton reverberatory furnaces, making matte carrying an average of circa 30% copper, 600 oz. silver and 1.5 oz. gold per long ton, sent to Europe for reduction. Bauxite bricks are used for lining the firebox of the reverberatory furnaces, and fuel is wood. The smelter also has a Huntington-Heberlein converter pot, installed 1907.

Production has been as follows: 71,680 lbs. fine copper in 1903; 98,560 lbs. in 1904; 175,840 lbs. fine copper, 51 long tons lead, 166,869 oz. silver and 202 oz. gold in 1906; 176,960 lbs. copper and 150,353 oz. silver, with lead and gold production, secured from the treatment of circa 7,500 tons of ore, in 1907. The company plans resumption of lead smelting, and completion of coke ovens, in 1909.

SILVER TIP GOLD MINING CO. **WASHINGTON.**

Dead. Formerly at Maple Falls, Whatcom Co., Wash.

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SILVERTON MINING CO. **COLORADO.**

Office: 1612 Ashland Blk., Chicago, Ills. Mine office: Silverton, San Juan Co., Colo. M. P. Levy, president; W. L. Springer, vice-president; Walter J. Gibbons, secretary; John Makin, treasurer; Thos. R. Henahan, general manager. Lands, on Sultan Mountain, including the North Star mine, are said to have produced $1,000,000 in silver values, before 1893. Is driving a long tunnel, hoping to open a good ore body. Has steam and water power and a 20-stamp mill.

SILVERTON MINING CO. **WASHINGTON.**

Dead. Formerly at Silverton, Snohomish Co., Wash.

SIMILKAMEEN COPPER MINES CO. **BRITISH COLUMBIA.**

Dead. Formerly at Princeton, Boundary district, B. C.

SIMILKAMEEN MINING & SMELTING CO., LTD. **BRITISH COLUMBIA.**

Office: care of Chas. F. Law, secretary, Vancouver, B. C. Mine office: Princeton, Boundary district, B. C. Fred Buscombe, chairman; W. H. Armstrong, managing director; preceding officers, E. J. McFealey and Clarence Marpole, directors. Organized 1905, under laws of British Columbia, with capitalization $2,000,000, shares $10 par.

Lands, 5 claims, 3 crown-granted, area circa 200 acres, known as the St. Lawrence and St. George groups, 8 miles from Tulameen City, on Bear Creek, a tributary of the Tulameen river, in the Similkameen division of the Boundary district. Lands, well timbered, have a 250-h. p. available waterfall. Development is by 4 shallow shafts, of circa 50′ depth each, a short tunnel, and numerous trenches, showing a strong ore body, between schist and granite, with intrusive porphyry dikes. The St. Lawrence mine has two 50′ shafts, showing an 8′ vein of massive cupriferous iron sulphide, giving average assays of about $10 per ton in copper, silver and gold. The St. George group shows a 4′ vein, carrying ore with quartz gangue, giving average assays of 1.38% copper, 2.08 oz. silver and $53 gold per ton. Property considered promising. Idle.

SINAÏ MINING SYNDICATE. **ARABIA.**

Mine office: Mt. Samarah, Arabia, care of G. Beyts & Co., Suez, Egypt. M. Wanner, mine manager, at last accounts. Property is sundry old argentiferous copper mines, worked by the early dynasties of Egyptian kings, and abandoned probably some 1,500 years before the Rio Tinto was first opened by the Phœnicians, which latter event occurred circa 1100 B. C. A little work was done, in 1903. Presumably idle for another 4,500-year period.

SINALOA EXPLORATION CO. **MEXICO.**

Office: Commonwealth Trust Bldg., St. Louis, Mo. Mine office: Guadelupe de los Reyes, Cosalá, Sinaloa, Mex. Geo. B. Clark, president; Dr. H. H. Born, secretary; Chas. Wiggins, treasurer; preceding officers, Chas. H. Filley, John Hartman, Henry Leschen, Chas. M. Rhodes and W. S. S. Rodgers, directors. Capitalization $500,000, shares $1 par. Lands include 7 square miles of miscellaneous timber and mineral lands. Property included the Santa Eduwiges and La Luz mines, which have been disposed of, for stock interests, to the Metates Mining Co., and another corporation. Idle.

SINALOA & SONORA MINING & SMELTING CO. **MEXICO.**

Dead. Formerly in Sinaloa, Mexico.

SIN RIVAL COPPER CO. **ARIZONA.**

Office: care of Wm. G. Kirchoff, Los Angeles, Cal. Mine office: Superior, Pinal Co., Ariz. Lands, 25 acres, near the Silver Queen and Lake Superior & Arizona mines.

SISKIYOU COPPER & GOLD DEVELOPING CO. **CALIFORNIA.**

Office: Medford, Ore. W. M. Baxter, president; Ernest Huth, secretary; Chas. Huth, treasurer. Organized Aug. 13, 1908, with capitalization $100,000.

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Lands, 75 miles from a railroad, in Siskiyou county, California, are said to show a vein of circa 100′ width, giving assays of 4.5% copper and $4.54 gold per ton.

SISKIYOU COPPER MINING CO. **CALIFORNIA.**

Office: Lewiston, Idaho. Mine office: Ashland, Jackson Co., Ore. W. R. Oxley, president; Robt. Hall, vice-president; C. E. Monteith, secretary; preceding officers, G. W. Holmes, H. E. Babcock, Robt. E. Kizer and J. F. Reddy, directors. Organized Oct. 10, 1905, under laws of Idaho, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, area 80 acres, near the Blue Ridge mine, in the Upper Applegate district, having tunnels of 75′, 100′ and 125′, said to give a good showing of ore. Idle.

SISKIYOU GOLD & COPPER CO. **CALIFORNIA.**

Dead. Was a swindle, perpetrated by "Baron" W. E. von Johannsen Formerly at Rollins, Siskiyou Co., Cal. Described Vol. VII.

SISKIYOU GOLD & COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly had an office at 44 Central Block, Salt Lake City, Utah.

SIX EAGLES MINING CO. **WASHINGTON.**

Office: Olympia, Wash. Mine office: Loomis, Okanogan Co., Wash. Robt. Frost, superintendent, at last accounts. Has auriferous and argentiferous lead and copper ores.

SJANGELI MINES. **NORWAY & SWEDEN.**

Mine office: Sjangeli, Nordland, Tromsö, Norway. Lands, circa 30 miles from the coast, with good water power available, include the Sjangeli, Alakats, Valfojokk and Ruopsuokjaure groups, mainly in Norway but partly in Sweden. Country rocks are hornblende schists, with narrow strata of limestone and lenticular bodies of massive gabbro, ores occurring in the schists as cuprite, chalcocite, bornite and chalcopyrite, assaying 2.5 to 55% copper, with an average tenor estimated at 12.5%, which probably is too high. Development is slight. Property considered promising. Idle.

SKYLARK COPPER MINING & MILLING CO. **UTAH.**

Dead. Was merged, Sept. 1, 1908, in the Utah United Copper Co. Formerly at Milford, Beaver Co., Utah. Fully described Vol. VII.

SLATE CREEK MINING CO. **ARIZONA.**

Dead. Formerly at Prescott, Yavapai Co., Ariz.

SLATE CREEK MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Wheatland, Laramie Co., Wyo.

SLATER COPPER MINES CO. **MISSOURI.**

Dead. Formerly, circa 1901, at Eminence, Shannon Co., Mo.

SLEEMINABAD COPPER CO. **INDIA.**

Office: care of P. C. Dutt, manager, Residency Road, Jubbulpore, Central Provinces, India. Mine office: Sleeminabad, Central Provinces, India. Lands are 1½ miles from Sleeminabad, on the East Indian Railroad, 40 miles from Jubbulpore, and 650 miles from Bombay, almost in the centre of India. The formation is of Silurian age, showing dolomite, slate, quartzite, mica-schist and jaspelite, much crumpled and metamorphosed, with numerous porphyry dikes, ore occurring in the vicinity of the porphyry. The Dharwar schists, here seen, belong to the same geological horizon as the Kolar gold fields. Country rocks have a generally east and west strike, and southerly dip, with veins occurring at approximately right angles and having a westerly dip. The veins have well defined walls, with considerable fluccan, showing slickensides. The property shows 16 veins, in a radius of 10 miles, veins averaging 6′ width, one vein outcropping for nearly 2 miles. Development is by a 100′ vertical shaft, and some diamond drilling has been done, showing auriferous and argentiferous malachite and tetrahedrite, giving assay values, according to the Indian Government Survey, up to 25% copper, 197 oz. silver and 15

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dwts. gold per long ton. Ore produced has been sold for £7 5s. 6d. per ton. Property is considered worthy of careful investigation. Presumably idle.

SLIDE ROCK MINE. **MEXICO.**

Office: care of Alpheus McCallum, 162 Randolph St., Chicago, Ills. Mine office: Magdalena, Socorro Co., N. M. Lands, 6 claims, area 120 acres, in the Magdalena district, 2 miles from the Santa Fé railway, held under bond and lease by Alpheus McCallum, Dr. Alex. McCallum and Dr. W. W. McCallum. Property has tunnels of 120′ and 200′, showing ore assaying up to 21.2% copper, 6 oz. silver and $19.84 gold per ton, with occasional lead and zinc values. Presumably idle.

SLIDING ROCK COPPER PROPRIETARY, N. L. **AUSTRALIA.**

Dead. Received a £2,000 subvention from the state, and repaid 12s. thereon, property reverting to the state. Formerly in South Australia.

SLOCUM COPPER CO. **ARIZONA.**

Mine office: Phœnix, Maricopa Co., Ariz. Lands, in the Winifred district, 22 miles north of Phœnix, have shafts of 130′ and 150′, showing ore assaying well in copper, silver and gold. Property is said to have a 10-ton smelter, and company is said to plan increasing capacity to 100 tons daily, but should open a mine first.

SMELTING & REFINING COMPANY OF AUSTRALIA (1901), LTD. **AUSTRALIA.**

Dead. Succeeded by Australian Smelting Corporation, Ltd. Formerly at Dapto, N. S. W., Australia. Described Vol. V.

SMOKEHOUSE MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Bernard Noon, general manager. Property includes the Detroit, National and Copper Bottom claims, also the Smokehouse mine, which consists of a city lot, in the heart of Butte. Was controlled, 1908, through ownership of a large majority of stock, by Davis-Daly Estates Copper Co., and presumably is controlled by successor of latter, the Davis-Daly Copper Co. Mine is described under title of latter.

SMUGGLER GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 202½ Stark St., Portland, Ore. Mine office: Index, Snohomish Co., Wash. McKinley Mitchell, president; Samuel Hart, secretary; D. S. Williams, treasurer; W. J. Walters, general manager. Organized July, 1904, under laws of Washington, with capitalization $1,000,000, shares $1 par; issued, $600,000. Lands, 19 claims, in the Silver Creek district. Presumably idle.

SNAKE RIVER CONSOLIDATED MINING CO. **WYOMING.**

Office: 319 Keith and Perry Bldg., Kansas City, Mo. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Chas. W. German, president; Geo. Creel, vice-president; L. E. Wyne, secretary and treasurer. Organized July, 1906, under laws of Wyoming, with capitalization $5,000,000, shares $5 par. Lands, 9 claims, area 180 acres, also 520 acres of placer lands, with total holdings of 700 acres, in the Three Forks district, 26 miles from a railroad. Has several pits and shafts of 10′ to 90′ depth, and several tunnels of 50′ to 440′ length, showing mainly sliver-lead ores, with some copper and zinc.

SNAKE RIVER MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Heath, Washington Co., Idaho. Is said to have opened a 24″ vein of ore assaying 40 to 50% copper.

SNOHOMISH MINE. **MONTANA.**

Owned half and half by Butte Coalition Mining Co. and Butte & Boston Consolidated Mining Co.

SNOQUALMIE COPPER MINING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Skykomish, King Co.,

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Wash. Lands, 8 claims, known as the Mountainview group, near the Dutch Miller mine, on the middle fork of the Snoqualmie river, showing a ledge of 200′ claimed width, opened by 3 tunnels, each showing auriferous and argentiferous copper ore, said to be of high grade. Idle.

SNOWBALL COPPER MINING CO., N. L. **AUSTRALIA.**

Mine office: Gundagai, N. S. W., Australia. Lands, 38 claims, leasehold, on Snowball Hill, 3 miles from Mount Horeb railway station, and 9 miles south of Gundagai. Mine, discovered 1873, was worked vigorously, 1876-1880, employing up to 400 men. Main shaft, 210′, sunk by old company, shows a vein of 30″ extreme width, carrying argentiferous and slightly auriferous melaconite, assaying 25% copper. Also has a new shaft of 25′. In 1907 shipped 95 long tons of 6.4% copper ore to the Blayney smelter.

SNOW CLIFF COPPER MINING CO., LTD. **MONTANA.**

Office: 719 Bank St., Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Andrew G. Gordon, secretary. Incorporated, circa 1907, under laws of Idaho, with capitalization variously given as $150,000 and $500,000.

SNOWDRIFT MINING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Peter Lundin, H. M. Force, W. J. Johnson, W. J. Rhodes and Jas. A. Wayne, directors. Organized 1907, under laws of Idaho, with capitalization $1,500,000, shares $1 par.

SNOWSHOE COPPER MINING CO. **MONTANA.**

Mine office: Canyon Ferry, Broadwater Co., Mont. Idle and presumably moribund.

SNOWSHOE GOLD & COPPER MINES, LTD. **BRITISH COLUMBIA.**

Office: 717 Salisbury House, London, E. C., Eng. Mine office: Phœnix, Boundary district, B. C. Earl of Chesterfield, chairman; Geo. S. Waterlow, D. L., J. P., vice-chairman; H. W. Batty, secretary; Anthony J. McMillan, managing director; J. W. Astley, superintendent; J. H. Trevorrow, mine superintendent. Organized Jan. 20, 1901, under laws of Great Britain, with capitalization £250,000, shares £1 par; issued, £198,155. Property is under lease to the Consolidated Mining & Smelting Co. of Canada.

Lands, 4 claims, freehold, area 120 acres, about a quarter-mile from the Granby, showing fissure replacements of 25′ to 200′ width, with an average of about 100′, traceable 1,000′, carrying chalcopyrite averaging about 1.5% copper and $1.25 gold per ton, ore occurring occasionally in distinct bodies, somewhat mixed, but mainly disseminated, in minute particles, through a silicious to calcareous gangue, with occasional magnetite and specular hemitite. Development is by tunnels of 200′, 250′ and 600′, with shafts of 200′ and 300′, the main shaft having 3 compartments, but bulk of production is secured from open-cast workings.

Equipment includes a 150-h. p. double-drum electric hoist, raising 2-ton skips, and the high-pressure half of a 30-drill Rand Corliss cross-compound condensing air-compressor.

Production has been as follows: 20,000 tons of ore in 1902; 74,000 tons, mined at an average cost of $1.10 per ton, in 1903; 125,001 tons in 1907, shipped to Greenwood and Trail smelters, yielding circa 3,125,000 lbs. fine copper. The ore body is low in grade, though of great size, and apparently the property can be operated profitably only on the basis of copper at about 16 cents per pound.

SNOWSHOE MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Wilbur D. Greenough, manager. Capitalization $1,500,000, shares $1 par. Lands, sundry claims, partly patented, shortly west of the Snowstorm mine, supposed

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to carry the extension of the Snowstorm ore body. Has a crosscut tunnel showing auriferous copper ore, without silver values. Idle.

SNOWSLIDE MINING & MILLING CO. **IDAHO.**

Dead. Was organized circa August, 1906, with capitalization $1,000,000. Geo. Snow was president. Formerly at Mullan, Shoshone Co., Idaho.

SNOWSTORM EXTENSION MINING CO., LTD. **IDAHO.**

Office: Chicago, Ills. Mine office: Mullan, Shoshone Co., Idaho. C. M. Vaughn, president; C. M. Sommers, vice-president; J. K. Scott, secretary and treasurer. Capitalization $1,000,000, shares $1 par. Lands, 4 claims, 1 fractional, said to be in the vicinity of the Snowstorm mine.

SNOWSTORM GOLD & SILVER MINING & MILLING CO. **COLORADO.**

Mine office: Durango, La Plata Co., Colo. J. E. Downer, manager, at last accounts. Ores are said to carry gold, silver, copper and mercury. Has water power and a 10-stamp mill. Idle.

SNOWSTORM MINING CO. **IDAHO.**

Office and mine: Larson, Shoshone Co., Idaho. Employs about 300 men. Thos. L. Greenough, president; Wilbur D. Greenough, vice-president and general manager; C. D. Miller, secretary and treasurer; preceding officers, P. J. Kline, Jas. Bean, J. H. Heward and H. E. Chaney, directors; Leo Greenough, superintendent.

Organized 1899, under laws of Idaho, with capitalization $1,250,000, increased, 1906, to $1,500,000, shares $1 par. Net earnings were $5,677 in 1905, $144,322 in 1906, and $498,013 in 1907, gross receipts of latter year being $875,919. Dividends were $90,000 in 1906, $360,000 in 1907, and $150,000 in 1908.

Lands, 11 claims, 7 patented, area circa 220 acres, also a 2-acre millsite, with 300 acres available for tailings, on Stevens Peak, east of Mullan, in the Hunter district, near the Montana boundary. Property shows a fissure vein of 10′ to 35′ width, with an average width of circa 20′, developed for nearly 1,000′ in length. Apparently the ore body is an impregnated cupriferous zone, conforming to the bedding planes in Algonkian quartzite. The ore is highly silicious, and devoid of iron and alumina, being mainly carbonate to depth of 750′, succeeded by slightly silicious chalcocite, with some bornite and chalcopyrite, the bornite occasionally carrying native silver in quantities up to 1,000 oz. per ton, disseminated in quartzite, all ores being more or less argentiferous, and averaging probably 4 to 4.5% copper, 6 to 7 oz. silver and circa $2 gold per ton, though considerable ore is produced averaging 8% copper.

The mine has a 200′ shaft, but development is mainly by 4 tunnels, No. 3, having a back of 1,200′, showing an ore chute circa 25′ in width and about 850′ in proven length, with No. 4 tunnel driven 500′ vertically below No. 3. Estimates of ore blocked out range from 1,000,000 to 3,000,000 tons, and probably 1,500,000 tons would be a fair figure, the mine having very large ore reserves.

The mine is connected with the railway spur at Larson by a 7,300′ tramline from No. 2 tunnel and a 3,000′ Riblet aërial tram from No. 3 tunnel.

Electric energy is used throughout, the power installation including 5 motors and an electric light plant, water being brought through a 4½-mile pipe-line, generating 300 h. p. Equipment includes 20-drill and 40-drill air-compressors, driven by direct-connected electric motors.

Buildings include a 40x50′ office, machine-shop, smithy and sawmill, at the mouth of tunnel No. 3, a changing-house and 2 large 2-story hotels, with accommodations for 300 workmen, these being 52x84′ and 40x200′ in size, the latter having cost circa $50,000.

The mill, near the mine, was remodeled and enlarged, 1907, when 3 large

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leaching tanks were added. The mill, of 300 tons nominal daily capacity, operated by 4 electric motors, includes a 125-ton leaching and precipitation plant, treating carbonate ores averaging 2 to 3% copper and circa 7 oz. silver per ton, which is said to obtain an extraction of about 90% of the assay values. The ore is crushed and then run into 3 agitators, where mixed with a 10% solution of sulphuric acid with calcium chloride, forming a solution of copper sulphate, which goes from the agitators through a series of 6 settling vats, where the copper is precipitated on scrap iron, and silver is precipitated as a chloride, the solution being passed through settling vats and the silver separated from the clear solution by sodium sulphite, filtered and shipped for refining.

The upper levels of the mine formerly were operated, under a 5-year lease, on royalty, by J. H. Heward & Co., but the lease was bought by the company, Aug. 4, 1906.

Production, begun 1904, ceased November, 1907, owing to depression in the metal market, but was resumed Feb. 20, 1908. For 1906 and 1907 the ores are said to have averaged returns of about 5% copper and 7 oz. silver per ton. Production, 1906, was 6,233,940 lbs. fine copper, and for fiscal year 1907 was 87,503 tons of ore, of which 9,721 tons were treated at the mine and 77,782 tons were shipped to smelters, yielding circa 10,000,000 lbs. fine copper and 596,000 oz. silver. The mine ended 1908 with daily shipments of about 500 tons, sent mainly to the Washoe works, with smaller shipments to smelters at Butte, Tacoma, Greenwood and Great Falls. Apparently the mine is capable of yielding 1,500 tons of 5% ore daily, on present development, which would give an annual output of about 22,500,000 lbs. fine copper, though in all likelihood several years will be required to reach this figure. The property is one of exceptional value and future promise, and is well managed.

SNOWSTORM MOUNTAIN COPPER MINING CO. **IDAHO.**

Dead. Formerly at Mullan, Shoshone Co., Idaho.

SNOWTOP MINING CO. **BRITISH COLUMBIA.**

Office: Detroit, Mich. Mine office: Port Hill, Kootenai Co., Idaho. A. B. Marintette, president; A. S. Brown, secretary. Capitalization $2,000,000. Lands, 13 claims, area circa 250 acres, also 4 timber claims, in the Creston division of the Boundary district of British Columbia, lying 3 miles north of the international boundary line, with postoffice in the United States. Lands show highly argentiferous copper ore. Has 7 buildings.

SOCORRO GOLD CO. **ARIZONA.**

Office and mine: Harrisburg, Yuma Co., Ariz. Geo. D. Workman, president; S. C. Workman, secretary; F. C. Smith, general manager. Organized 1901, under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 10 claims, area 200 acres, in the Ellsworth district, showing a 2′ fissure carrying covellite and chalcopyrite, assaying about $10 gold and 5 oz. silver per ton, with small copper values, developed by a 667′ shaft and 11 tunnels, with 2,467′ of underground workings, said to give 5,000 tons of ore blocked out for stoping. Has a 20-stamp mill, 3 Standard concentrators and cyanide plants of 10 tons and 50 tons daily capacity. Presumably idle.

SOLACE COPPER MINING CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Ignatius Schlinger, president and treasurer; Henry Smith, vice-president; A. P. Murray, secretary; T. Schlinger, treasurer; Wm. Howe, superintendent. Organized 1903, under laws of Arizona, with capitalization $500,000, shares $1 par, in $100,000 preferred and $400,000 common shares. Lands, 4 claims, in the Bloody Tank district, circa 8 miles from Globe, showing 4 ore bodies, of 20″ average width, opened by several pits, giving assays of 8% copper and $15 gold per ton. Presumably idle.

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COMPAÑIA MINERA LA SOLEDAD. **MEXICO.**

Office: care of Dr. S. H. Quint, Ameca, Jalisco, Mex. Mine office: Guachinango, Mascota, Jalisco, Mex. Chris. D. O'Brien, Jr., manager. Lands, 78 pertenencias, circa 12 miles southwest of Ameca, in the Sierra Tetilla district, including the Soledad and Santa Isabel mines, carrying auriferous and argentiferous copper ore and free gold, with values mainly in gold, in a 12′ vein, with deepest workings circa 400′, showing sulphides below the 200′ level, with 10,000 tons of ore estimated in sight. Equipment includes steam power and a stamp-mill having 10 stamps, 1 Wilfley table and 1 Pender concentrator.

SOLMS-BRAUNSFELS'SCHE BERGWERKE. **GERMANY.**

Mine office: Braunsfels, Rheinprovinz, Germany. Herr Bergassessor Bellinger, manager. Has iron, manganese and copper ores.

SOLOMON SPRINGS COPPER MINING CO. **ARIZONA.**

Office and mine: Naco, Cochise Co., Ariz. Lands, 20 claims, area 400 acres, in the Naco valley, about midway between Bisbee and Naco. Lands show a vein having a gossan of 4′ to 40′ width. Was under bond, circa 1903-1905, to Houghton Development Co. Idle several years.

SONGATOF MINE. **SIBERIA.**

Mine office: Semipalatinsk, Siberia. Is a small producer, located in the province of Semipalatinsk, near the Chinese boundary line.

SONOMA COPPER MINING CO. **NEVADA.**

Mine office: Rosebud, Humboldt Co., Nev. B. C. Williams, superintendent. Lands, circa 5 miles east of Rosebud, are opened by tunnel, showing ore giving good assay values in copper, gold and silver.

SONOMA MINES OF MEXICO, LTD. **MEXICO.**

Office: 4 Great Winchester St., London, E. C., Eng. Mine office: Avino, San Juan del Rio, Durango, Mex. Geo. H. Johnson, secretary; W. B. Jeffrey, mine manager; E. L. Wagner, superintendent. Organized Nov. 4, 1899, under laws of Great Britain, with capitalization £500,000, shares £1 par; issued, £450,407. Lands, 415 acres, carrying ores of gold, silver and copper, the Sonoma claims showing a large body carrying 2.5 to 4% copper, with fair gold and silver values, while the Malinche claim is said to show ore carrying up to 10% copper, with small gold and silver values. Has steam power.

COMPAÑIA MINERA DE LA SONORA. **MEXICO.**

Mine office: Cumpas, Moctezuma, Sonora, Mex. Property is the San José mine, carrying auriferous and argentiferous copper-lead ores. Has steam power.

SONORA BONANZA MINING CO. **MEXICO.**

Dead. Reorganized, 1907, as Superior-Bonanza Mining Co. Formerly at Imuris, Magdalena, Sonora, Mex. Described Vol. VI.

SONORA-CANANEA DEVELOPMENT CO. **MEXICO.**

Office: care of L. A. Burleigh, clerk, Augusta, Me. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. Organized circa January, 1907, under laws of Maine, with capitalization $5,000,000. Apparently still-born.

SONORA CENTRAL MINES CO. **MEXICO.**

Office: 920 Merchants Loan & Trust Bldg., Chicago, Ills. Mine office: Alamos, Sonora, Mex. Employs circa 30 men. Frederick B. Smith, president; Amos C. Ballou, vice-president; W. R. Angell, secretary; Frederick E. Mills, treasurer; Jas. R. Hendra, general manager; preceding officers, Otto R. Barnett, Edw. B. Tolman, A. C. Waters, Van Ness D. Smith, Edmund J. James, Marquis E. Eaton, Lawrence D. Ballou, A. S. Service and Don S. Harvey, directors; Dr. Ernest A. Haggott, consulting engineer.

Organized July 18, 1907, under laws of Arizona, with capitalization $10,000,000, shares $10 par; fully issued. Continental Securities Co., fiscal

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agent; Loan, Trust & Savings Bank, Chicago, transfer agent. Annual meeting, fourth Saturday in September.

The corporate relations of this company are somewhat indistinct, as the company ostensibly was a merger of the International Copper & Gold Co., Southern Sonora Development Co., and Santa Cruz Mining Co., but apparently the corporations named as merged remain in existence, and the Sonora Central Mines Co. apparently controls, through stock ownership, the International Copper & Gold Co., Southern Sonora Development Co. and Santa Cruz Mining Co., which in turn apparently control the Montana Copper & Gold Co., Santa Fé Copper & Gold Co., San Bernardo Copper Co., and Sombreretillo Mining Co., S. A. Inasmuch as the various corporations named are credited with the ownership of mining properties apparently claimed also by others of the number, it has been thought best to describe, under the title of Sonora Central Mines Co., the various properties claimed, either through stock ownership or through control of subsidiary corporations.

Lands are reported, by the company, as 271 claims, area 780 acres, held from the Mexican government, but 271 pertenencias, in Mexico, would have an area of 655 acres only. There also is a 10-acre millsite and 3,087 acres of agricultural lands in the Mayo Valley, where the company claims that 3 crops can be raised yearly. Lands, as reported by the company, are in the Altar and Alamos districts of Sonora, Mexico, but, in the company's advertisements, are reported as also occurring in Sinaloa, Mexico, and in Madison and Missoula counties, Montana. There are 20 different properties, of which 5 are said to carry copper, 1 lead, 6 silver and 8 gold.

Principal property is the Santo Domingo, near the Quintera and Zambona mines, showing ore bodies reported as fissure veins in granite and porphyry, and as contact deposits between granite and porphyry, apparently occurring as a vein of 30′ width and 2,000′ length, carrying chutes of payable ore of 6′ to 18′ width and 40′ to 90′ length. The Santo Domingo is said to have ore with a footwall paystreak assaying up to 220 oz. silver, from silver-copper glance, and is said to have 7′ of mixed copper and silver ore, assaying 17 oz. silver per ton. Development is by a 360′ shaft, with circa 2,500′ of workings.

The Stone Creek mines, sometimes known as the Ballarat & Wallede group, area 120 acres, 18 miles from Dillon, Madison Co., Mont., have a 300′ two-compartment shaft, with 1,370′ of workings, and are said to have shipped some ore to Butte smelters returning 17% copper.

The Dolcoath mine, at Alamos, is said to show ore assaying 12% copper and circa 20 oz. silver per ton.

El Sombreretillo gold mine, area 112 hectares, is in the Altar district of Sonora.

La Australia group, 20 claims, in El Fuerte district of Sinaloa, is opened by a 70′ shaft, with circa 400′ of workings, showing a 12′ paystreak of ore assaying 15% copper and 112 oz. silver per ton.

El Sorteo group, 20 claims, 7 miles from San Bernardo, Alamos, Sonora, has a 30′ vein, opened by a 300′ tunnel, showing ore assaying well in copper, silver and gold.

El Pedregal group, 15 hectares, 17 miles from Alamos, has a 200′ shaft and a 1,760′ tunnel.

La Negra group, 14 hectares, adjoining El Pedregal, has a 100′ shaft, with circa 1,500′ of workings, and is equipped with a 10-stamp mill.

La Perla group, 5 claims, near Quiriego, has a 100′ shaft and a 250′ tunnel.

The Zacatecas group, 10 hectares, near the Trigo gold mine, has 50′ of workings, said to show gold ore.

The Santa Cruz group includes the Marte and Cuiche gold properties, in

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the Altar district, the Santa Cruz having a 380′ shaft and a 300′ tunnel, and the Cuiche having a 60′ shaft, the properties having circa 3,000′ of workings, and a 10-stamp mill.

El Niño group, 10 claims, 8 miles east of El Pedregal and 30 miles south of San Bernardo, has 90′ of workings, said to show silver-lead ore.

San Pablo group, 10 claims, in the Altar district, is said to be an antigua, with considerable workings.

La Higuera group, 8 claims, is said to show silver-lead ore.

La Josefita group, 14 claims, 30 miles east of Alamos, has 100′ of workings, said to show copper ore.

Santa Ana group, 4 claims, has 50′ of workings, said to show silver-lead ore.

La Higuera group, 8 hectares, is said to show a 16′ paystreak in a 50′ vein carrying mainly silver values.

El Quebradillo group, 4 claims, is said to show copper ore.

The Ruth group, in Missoula county, Montana, with 100′ of workings, is said to show copper ore.

The company plans deepening the Santo Domingo mine and adding a 100-ton concentrator. The company has some excellent men in its directorate, but is not regarded favorably, because of the antecedents of the present corporation, and the difficulty experienced in determining which is which in the matter of properties held by the different interlocking companies. The ownership of 20 scattered properties must be regarded as a source of weakness rather than of strength.

SONORA CHIEF MINING CO. **MEXICO.**

Office: 323 American Bank Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. L. H. Jansen, president and general manager; Dr. Moses T. Runnels, vice-president; Dr. C. L. V. Hedrick, secretary and superintendent; Harry Haldemann, assistant secretary and treasurer; preceding officers, A. H. Glasner and W. T. Cramer, directors; Morris Hesse, mine superintendent. Organized July 18, 1904, under laws of Arizona, and procotolized, October, 1905, under laws of Mexico, with capitalization $1,500,000, shares $1 par.

Lands, 11 claims, in 2 groups, known as the Phœnix and Lakeside, area 464 acres, 8 miles south of Suaqui de Batuc, with country rocks of granite-porphyry, diorite and limestone, showing several large, continuous ore bodies, of which 4 are of 5′ to 6′ average width, carrying ores said to give average assays of 15.8% copper, 10 to 80 oz. silver and $25 to $49 gold per ton. Company reports that 10% of production is auriferous and argentiferous whitneyite. Development is by shafts of 95′ and 125′, and by tunnels of 25′, 754′ and 248′, with circa 4,000′ of workings. Development is mainly at the Phœnix group. The Yaqui river has an available waterfall, estimated as capable of generating 440 h. p. Idle.

SONORA CONSOLIDATED GOLD MINES CO., LTD. **MEXICO.**

Office: Quiriego, Alamos, Sonora, Mex. Capitalization $3,000,000, shares $5 par. Is controlled, through stock ownership, by Douglas Copper Co. Lands, circa 140 acres, known as the Trigo group of gold claims, said to include antiguas having extensive workings.

SONORA COPPER COMPANY OF MEXICO. **MEXICO.**

Dead. Assets, consisting of a lawsuit, sold to Puertecito Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

SONORA COPPER SMELTING CO. **MEXICO.**

Office: 424 Scarritt Bldg., Kansas City, Mo. Mine office: Noria, Magdalena, Sonora, Mex. Employs circa 60 men. A. M. Conrad, president and superintendent; J. M. Lowe, vice-president; C. E. Kroh, secretary; W. R. Moore,

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treasurer; preceding officers, R. S. Stone, F. E. Reed and E. E. Axline, directors. Organized June 25, 1908, under laws of Arizona, as successor of Sonora Copper Co., with capitalization $3,000,000, shares $10 par; issued, $1,500,000. Annual meeting, third Tuesday in December.

Lands, circa 500 acres, with miscellaneous holdings of approximately 8,500 acres of valley land, on both sides of the railroad, including a townsite at Noria, between Llano and Puerto. Lands are in 5 groups, known as the Extension de la Washington, Cobre Grande, Creston de Cobre, Veta Grande and Wedge. Principal property, area 123 acres, shows limestone, diorite, porphyry, granite and quartzite, carrying various ore bodies, mainly with north and south strike, principal work being on the large ore body of the Extension de la Washington group, of 4′ to 97′ width, said to be traceable 3 miles on the company's lands, carrying cuprite, melaconite, azurite, malachite, chalcocite, chalcopyrite, chrysocolla, tetrahedrite and galena, giving assays of 2 to 40% copper, 5 to 25 oz. silver and $2.50 to $30 gold per ton. Development is by 7 shafts, of 53′ to 260′ depth, and by tunnels of 50′, 200′, 245′, 250′ and 1,150′, with about 4,500′ of workings, estimated to show 50,000 tons of ore. Upper workings are said to show veins of 25′ and 40′ width, carrying oxidized ores.

Equipment includes a steam plant and a 25-h. p. gasoline hoist, and the company has a store at the mine. Company plans continuous development, and eventually adding necessary mining and reduction equipments.

SONORA DEVELOPMENT CO. **MEXICO.**

Dead. Lands sold, 1907, to Fay-Cananea Copper Co. Formerly at Moctezuma, Sonora, Mex. Described Vol. VI.

SONORA & KANSAS CITY DEVELOPMENT CO. **MEXICO.**

Dead. Formerly at Suaqui de Batuc, Ures, Sonora, Mex.

SONORA MINING CO. **MEXICO.**

Dead. Was succeeded, circa 1906, by Antigua Copper Co. Formerly at Aguacaliente de Baca, Fuerte, Sinaloa, Mex. Fully described Vol. VI.

SONORA MINING & DEVELOPMENT CO. **MEXICO.**

Office: Spitzer Bldg., Toledo, Ohio. Mine office: San Antonio de la Huerta, Ures, Sonora, Mex. A. E. Klauser, president; A. V. Baumann, vice-president; H. B. Thompson, secretary; H. R. Klauser, treasurer; Herman Lockhart, Jr., general manager; H. C. Gerber, superintendent; preceding officers and C. A. Leeper, directors; Samuel James, consulting metallurgist. Organized 1901, with capitalization $5,000,000, shares $1 par; issued, $1,500,000. International Trust Co., Boston, registrar; Frederick R. Tibbetts, Boston, Mass., transfer agent.

Lands, 154 hectares, also circa 1,000 acres miscellaneous lands, including a townsite, in the Hermosillo, Sahuaripa and Ures districts. Nearest railroad is the Cananea, Rio Yaqui y Pacifico, 30 miles distant, but direct rail connections are expected later.

Company has experienced considerable trouble from Yaqui Indian depredations, and also has met with some difficulties in working out metallurgical problems.

SONORA MINING & MILLING CO. **MEXICO.**

Dead. Was succeeded, Feb. 15, 1906, by Juarez Mining Co. Formerly at Tubutama, Altar, Sonora, Mex. Described Vol. V.

SONORA & SOUTHWESTERN MINES CO. **MEXICO.**

Office: care of Chas. W. Bolen, Clinton Bldg., Columbus, Ohio. Organized circa January, 1907, to develop properties in the Ures district of Sonora, Mexico.

SONORENSE PROSPECTING & DEVELOPING CO. **MEXICO.**

Dead. Formerly at Ures, Sonora, Mex. Described Vol. VI.

COMPANHIA MINEIRA DE SOTIEL-CORONADA. **SPAIN.**

Office: Rua dos Sapateiros 22, Lisbon, Portugal. Mine office: Calañas,

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Huelva, Spain. Senhor Dom Agusto Fuschini, chairman; Thos. Morrison & Co., agents. Lands, 666 hectares, including 34 old mines, carrying cupriferous pyrite. Works steadily, in a rather small way, producing cupriferous pyrite and cement copper equivalent to an average annual production of 1,000,000 lbs. fine copper.

SOCIEDAD ANONIMA MINAS DE SOTO. **SPAIN.**

Office: Bilbao, Spain. Mine office: Reinosa, Santander, Spain. Lands, under perpetual lease to Enrique G. W. Romer, with option of purchase, are described under title Minas de Soto.

MINAS DE SOTO. **SPAIN.**

Office: 32 Muelle, Santander, Spain. Mine office: Reinosa, Santander, Spain. Lands, owned by Sociedad Anonima Minas de Soto, are held, on perpetual lease, with option of purchase, by Enrique G. W. Romer. Property, which is the most important copper mine in the north of Spain, shows veins carrying high grade chalcopyrite, and about 250 tons of 28% ore were shipped, latter half of 1906 and first half of 1907. Has steam power and a small mill. Production, 1907, estimated at 125,000 lbs. fine copper.

SOUTH AFRICAN COPPER ESTATES, LTD. **CAPE COLONY.**

Dead. Dissolved, September, 1904. Formerly in Little Namaqualand, Cape Colony.

SOUTH AFRICAN GOLD & COPPER SYNDICATE, LTD. **TRANSVAAL.**

Office: 237 Finsbury Pavement House, London, E. C., Eng. Mine office: Pietersburg, Zoutpansberg, Transvaal. E. G. Knights, chairman; E. C. C. Smith, secretary. Organized Nov. 24, 1903, under laws of Great Britain, with capitalization £15,000, shares £1 par, in £10,000 preferred and £5,000 ordinary shares. Lands, 11,300 acres, held under option, southeast of Pietersburg. It is stated that gold and copper ores have been found.

SOUTH AMERICAN COPPER SYNDICATE, LTD.

Office: 2 Broad Street Place, London, E. C., Eng. E. Edwards, chairman; Chas. D. Comrie, secretary. Organized March 27, 1907, under laws of Great Britain, with captalization £7,500, shares £1 par. Was organized with object of acquiring and working copper mines in South America. Location of lands, if any, unknown.

SOUTH AMERICAN DEVELOPMENT CO. **PERÚ.**

Dead. Was succeeded, circa 1903, by Cerro de Pasco Mining Co. Formerly at Cerro de Pasco, Junín, Perú.

SOUTH AUSTRALIAN COPPER SYNDICATE, LTD. **AUSTRALIA.**

Dead. Never did any business.

SOUTH BEE SYNDICATE. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Organized 1906, under laws of New South Wales, with capitalization £25,000, shares 5s. par. Lands, lying south of the Queen Bee Mine, have a shallow shaft, showing copper stains.

SOUTH BISBEE COPPER MINING & TOWNSITE IMPROVEMENT CO. **ARIZONA.**

Dead. Wound up, 1904. Lands sold to Lake Superior & Pittsburg Mining Co. Formerly at Bisbee, Cochise Co., Ariz. Described Vol. II.

SOUTH BLUESTONE MINE. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Is said to have a good surface showing of ore.

SOUTH BUTTE COPPER MINING CO. **MONTANA.**

Office: 51 East Broadway, Butte. Silver Bow Co., Mont. Mine office: Corbin, Jefferson Co., Mont. Jas. Davidson, president and general manager; Geo. B. Conway, vice-president; Frank E. Whitehead, secretary; J. W. Kemper,

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treasurer; preceding officers and R. E. Tait, directors; Hugo Freyler, superintendent. Organized Jan. 24, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $860,000. Annual meeting, first Wednesday in April.

Lands, 8 claims, freehold, area 151 acres, in the Summit Valley district, 2 miles south of Butte, opened by the 326′ Virginia shaft. Company also holds, under bond and lease, the Daphne group of 5 claims, adjoining the Boston & Corbin mine, in Jefferson county, having a 175′ shaft and a 460′ tunnel, said to show a 12′ vein carrying native copper and some ore assaying up to 14% copper, 11 oz. silver and $2 gold per ton. Equipment includes a 75-h. p. hoist and 2-drill air-compressor, with several small mine buildings. The Daphne group is held under a bond for $83,000, due Nov. 2, 1909, with lease on 15% royalty, payments to be applied on the bond.

SOUTH BUTTE MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. John G. Williams, M. E. Riley and Arthur Howell, directors. Organized May 25, 1906, under laws of Minnesota, with capitalization $500,000, shares $100 par. Was organized by the Great Northern Railway interests, and is controlled by the Lewisohns. Has been in litigation with numerous individuals and companies, including the East Butte, in efforts to quiet title to a narrow strip of the Great Northern right-of-way, to which the mineral rights are claimed by the East Butte and North Butte.

SOUTH BUTTE ZONE MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. C. F. Floyd, John Redlich, Albert Cully, Geo. E. Seiple and Edward Power, directors. Organized, early 1907, with capitalization $1,000,000, shares $1 par. Never operative and apparently moribund.

SOUTH CANANEA COPPER MINING CO., S. A. **MEXICO.**

Is the Mexican incorporation of the Pennsylvania & Cananea Copper Co.

SOUTH CANNINDAH SYNDICATE, LTD. **AUSTRALIA.**

Mine office: Mount Cannindah, Queensland, Australia. Lands, 1 to 2 miles south of the Mount Cannindah mine, are supposed to carry circa one-third mile of the extension of the Apple Tree ore body. Mine has a 75′ underlay shaft, showing a vein of 7′ to 8′ width, and management plans sinking 2 additional underlay shafts. Shipments, December, 1906, to April, 1907, of about 25 tons of hand selected ore, gave average returns of circa 9.7% copper, 1.4 oz. silver and 2 dwts. gold per long ton. Idle.

SOUTH CATTLIN MINE. **AUSTRALIA.**

Mine office: Ravensthorpe, Phillips River gold field, Western Australia. Lands, south of the Mt. Cattlin, show a 30′ vein.

SOUTH COLUMBUS MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Anthony O. Jacobson, president and manager; Walter L. Maas, secretary and treasurer; preceding officers, Val. S. Snow, S. A. Whitney and Wm. M. Bradley, directors. Organized Feb. 11, 1904, with capitalization $3,000,000, shares $1 par, as successor of Centennial-Bingham Mining Co., and increased capitalization, circa September, 1908, to $500,000, shares $1 par, to provide capital for acquiring the Columbus-Wedge. In October, 1908, sold 70,000 shares of treasury stock, for $35,000 cash, leaving 30,000 shares unissued, and gave 115,000 shares of new stock to the Columbus-Wedge Mining Co., in exchange for property of latter.

Lands include the Wedge group, showing good silver-lead values, and the Alta-Quincy group, opposite the Columbus Consolidated, having a tunnel cutting a 25′ fissure vein having a hanging-wall paystreak assaying up to 11%

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copper, 10 oz. silver and $2.80 gold per ton. In November, 1908, on the 600' level, a crosscut showed ore assaying 10% copper, 5.5% lead and 25 oz. silver per ton.

Company formerly held a property, circa 4 miles from Park City, area 6 acres, having a 1,050' tunnel, showing mainly silver-lead values, with some ore of 3.5 to 45% copper tenor, from which small shipments were made, 1907, but apparently this property is idle, or has been forfeited.

SOUTHERN ARIZONA SMELTING CO. **ARIZONA.**

Office: 11 Pine St., New York, N. Y. Operating office: Tombstone, Ariz. Works office: Silver Bell, Pima Co., Ariz. Employs circa 125 men. E. B. Gage, president; W. F. Staunton, vice-president and general manager; A. N. Gage, secretary and treasurer; preceding officers, Selwyn Eddy, V. L. Mason, F. M. Murphy and H. M. Robinson, directors; A. S. Donan, superintendent. Organized Aug. 10, 1906, under laws of Arizona, with capitalization $1,500,000, shares $100 par. Is controlled, through ownership of entire stock issue, by Imperial Copper Co. Works represent an investment of circa $500,000.

Lands, 8 miles south of Red Rock and 12 miles from the Imperial mine, with a down grade haul, include the 110-acre townsite of Sasco, with 400 lots, each 50x150'.

The reduction plant, known as the Sasco smelter, includes a sampling mill, blast-furnace building, converter building, power-house, boiler-house, machine-shop and smithy, all of steel frames, also dwelling houses, a store, office and miscellaneous buildings. All of the principal buildings are planned so that they can be extended in two directions, providing an almost unlimited capacity for expansion. The smelter, blown in Feb. 1, 1908, does a general custom business, but treats mainly ore of the Imperial mine, and is of 300 tons nominal daily capacity.

The sampling mill is small, but fully equipped. Ore is received from the mines in 50-ton steel-bottom dump cars, discharging into 4,000-ton storage bins.

The cupola building is constructed for 2 blast-furnaces, with one furnace installed, this, rated at 300 tons, giving an actual duty up to 400 tons daily. Charging is by cars hauled by electric locomotives, on tracks of 36" gauge. Settler is elliptical, slags, which are of low copper tenor, skimming into 10-ton slag-trucks, hauled by steam locomotives on a standard-gauge track. The dust chamber is 100x350', leading to a 175' stack of 12' diameter.

The converter department has a 50-ton electric traveling crane, of 45' span. There are 6 shells, 84x126" in size, rotated hydraulically, and hoods from the converter stands lead to an independent dust-chamber and stack. Product is blister copper, averaging 99.3% copper, with small quantities of silver and gold.

The power plant has an electric traveling crane and a 650-kw. electric power plant with 440-volt induction motors. There are 2 Nordberg Corliss condensing engines, direct-connected to a No. 9 Connersville blower and a Nordberg cross-compound Corliss condensing air-compressor with 15" and 30" steam cylinders, with two 36" air cylinders and 42" stroke. The boiler-house has 4 Morrison marine boilers. Water is secured from wells in the Santa Cruz valley, by an 8" pipe-line.

SOUTHERN COPPER CO.

Organized Feb. 22, 1905, under laws of Maine. Location of lands, if any, unknown.

SOUTHERN COPPER CO. **NORTH CAROLINA.**

Mine office: Gold Hill, Rowan Co., N. C. A. M. A. Richardson, president; Otto Germer, vice-president; W. M. Richardson, secretary; Walter George

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Newman, manager. Organized circa May, 1906, with capitalization $3,000,000. Presumably idle.

SOUTHERN COPPER MINING CO. **UTAH.**

Office: care of J. M. Reynolds, secretary, treasurer and general manager, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. J. K. Persons, president; B. J. Persons, vice-president; Ed. Mills, superintendent. Organized, May, 1905, under laws of Utah, with capitalization $300,000, shares $1 par. Lands, 5 claims, area 100 acres, surveyed for patents, known as the Brooklyn group, 12 miles north of Milford, adjoining the Wahsatch King. Development is by a 60′ shaft and 200′ tunnel, latter cutting a vein carrying fair values in copper, silver and gold. Presumably idle.

SOUTHERN CROSS COPPER MINE CO., LTD. **BRITISH COLUMBIA.**

Office: 8 Broad Street Ave., London, E. C., Eng. Mine office: Alberni, Vancouver Island, B. C, T. D. Conway, chairman and managing director; Arthur Hebden, secretary. Organized March 5, 1906, under laws of British Columbia, with capitalization $750,000, shares $5 par.

Lands, 5 claims, area 250 acres, crown-granted, with an option over 500 acres adjoining, on the northern side of Uchucklesit Harbor, showing a vein of 12′ to 20′ width, with estimated average of 15′, traceable for some distance, developed by an opencut and a 370′ tunnel, showing chalcopyrite assaying up to 18% copper and $11 gold per ton. Is said to plan a smelter. Shipped, 1906, circa 100 tons of ore.

SOUTHERN NEVADA GOLD & COPPER MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Luning, Esmeralda Co., Nev. I. H. Hood, secretary. Organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, area 40 acres, 3 miles southeast of Luning, said to be in litigation.

SOUTHERN PACIFIC GOLD & COPPER MINING & MILLING CO. **UTAH.**

Office: 213 West Fifth St., Salt Lake City, Utah. Mine office: Ogden, Weber Co., Utah. Employs 5 men. T. S. Freeney, president; Wm. Pow, vice-president; J. W. Burnham, treasurer and general manager. Organized July 20, 1903, under laws of Utah, with capitalization $1,000,000, shares $1 par; issued, $773,910.

Lands, 12 claims, unpatented, area 240 acres, in the Sierra Nevada district, circa 8 miles north of Ogden, carrying circa 25 ore bodies, mainly as contact deposits between quartzite and gneiss, of which 3, under development, of 3′ to 200′ estimated average width, show some oxidized ores, but mainly sulphides, including covellite, bornite and chalcopyrite, developed by 8 tunnels, longest 330′, with circa 700′ of workings, with considerable ore in sight, giving average assays of 3.5% copper and circa 3 oz. silver per ton, with occasional high gold values. Company plans continuous development.

SOUTHERN SMELTING & REFINING CO. **TEXAS.**

Dead. Abortive. Formerly at El Paso, El Paso Co., Tex. Described Vol. VI.

SOUTHERN SONORA DEVELOPMENT CO. **MEXICO.**

Office: 135 Adams St., Chicago, Ills. Mine office: Alamos, Sonora, Mex. Frederick E. Mills, president; Lucius W. Winchester, vice-president; Lawrence D. Ballou, secretary; Amos P. Ballou, treasurer and general manager; preceding officers, F. B. Smith and John W. Elliott, directors; J. R. Hendra, superintendent. Organized July 1, 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, 28 pertenencias, area 69 acres, held under name of San Bernardo Mining Co., showing granite and diorite carrying various fissure veins, of which the Santo Domingo vein, of 14′ average width, is traceable 3,200′, and the Quebradilla vein, estimated at 15′ average width, and the Santa Ana at 8′ average width. Development is by a 300′ shaft, with 360′ of workings, esti-

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mated to show 15,000 tons of carbonate ore, assaying 2% copper, 5% lead, 67 oz. silver and $42 gold per ton, which seems too high. Equipment includes an 80-h. p. hoist, good for 1,500′, a store, assay office and mill, latter not in use.

SOUTHERN STAR COPPER & SMELTING CO.

Dead. Formerly had an office in St. James Bldg., New York, N. Y.

SOUTHERN ZINC & COPPER MINING CO. **ARKANSAS.**

Dead. Formerly at Gillham, Sevier Co., Ark. Described Vol. VI.

SOUTH FURNACE CREEK COPPER CO. **CALIFORNIA.**

Office: Union Trust Bldg., Los Angeles, Cal. Mine office: Greenwater, Inyo Co., Cal. A. T. Woods, treasurer; L. R. Myers, secretary; preceding officers, C. J. Fox and J. G. Lawrence, directors. Lands, 9 claims, 14 miles south of Greenwater, on the eastern slope of the Funeral Range, said to have a 100′ shaft on a 5′ vein, showing ore assaying 25% copper and 10 to 12 oz. silver per ton. Idle.

SOUTH GLOBE DEVELOPMENT CO. **ARIZONA.**

Dead. Lands were 12 claims, 6 miles south of Globe, having a shallow shaft showing auriferous sulphide copper ore of fair tenor. Formerly at Globe, Gila Co., Ariz.

SOUTH GREENWATER COPPER CO. **CALIFORNIA.**

Office: Tonopah, Nev. Mine office: Greenwater, Inyo Co., Cal. John S. Hills, president and general manager; Malcolm Smith, vice-president; R. C. Moore, secretary and treasurer; preceding officers, Hon. T. L. Oddie and Roger C. Knox, directors; H. S. Chapman, superintendent. Organized November, 1906, under laws of Nevada, with capitalization $1,500,000, shares $1 par.

Lands, 14 claims, 1 fractional, area circa 275 acres, known as the Miller group, at Miller Springs, 15 miles south of Greenwater, having 3 shallow shafts showing 2 veins, 1 carrying a promising outcrop of about 40′ width, and 1 of about 6′ average width carrying ore giving good assay values in copper. Property is above the average of promise in the Greenwater district. Idle.

SOUTH KEARSARGE MINE. **MICHIGAN.**

Owned by Osceola Consolidated Mining Co.

SOUTH MOUNT LYELL MINING CO., LTD. **TASMANIA.**

Dead. Formerly at Gormanston, Montagu Co., Tasmania. Described Vol. VI.

SOUTH NAMAQUA SYNDICATE. **CAPE COLONY.**

Dead. Was merged, circa March, 1908, in Insizwa Nickel & Copper Developing Co., Ltd. Formerly at Kokstad, Cape Colony.

SOUTH NEVADA COPPER SYNDICATE. **NEVADA.**

Letter returned unclaimed from former office and mine, Goldfield, Nev. Walter Stone, president; Frank B. Hobbs, secretary and treasurer; Wm. Prior, general manager. Organized 1906, under laws of South Dakota, with capitalization $2,000,000, shares $1 par. Lands, 5 claims, area 100 acres, known as the Santa Ana group, in the Slate Range, circa 14 miles south of Goldfield, having a 30′ shaft, showing a 30′ vein, surface ores of which assay 9 to 10% copper, 8 oz. silver and $10 gold per ton. Presumably idle.

SOUTH PACKER MINE. **IDAHO.**

Mine office: Ivers, Custer Co., Idaho. Has lands near the Lost Packer.

SOUTH PEACOCK MINING CO. **IDAHO.**

Office: 88 State St., Boston, Mass. Letter returned unclaimed from former mine office, Weiser, Washington Co., Idaho. Thos. S. Wentworth, president; Wm. L. Pratt, secretary. Capitalization, $500,000. Has a shaft showing cuprite. Idle some years.

SOUTH RANGE MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. John W. Belches, president; H. W. Wesson, treasurer; F. W.

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Nichols, secretary. Capitalization $2,500,000, shares $25 par. Lands, circa 7,000 acres, undeveloped, lying mainly between the Globe and Belt properties, in Houghton and Ontonagon counties, Michigan, and so located that future mining companies, carved out of new territory in this district, will have to see the South Range company, or organize with very jagged outlines, in many cases.

SOUTH SAN XAVIER COPPER CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. Lands show a contact deposit between limestone and porphyry, with a good gossan, of 30′ estimated width, carrying a 30″ paystreak of sulphide ore assaying up to 28% copper and 12 oz. silver per ton, opened by a two-compartment shaft of circa 200′ depth. Smelter shipments have returned 13.5 to 20% copper, with small silver values.

SOUTH SIDE MINING CO. **MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. Mine office: Leopold Bldg., Houghton, Houghton Co., Mich. John C. Watson, president; Fred W. Nichols, agent; C. O. Burbank, secretary and treasurer. Reorganized April, 1899, under laws of Michigan, as successor of company of same name, which levied assessments of about $90,000 to 1872. Annual meeting, first Monday in March. Lands, circa 200 acres, lying west of the Dakota and north of the Naumkeag, immediately west of Houghton, with one-half mile frontage on Portage Lake. Mining operations were confined to exploratory work many years ago. Idle since circa 1873.

SOUTH SWANSEA MINING CO. **UTAH.**

Office: 431 Atlas Blk., Salt Lake City, Utah. Mine office: Silver City, Juab Co., Utah. Claude V. Wheeler, president; J. M. Wheeler, vice-president; J. C. Croxall, treasurer; W. H. Farnsworth, secretary; Jesse Knight, general manager. Organized May 11, 1908, under laws of Utah, with capitalization $300,000, shares $1 par. Has paid dividends of $169,460, last dividend being disbursed April, 1904. Ore carries mainly silver values, with some copper and gold. Production, 1907, was only 3 carloads of ore.

SOUTH THARSIS MINING CO., N. L. **TASMANIA.**

Dead. Property was sold, for £45,000, to Mount Lyell Mining & Railway Co., Ltd. Formerly at North Mount Lyell, Montagu Co., Tasmania.

SOUTHWEST AFRICA CO., LTD. **GERMAN SOUTHWEST AFRICA.**

Offices: 3 Laurence Pountney Hill, Cannon St., London, E. C., Eng., and Unter den Linden 35, Berlin, Germany. E. Davis, chairman; C. Launspach, secretary; Tob. Tönnesen, African manager. Organized Aug. 18, 1892, with capitalization £2,000,000, shares £1 par; issued, £1,200,000. Property is mineral concessions covering 22,000 square miles, including nearly 4,500 square miles of freehold, in Damaraland, and mining rights to 23,000 square miles in Ovamboland, total holdings including 40,000 square miles of freehold, with mining rights over 90,000 square miles additional, also sundry railroad concessions. Holds large share interests in the Otavi Mines & Railway Co.

SOUTHWESTERN CONSOLIDATED SMELTING CO. **CALIFORNIA.**

Office: 39 Cortlandt St., New York, N. Y. F. C. Kaye, president; J. C. De Wolfe, treasurer; I. L. Thompson, secretary; E. Homer Grasty, manager. Organized August, 1904, with capitalization $2,000,000, shares $1 par. Company claimed to plan building a smelter somewhere in California. Was merely a stock-jobbing device, promoted by Messrs. Kaye, De Wolfe & Co., whose "mining" operations merely lead to the depletion of the pockets of their "customers."

SOUTHWESTERN COPPER CO. **NEW MEXICO.**

Dead. Lands sold, circa May, 1906, to Burro Mountain Copper Co. Formerly at Silver City, Grant Co., N. M.

SOUTHWESTERN COPPER CO. **TEXAS.**

Letter returned unclaimed from former mine office, Sierra Blanca, El Paso

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Co., Tex. F. W. Thomme, president. Lands, 1 mile from Sierra Blanca, have a 200′ shaft, showing a 6′ vein, carrying ore assaying up to 18% copper. Has steam power. Idle.

SOUTHWESTERN COPPER & IRON CO. **NEW MEXICO.**

Dead. Lands sold, May, 1906, to Burro Mountain Copper Co. Formerly at Leopold, Grant Co., N. M.

SOUTHWESTERN DEVELOPMENT & IMPROVEMENT CO. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Property is the Polaris mine, held under bond and lease, from Polaris Mining & Milling Co. Property is described under title of owner.

SOUTHWESTERN GOLD & COPPER CO. **ARIZONA.**

Dead. Formerly at Douglas, Cochise Co., Ariz.

SOUTHWESTERN MINE & SMELTING CO. **ARIZONA.**

Dead. Formerly at Gleeson, Cochise Co., Ariz.

SOUTHWESTERN MINING CO. **MEXICO.**

Dead. Was merged, circa August, 1908, in Kansas-Cananea Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex. Fully described Vol. VI.

SOUTHWESTERN SMELTING CO. **CALIFORNIA.**

Dead. Formerly at Letcher, San Bernardino Co., Cal.

SOUTHWESTERN SMELTING & REFINING CO. **ARIZONA.**

Dead. Sold, Sept. 15, 1906, by sheriff, under execution, to Walter L. Wilie. Formerly at Benson, Cochise Co., Ariz. Described Vol. VI.

SOUTH WEST SMELTING & REFINING CO. **NEW MEXICO.**

Office: 517 Francis St., St. Joseph, Mo. Mine and works office: Orogrande, Otero Co., N. M. Geo. J. Green, president; Geo. A. Guild, vice-president; T. G. Travis, secretary and treasurer; Daniel B. Hunt, assistant secretary; Wm. A. Evans, assistant treasurer; preceding officers, Mansfield M. Riggs, Archibald M. Woodson, John E. Lonsdale, Chas. B. Hughes, Clinton P. Cockrill, Jos. P. Standley and Ichabod McCord, directors; J. J. Murray, general manager; J. S. Airheart, superintendent.

Organized Dec. 5, 1904, under laws of New Mexico, with capitalization $750,000, increased, circa April, 1907, to $1,250,000, shares $100 par. Bonds, $150,000, at 5%. Controls, through stock ownership, New Mexican Land & Development Co., which owns the townsite of Orogrande, and is said to control a number of other allied and subsidiary corporations. Annual meeting, third Tuesday in November.

Lands, 36 claims, area 720 acres, also an 80-acre smeltersite and a 640-acre townsite, giving total holdings of 1,440 acres, bought of the Jarilla Mining Co., in the Silver Hill district of Otero county and the Organ district of Donna Ana county, New Mexico. Principal holdings are in the Silver Hill district, in the Jarilla Mountains, circa 60 miles north of El Paso, and, in addition to copper lands, the company holds sundry placer gold claims and a mine of auriferous iron ore, highly suitable for fluxing. The company also owns a limestone quarry for flux, which has been stated in the press to carry 80 cents to $6 gold per ton, which seems too good to be true.

Principal mining properties are the Lucky, Nanny Baird, Iron Mask and Garnet mines. The three properties first named show limestone and porphyry, carrying 16 contact deposits, of which 7, more or less developed, range from 3′ to 40′ in width, with known length of 100′ to 700′, carrying native copper, cuprite and malachite, said to give average assays of 7% copper, 2 oz. silver and $5 gold per ton, all ores being slightly argentiferous and strongly auriferous.

The Lucky mine, developed by a 300′ shaft, and by tunnels of 250′ and 625′, is said to show a large amount of auriferous copper ore averaging circa 7% copper and $6 gold per ton, and the mine has proven very wet. A 500′ tramway from the mine leads to the railway track.

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The Nanny Baird mine has a vein of circa 25′ average width, carrying small copper and silver values, with good gold values, and to the south is a placer gold tract, of some promise. Development is by a 100′ vertical shaft and an 800′ incline shaft. The Lucky and Nanny Baird mines jointly have about one mile of workings, estimated by company to show 100,000 tons of ore of good average grade blocked out for stoping, which figures probably are too high.

The Iron Mask mine, on Iron Mountain, produces auriferous iron ore, assaying circa 60% iron and $2 to $8 gold per ton, with an estimated average gold value of $3 to $4. It is planned to reach the Iron Mask by a railroad spur.

The Garnet mine, taken over early 1908, has a 480′ shaft, equipment including a 20-h. p. gasoline engine and an air-compressor.

The mining plant includes three 85-h. p. boilers, two 8x10″ hoists, good for 800′ each, and 2 Sullivan air-compressors, of 28 drills aggregate capacity, with 23 power drills.

Buildings are 22 in number, including 4 smithies, a 20x40′ machine-shop, general store, office, assay office and laboratory. The townsite of Orogrande has electric light and a telephone exchange, maintained by the company.

Water is brought, 21 miles, from a dam across the Sacramento river, in the Sacramento Mountains, by a 6″ pipe-line, leading to a 25,000,000-gallon reservoir, on the side of Baird Hill, just above the townsite of Orogrande. The daily flow of the river is said to be 10,000,000 gallons, and the capacity of the pipe-line is circa 500,000 gallons daily, delivering water at about 800 lbs. pressure per square inch, under a static head of 1,500′.

The smeltersite, less than a mile from Jarilla Junction, is about 1½ miles from the mine, and includes ore-bins, sampling mill, furnace building and power-house. The furnace building, of steel, is designed for two 250-ton furnaces, with equipment in place for both, but only one furnace is installed, this having been blown in early November, 1907. The furnace building has a 125′ steel smokestack, of 14′ diameter at the base and 9′ at the top. The smelter is reached by a private spur track from the El Paso & Northeastern Railroad, and is connected by a branch line with the mines.

The smelter power plant has three 150-h. p. Heine boilers, two 120-h. p. Filer & Stowell Corliss high-speed engines, 2 Hendrie & Bolthoff electric generators and two No. 8 Connersville blowers.

The company formerly employed about 200 men, and made its first matte shipment to Chrome, N. J., in July, 1907, but suspended operations May, 1908, when Geo. J. Green, the president, was appointed receiver, in a friendly action. The plant was idle at the end of 1908.

SOUTH YALE COPPER CO., LTD. **BRITISH COLUMBIA.**

Mine office: Grand Forks, Boundary district, B. C. Frederick Keffer, manager. Organized January, 1905, under laws of British Columbia, with capitalization $450,000, shares $1 par. Apparently property was a bond and lease on the Sunset group.

SOUTH YUBA MINING & SMELTING CO. **CALIFORNIA.**

Mine office: French Corral, Nevada Co., Cal. Presumably idle.

SOVEREIGN CONSOLIDATED COPPER CO. **OREGON.**

Office: Baker City, Ore. Mine office: Sparta, Baker Co., Ore. W. G. Gladding, president; John Arthur, vice-president; Kenneth O. McEwen, secretary; J. W Patterson, treasurer; preceding officers and John Ramb, directors. Organized Dec. 5, 1907, under laws of Oregon, with capitalization $2,000,000. Lands, 12 claims, area circa 200 acres, on Coin Creek, in the foothills of the Eagle Mountains, showing a mineralized zone of about 200′ width, traceable 6,000′ on the company's lands.

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SOVEREIGN COPPER MINING CO. **WYOMING.**

Dead. Formerly at Battle, Carbon Co., Wyo.

SPANISH-AMERICAN FEDERAL SMELTING & REFINING CO. ARIZONA.

Office: 11 Buckler Bldg., El Paso, Tex. Mine office: Nogales, Santa Cruz Co., Ariz. J. V. Smith, president; F. A. Schneider, general manager; J. P. Stapleton, attorney. Organized circa January, 1908. Property apparently is the idea of building a 1,200-ton smelter at Nogales, and company apparently is a replica of the Pan-American Smelting & Refining Co., and is not regarded favorably.

SPANISH COPPER CO., LTD. **SPAIN.**

Office: 2 Tokenhouse Bldgs., London, E. C., Eng. Mine office: San Vicente, via Paimogo, Huelva, Spain. G B. Mee, chairman; Miguel Yglesias, managing director. Organized June 8, 1883, with capitalization £150,000; shares £10 par; issued £110,000.

Lands, 16 claims, area upwards of 400 acres, 6 claims, area 200 acres, perpetual leasehold, being held on an annual rental of £400, also 23 acres miscellaneous lands, in the Paimogo district of Huelva, showing 6 contact veins between porphyry and clay-slate, of which 3 are developed, these averaging 30′ width and 500′ length, opened by numerous shafts of 30′ to 165′ depth, and 14 tunnels, longest 1,840′, estimated to show 2,500,000 tons of ore, with 100,000 tons blocked out for stoping. Ore is mainly cupriferous pyrite, claimed to average about 4% copper, 3 oz. silver and $2 gold per ton. Mines, first opened by the Phœnicians, were reopened 1862, and again in 1872, 1883, 1901 and 1905. The Guadiana railroad is 5 miles distant.

SPANISH MINERALS DEVELOPMENT, LTD. **SPAIN.**

Dead. Was succeeded, Feb. 14, 1908, by Esperanza Copper & Silver Co., Ltd. Formerly at Almonáster, Huelva, Spain. Described Vol. VI.

SPAR COPPER MINES & TUNNEL CO. **COLORADO.**

Office: care of F. N. Stiles, president and general manager, Denver, Colo. E. A. Stiles, secretary; F. W. Downs, treasurer. Organized June 17, 1904, under laws of Colorado, with capitalization $600,000, shares $1 par. Lands, 9 claims, on Contact Mountain, Tomichi district, Gunnison county, Colorado, formerly known as the Morning Glim, having circa 1,500′ of workings, with gasoline power and 3 mine buildings. Is said to have produced upwards of $75,000 worth of ore, in the past. Presumably idle.

SPAR GOLD & COPPER CO. **ARIZONA.**

Dead. Lands sold, circa 1908, to Pocahontas Copper Queen Mining Co. Formerly at Mayer, Yavapai Co., Ariz.

SPARTA MINING & DEVELOPMENT CO. **OREGON.**

Office: care of Chas. P. Caffrey, Logansport, Ind. Mine office: Sparta, Baker Co., Ore. Lands, 15 claims, including the Blue Boulder group, 3 miles south of Sparta, having a vein of about 100′ width, opened by a 75′ tunnel and several pits of 10′ to 20′ depth, showing auriferous copper ore.

SPASSKY COPPER MINE, LTD. **SIBERIA.**

Office: 60 London Wall, London, E. C., Eng. Mine office: Spassky Zavod, Akmolinsk, Siberia. Arthur Fell, M. P., chairman; Ernest Carnot, vice-chairman; John A Clark, secretary; Herbert C. Wolmer, general manager; R. E. V. Vinicombe, mine superintendent; R. McLeod Percy, colliery superintendent; F. C. Knight, smelter superintendent; Pellew, Harvey & Fell, consulting engineers.

Organized July 9, 1904, under laws of Great Britain, with capitalization £300,000, shares £1 par, fully issued. Debentures, £300,000, at 6%, retiring former first-mortgage debenture issue of £100,000 at 5%, and a £30,000 second-mortgage issue at 6% Company authorized, March, 1908, an increase of

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capitalization to £500,000, to provide for the conversion of the new issue of £300,000 debentures into shares, at £3 per share, until Jan. 1, 1912.

Lands, 100 square miles, on the Ishim river, an affluent of the Irtish, in the Kirghiz Steppe, circa 250 miles south of Petropavlovsk, on the Siberian railway, which is the nearest railroad point. Property includes about 25 square miles of coal lands, carrying 4 seams of bituminous coal, said to be of excellent grade. Lands of the company also carry gold, iron and limestone, and include the Yuspensski mine and the Spassky smelter.

The Yuspensski mine was opened 1864, closed 1884, reopened 1896 and bought by present company, 1904. Original development was by an open pit, once 150′ deep, but long since caved in.

The Yuspensski shows a network of veins, at and near the contact of slate and arcose, in sedimentaries of Permian age. The 2 main veins, known as the Annensky and Vladimir, are circa 200′ distant and substantially parallel, hence it is thought they may join at depth. The mine has been tested by diamond drill borings, to a depth of 475′, ore in bottom of holes assaying up to 67% copper. Principal development is on the Annensky vein, which is 10′ to 60′ in width, carrying mainly chalcocite and bornite, with small quantities of chalcopyrite and occasional tetrahedrite, with gangue of quartz and barite, estimated by company to average 12 to 20% in copper tenor. The upper workings show some native copper, cuprite, azurite and malachite.

The mine has 35 old shafts, mainly shallow and in extremely bad condition, the mining practice of the former owners having been of the most primitive nature, timbering costs averaging $1.25 per ton of ore mined, and timber being subject to frequent crushes, owing to bad mining, after which new timbers were installed inside of the old, with the result of eventually reducing the mine openings to impassable dimensions. New development, by present company, includes 6 shafts, of 350′, 375′, 300′, 150′, 120′ and 150′. The 350′ main shaft, known as the Annensky, is sunk in the footwall and connected with the veins by crosscuts. The bottom level, at 350′, shows a vein of 38′ extreme and 15′ average width, giving ore of 10 to 40% copper tenor, with an average, from actual smelting returns, of 21.77%. This vein apparently is merely the paystreak of an ore body of immense width, a crosscut on the 300′ level showing, in addition to the paystreak, 651′ width of vein matter, carrying declining copper values, with a tenor of circa 1% copper only, at the end of the crosscut, hence it is probable that much of the vein hitherto untouched, may be found workable, eventually. At one point the former owners had extracted chalcopyrite, leaving a wall showing slickensides of what they considered slate, but which, upon investigation, by the present management, proved to be a vein of massive chalcocite. Ore developed is estimated at about 175,000 long tons, of circa 15% average copper tenor.

The old equipment at the mine, of a most primitive nature, has been replaced by a 700-h. p. steam plant, with a 50-h. p. hoist, good for 1,000′ depth, and a 10-drill straight-line air-compressor. Buildings include a 50x100′ stone machine-shop, 20x30′ smithy, a variety of miscellaneous mine buildings, and dwellings for workmen, constituting a small town. The company maintains schools, baths, hospital and a church, for workmen and their families.

The coal mine, about 26 miles from the smelter, shows 2 seams of 60″ and 65″ thickness, and yields about 60,000 long tons of coal yearly, for the company's requirements, in addition to production for commercial uses. A coking plant, with beehive ovens, has been constructed.

The company has a 26-mile private railway, known as the Spassky-Karagandy line, of 600-mm. gauge, equipped with 5 locomotives and 75 cars.

Transportation between the mine and smelter, a distance of 70 miles, is

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by team, a traction engine and ore-wagons bought for the purpose apparently having proven unsuitable. Under the old management ore was carried in carts, but so much ore was lost in transit that the track of the ore-carts remains emblazoned by a purple train of bornite, visible for several miles. The Russian government is said to plan building the Orenburg-Akmolinsk-Semipalatinsk railway to pass near the company's copper and coal mines, and consideration has been given to the matter of organizing a subsidiary company, to construct a railway between the mine and smelter.

The former smelting practice, under previous ownership, scarcely could have been improved on for badness. The ore was heap-roasted with coal, the process requiring 3 weeks, and as the heaps were located on the top of a hill, where furious winds prevailed, there was much cintering and heavy losses. The old smelter had 6 rectangular brick furnaces, of 2½ tons daily capacity each, and so poor was the former practice that a smelter charge of 16 tons of ore required 54 tons of fuel and flux for its reduction. Matte was run onto the casting floor, of sand, with frequent pools of water, causing serious explosions, and only about half of the matte was removed by tapping, the balance being dug out by hand. The slags run about 3% copper, and were fed back into the furnace repeatedly, until gradually worn out.

The old smelting plant, which was poorly designed, in bad condition and remarkably inefficient, has been patched up and improved, but remains far from modern. The capacity is reported, by the company, as 80 to 100 tons daily. Equipment includes 8 small Raschette blast-furnaces and seven 5-ton reverberatory furnaces, the works being designed for a capacity of 300 long tons fine copper monthly. The converter department has a 20-ton electric traveling crane and one stand, with shells of the Anaconda type, treating matte of 58% copper tenor, and turning out blister copper averaging 99% copper, 20 to 40 oz. silver and 0.4 oz. gold per ton. There is an electrically driven quartz mill for preparing converter linings.

The smelter power plant includes a 700-h. p. steam installation, 150-h. p. electric plant and a 150-h. p. air plant, with 2 Connersville blowers and a Bessemer blowing engine.

Considerable trouble was had with labor, and forces were changed, 1907. Production, Aug. 1, 1904, to Sept. 30, 1906, was 1,784 long tons fine copper, and July, 1907, was said to be 74 long tons fine copper. Production, 1907, is estimated at 1,750,000 lbs. fine copper. The company was claimed to have made a profit of £33,000 on the first 15 months' operations, but was compelled, a little later, to raise additional capital. The property is one of very great promise, but, owing to lack of adequate transportation facilities, labor troubles and other difficulties, its development to a point commensurate with its promise is likely to require some years.

SPECULATOR MINE. **MONTANA.**

Owned by North Butte Mining Co.

SPECULATOR MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Clinton, Missoula Co., Mont. John A. Creighton, president; John Dougherty, vice-president and general manager. Property, near Clinton, includes the Black Hawk group, and options on adjoining lands. The Black Hawk is developed through the Cape Nome shaft, which this company sunk 200', to the 500' level. Company formerly owned the Speculator group, at Butte, sold, 1905, to the North Butte Mining Co. Former holdings, now owned by North Butte, were fully described Vol. V.

SPENCE & CO. **OREGON.**

Office and mine: Kerby, Josephine Co., Ore. Dr. Jas. Spence, general

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manager; C. W. Spence, superintendent. Lands, 11 claims, area 220 acres, 40 miles from a railroad, showing diorite and porphyry, carrying 4 veins, under development, estimated at 4′ to 100′ width, opened by 7 tunnels, of 40′ to 800′ length, showing cuprite, melaconite, malachite, azurite and chalcopyrite, mainly the latter, giving assays of 3 to 20% copper, 1 to 6 oz. silver and $1 to $10 gold per ton. Property is being developed slowly, with a small force, but is kept out of debt.

SPENCE MINERAL CO. **CALIFORNIA.**

Office: San Francisco, Cal. Mine office: Spenceville, Nevada Co., Cal. Chas. W. Howard, Jr., general manager. Property is an old mine, operated since circa 1875, until main shaft caved in, 1903. Ores are auriferous and argentiferous sulphides, averaging about 5% copper and 45 to 50% sulphur, occurring in wide, irregular fissures, near the contact of diorite and granodiorite. Idle.

SPENAZUMA COPPER CO. **ARIZONA.**

Dead. Was a fake, promoted by Dr. R. C. Flower. Formerly at Duncan, Graham Co., Ariz.

SPIRIT LAKE POWER & MINING CO. **WASHINGTON.**

Office and mine: Chehalis, Lewis Co., Wash. R. C. Lange, secretary and general manager. Lands are said to show auriferous and argentiferous copper ores.

SPITZEE GOLD MINES, LTD. **BRITISH COLUMBIA.**

Dead. Reconstructed, August, 1905, as Spitzee Mining Co., Ltd. Formerly at Phœnix, Boundary district, B. C.

SPITZEE MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Phœnix, Boundary district, B. C. Organized 1905, under laws of British Columbia, with capitalization $350,000, shares $5 par, as successor of Spitzee Gold Mines, Ltd. Lands, 110 clams, area circa 5,500 acres. Property produced, to September, 1905, circa 5,000 tons of ore, averaging $12 per ton in value, and was said, at that date, to have circa 30,000 tons of ore in sight. Bonded, 1907, to LeRoi Mining Co., Ltd. Idle, except for diamond drilling, at last accounts.

SPOKANE-ALASKA MINING CO. **ALASKA.**

Office: Spokane, Wash. Mine office: Ketchikan, Alaska. Wm. F. Newton, president and general manager. Lands, 15 claims, held under bond and lease, including the Sanford group, at Dahl Head, showing promising auriferous copper ore.

SPOKANE COPPER CO. **WASHINGTON.**

Dead. Formerly at Cle-Elum, Kittitas Co., Wash.

SPOKANE-MONTANA MINING & MILLING CO. **MONTANA.**

Office: Spokane, Wash. Mine office: Iron Mountain, Missoula Co., Mont. Organized circa 1907, under laws of Idaho, with capitalization $1,000,000, by Michael Luxemburger, W. McCracken and others. Lands are said to show auriferous and argentiferous copper sulphides, at shallow depth.

SPRAGG MINE. **NEVADA.**

Owned by Mason Valley Mines Co.

SPRAGUE COPPER MINING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Chewelah, Stevens Co., Wash. Dr. H. E. Schlegel, manager. Property is said to show, at depth of 65′, a 3′ vein carrying copper, gold and silver values. Company plans a 100′ tunnel.

SPRINGDALE COPPER MINING CO. **OREGON.**

Mine office: Athena, Umatilla Co., Ore. Idle and apparently moribund.

SPRINGFIELD GOLD & COPPER MINING CO., LTD. **IDAHO.**

Office: 720 Bank St., Wallace, Shoshone Co., Idaho. Mine office: Mullan, Shoshone Co., Idaho. Wm. Lively, president; D. A. McKenzie, vice-president

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and manager; Jos. T. Whelan, secretary; John Jecklin, superintendent. Capitalization $100,000, shares 10 cents par. Lands, 4 claims, patented, area 80 acres, well timbered, on Stevens Peak, in the St. Joe district, opened by tunnels, longest a crosscut adit of 1,700′, which, at 1,400′, cuts a 25′ vein of copper ore below commercial grade. The upper tunnel shows chalcopyrite assaying up to 33% copper, with good gold values, and small shipments have been made.

SPRINGFIELD-MEXICAN MINING CO. **MEXICO.**

Office: 213½ South Sixth St., Springfield, Ills. Mine office: Unión de Tula, Autlán, Jalisco, Mex. Geo. F. Stericker, president; Geo. M. Morgan, vice-president; Harvey C. McCann, secretary; Alfred Orendorff, treasurer; Gerald G. Hereford, superintendent; Arthur Hay, engineer. Organized June 3, 1903, under laws of Arizona, with capitalization $500,000, shares $1 par.

Lands, 25 hectares, 6 miles south of Ayutla, including the Concepción group, showing 3 veins, of 4′ average width, with circa 1,000′ of workings. The various properties of the company show fissure veins in porphyry, of 7′ average width, carrying malachite, azurite, bornite and chalcopyrite, giving average assays of 7% copper and 12 oz. silver per ton. Has shafts of 220′, 58′, 86′, 25′, 100′ and 175′, and 8 tunnels, 2 longest 258′ and 340′, estimated to show 10,000 tons of ore blocked out for stoping. Property is an antigua, closed 1821, reopened 1903. Equipment includes a 30-h. p. steam plant and 6 mine buildings. Nearest railroad, 40 miles, is the Mexican Central. Presumably idle.

SPRING GULCH GOLD MINING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. B. MacFarlane, superintendent, at last accounts. Property is the Banty group, carrying auriferous and cupriferous silver-lead ores. Has gasoline power. Idle.

SPRUCE MOUNTAIN COPPER CO. **NEVADA.**

Mine office: Sprucemont, Elko Co., Nev. Is said to employ 25 men. Lands, adjoining the Latham, show ore assaying up to 40% in copper tenor, and mine was producing some ore, August, 1908, through P. A. Cole, lessee. Production, 1907, returned as 1,338,198 lbs. fine copper.

STADTBERGER HÜTTE ACTIEN GESELLSCHAFT. **GERMANY.**

Office: Köln, Germany. Mine office: Nieder Marsberg, Westfalen, Germany. Otto Meurer, president; Anton Hamers, vice-president; Erich Meurer, mining engineer. Organized 1872, under laws of Germany, with capitalization 2,250,000 marks, shares 600 marks par. Paid dividends, to Dec. 31, 1907, of 112,500 marks.

Lands show fissure veins in argillaceous schist, carrying ore estimated to average 1.5% copper. The property, formerly operated by the Stadtberger Gewerkschaft, was discovered circa A. D. 800, and has been working, with few idle intervals, since A. D. 1150. Property includes 3 mines, the Mina, Friederike and Oscar, latter idle, all three opened by new deep shafts.

Equipment includes a 400-h. p. steam plant and a 60-h. p. water plant.

The reduction plant includes a concentrator, smelter and 1-ton electrolytic refinery, latter treating argentiferous coment copper. Ore is reduced mainly by wet process. Production has been as follows: 1,609,358 lbs. in 1905; 1,388,898 lbs. in 1906; 1,322,760 lbs. in 1907, latter secured from 42,000 metric tons of ore treated.

STANDARD CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 43-52 Wall St., New York, N. Y. Mine office: Clifton, Graham Co., Ariz. John K. Erskine, Jr., president; M. Gould, secretary and treasurer; preceding officers, John F. Brooks, Geo. Frazer and Smith Lent, directors; Geo. H. Dudley, manager. Organized 1903, under laws of Maine, with capitalization $1,500,000, shares $10 par. Is a holding company, controlling various subsidiary corporations through stock ownership. Shareholdings include $292,515 of the capital stock of the Standard Copper Mines; $700,000, or 70% of the

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capitalization, of the Clifton Copper Mines, Ltd., and 26,107 shares of the capital stock of the Coronado Mining Co., control of latter being held by Shannon Copper Co. The Standard Consolidated Copper Co. owns the Standard, San José, Copper Centre and Los Angeles mines.

Lands owned and controlled by the company are all more or less contiguous, lying on both sides of Chase Creek, for 1½ miles, on the line of the Coronado railroad, 5 to 6 miles north of Clifton, the Standard mine being in the centre, flanked by the Clifton and San José groups.

The Standard mine, 5 claims, area 99 acres, is developed mainly open-cast, with upwards of one mile of underground workings, on a vein of 2′ to 4′ width, carrying ores of 3 to 60% copper tenor, with an average smelter return of circa 20%.

The Coronado group of 7 claims, adjoining the Standard mine, is supposed to carry a continuation of the Standard ore body.

The San José group of 3 claims, patented, area 48 acres, lying west of the Standard group and south of the King mine of the Arizona Copper Co., Ltd., is about one mile east of Metcalf, showing a 4′ to 5′ vein of chalcocite, of high average assay tenor. This property, slightly developed, is a small producer.

The Copper Centre group of 8 claims, partly patented, has a 280′ shaft showing a 3′ vein of chalcocite, giving assays of 30 to 40% copper.

Los Angeles group, 4 claims, area 80 acres, about 2 miles from the San José group, and near Morenci, is developed by a 110′ shaft and a 225′ tunnel.

Buildings include an engine-house, smithy, office, laboratory, boarding-house, general store, stable and several buildings. Mine equipment includes a gasoline hoist.

The ore from the Standard mine is taken to the Coronado railroad by a 3,200′ Leschen aërial gravity tram, with drop of 800′, which transports ore at an average cost of circa 5 cents per ton, as against a previous charge of $2 per ton, when shipped by burros. The tram-line has shipping-bins at the lower terminal, on the railroad tracks.

Ore, formerly shipped to the Shannon, has gone to the Detroit smelter since 1906. Production has been as follows: 1,088,952 lbs. fine copper and 2,620 oz. fine silver, of which 31,853 lbs. copper came from the San José and 37,517 lbs. copper came from the Clifton mine, in 1905; 78,097 lbs. fine copper and 4,717 oz. silver in 1906; 497,286 lbs. fine copper in 1907.

The company, under former management, began dividends before such disbursements were warranted, and much trouble arose from quarrels among the directors, but apparently matters are harmonious again, and the property is considered meritorious.

STANDARD CONSOLIDATED MINES CO. **OREGON.**

Office: Sumpter, Ore. Mine office: John Day, Grant Co., Ore. D. M. Campbell, president; Edw. W. Mueller, secretary; C. B. Wade, treasurer; H. H. Nicholson, manager. Organized May, 1903, under laws of Arizona, with capitalization $5,000,000, shares $1 par.

Lands, 26 claims, area circa 500 acres, on both sides of Dixie Creek, in the Quartzburg district, showing auriferous ores of copper, nickel and cobalt. The mine is said to have about 2 miles of workings, and equipment includes a 50-ton concentrator. Some ore was shipped, 1906. Presumably idle.

STANDARD COPPER CO. **ARIZONA.**

Mine office: Casa Grande, Pinal Co., Ariz. Lands, 7 claims, 13 miles from Casa Grande. Idle several years and apparently moribund.

STANDARD COPPER CO. **UTAH.**

Dead. Changed name, 1906, to Bingham Standard Copper Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

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STANDARD COPPER CO. OF ARIZONA. **ARIZONA.**

Office: 520 Chamber of Commerce, St. Louis, Mo. Location of lands, if any, unknown.

STANDARD COPPER MINES. **ARIZONA.**

Office: 52 Wall St., New York, N. Y. Mine office: Clifton, Graham Co., Ariz. John K. Erskine, Jr., president; M. Gould, secretary; G. H. Dudley, manager. Organized Feb. 21, 1901, under laws of Arizona, with capitalization $500,000, shares $1 par; issued, $425,000. Is controlled by the Standard Consolidated Copper Co., through ownership by latter of $292,515 of issued stock. Paid dividends, to end of 1905, of $69,500. Lands, 99 acres. Buildings include an engine-house, office, laboratory, smithy, boarding-house, stables, etc.

STANDARD COPPER MINES CO. **ALASKA.**

Office: 68 William St., New York, N. Y. Mine office: Landlock, Alaska. Employs circa 15 men. Morris B. Mead, president; John L. Steele, vice-president and engineer; E. F. Bourke, secretary; J. O. Molander, treasurer; Jas. A. Bourke, general manager; preceding officers, Thos. R. Manley and Chas. Williams, directors. Organized Feb. 2, 1906, under laws of New Jersey, with capitalization $300,000, shares $100 par; issued, $220,000. Bonds, $300,000 issued. Cash on hand, Sept. 17, 1908, was $30,000. Annual meeting, third Saturday in December.

Lands, 13 claims, area 260 acres, also a 14-acre millsite, in the Valdez district, showing greenstone, carrying 17 fissure veins, of which 4, under development, carry chalcopyrite, estimated to average 6% copper, 1 oz. silver and 90 cents gold per ton. Mine is opened by tunnels of 260′, 80′ and 460′, estimated to show 20,000 tons of ore, with 12,000 tons blocked out for stoping.

The mine is connected with 500-ton ore-bunkers on a wharf at tidewater by a 3,300′ aërial tram, in two sections, one of 912′ and one of 2,526′ length. Production, 1907, was circa 1,000 tons of 6% ore, yielding 120,000 lbs. fine copper. Company is operated as a close corporation, and seems developing along businesslike lines.

STANDARD COPPER MINING CO. **MONTANA.**

Office: care of A. M. Stevens, Higgins Block, Missoula, Mont. Organized 1907, under laws of Montana, with capitalization $1,000,000, shares $1 par.

STANDARD COPPER MINING CO. **WASHINGTON.**

Mine office: Bolster, Okanogan Co., Wash. J. W. McBride, Jas. Caughran, Patrick Welch, E. Garlinger and Fred N. Freer, directors. Lands are on Copper Mountain, in the Myers Creek district. Presumably idle.

STANDARD COPPER MINING CO. **WYOMING.**

Office: 1212 Nicholas Bldg., Toledo, Ohio. Mine office: Encampment, Carbon Co., Wyo. Geo. P. Waldorf, president; Alphonse Mennell, vice-president; Jos. M. Spencer, secretary and treasurer; Chas. E. Winter, managing director; preceding officers, Fred O. Paddock, Harvey M. Cook, John H. Lloyd, John D. Dorn and John A. Scott, directors; A. H. Oldman, mine superintendent. Organized August, 1903, under laws of Wyoming, with capitalization $1,500,000, shares $1 par.

Lands, 10 claims, including the Susquehanna group of 6 patented claims, area 120 acres, about one-half mile east of the Itmay mine, carrying sundry contact and fissure veins, of 10′ estimated average width, including a vein of 40′ claimed width, opened by 7 pits and shafts of 10′ to 207′ depth, showing azurite, malachite, chalcocite, bornite and chalcopyrite, giving assays up to 18% copper and $2 gold per ton, with small silver values. Has a 600′ hoist and 5 buildings. Idle since Dec. 16, 1905.

STANDARD COPPER MINING & REDUCTION CO. **MONTANA.**

Office: 109 East Broadway, Butte, Mont. Mine office: Divide, Silver Bow Co., Mont. John H. Lynch, president; C. W. Siglar, vice-

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president; D. C. Campbell, secretary and treasurer; preceding officers, G. D. Beveridge, C. J. Fellows, F. C. Geiger and C. Woltjen, directors. Organized 1905, under laws of District of Columbia, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, in the Fleecer Mountain district, circa 25 miles southwest of Butte and 5 miles from Divide, with a good wagon road to latter point. Property has 2 shallow shafts, showing ores giving good assay values in copper. Idle several years and apparently moribund.

STANDARD COPPER PYRITES CO. **ALABAMA.**

Office: 1309 Brown-Marx Bldg., Birmingham, Ala. Mine office: Pyriton, Clay Co., Ala. Robt. Ross Zell, president; J. C. Clark, vice-president; G. Johnson, treasurer; J. D. Stagg, secretary. Capitalization, $50,000. Lands show a large ore body, giving assays up to 6% copper and carrying 42 to 46% sulphur. It is probable that copper values will decrease at slight depth, but property should prove valuable for its sulphur ores alone.

STANDARD DEVELOPMENT CO. **COLORADO & CALIFORNIA.**

Office: 52-240 La Salle St., Chicago, Ills. W. A. McGuire, president; C. N. Harlan, vice-president; R. J. Jennings, second vice-president; J. Jennings, general manager; E. C. Boisot, secretary and treasurer. Capitalization $10,000,000, shares $1 par. Supposedly controls, through stock ownership, Grand Republic Mining Co. and Mount Zirkel Mining Co., of Larimer county, Colorado, which apparently are moribund. Is said also to own the Jennie "group," of 20 acres, on the McCloud river, in Shasta county, California. Company apparently is merely a stock-jobbing enterprise.

STANDARD GOLD & COPPER MINING CO. **OREGON.**

Dead. Absorbed, 1903, by Standard Consolidated Mines Co. Formerly at John Day, Grant Co., Ore.

STANDARD MAGDALENA MINES CO. **MEXICO.**

Office: Los Angeles, Cal. Mine office: Nogales, Magdalena, Sonora, Mex. Has a 107′ shaft.

STANDARD MINES CO. **CALIFORNIA.**

Office: 318 Grant Bldg., Los Angeles, Cal. Mine office: Cima, San Bernardino Co., Cal. John W. Kemp, president; Frank S. Adams, secretary; preceding officers and R. R. Patterson, directors. Lands, 11 full and several fractional claims, 10 miles north of Cima, having a 356′ shaft, with circa 2,000′ of workings, showing carbonate ores near surface, with melaconite and sulphide copper ores on the 100′ level. Shipped, 1906, to Salt Lake smelter, 81 carloads, returning an average of circa 10% copper, 5 oz. silver and $2 gold per ton. Production, 1906, estimated at 250,000 lbs. Property considered promising.

STANDARD MINING CO. **IDAHO.**

Mine office: Silver City, Owyhee Co., Idaho. F. M. Clemens, superintendent. Has lead and copper ores, presumably argentiferous, with steam power, employing circa 20 men, at last accounts.

STANDARD PYRITIC SMELTING CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Greenwood, Boundary district, B. C.

STANLEY BUTTE CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 601-17 State St., New York, N. Y. Mine office: San Carlos, Gila Co., Ariz. Jas. E. Carpenter, general manager; Harry Pryor, superintendent. Lands, 60 claims, held under bond and lease, having a 125′ tunnel. Presumably idle.

STANLEY MINES CO. **COLORADO.**

Office: 305 Colorado Bldg., Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. Arthur G. Brownlee, president and general manager; John M. Jackson, superintendent. Organized, circa 1906, as successor of the Consolidated Stanley Mining & Milling Co. Lands, circa 90 claims, showing

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auriferous and argentiferous lead and copper ores. Has steam and water power and 10-stamp mill, employing about 40 men, at last accounts.

STAR CONSOLIDATED MINING CO. **UTAH.**

Dead. Merged, 1907, in Black Jack Consolidated Mining Co. Formerly at Park City, Summit Co., Utah.

STAR COPPER MINING CO. **MICHIGAN.**

Office: care of John C. Watson, 68 Devonshire St., Boston, Mass. F. H. Raymond, president; C. O. Burbank, secretary and treasurer. Lands, circa 760 acres, in Sections 9, 10 and 16, Town 58 North, Range 28 West, Keweenaw county, Michigan. Has 2 shafts, deepest 300′, on a fissure vein, south of the greenstone, sunk 1851-1857, when company expended circa $70,000. Idle since 1857.

STARLUS COPPER & GOLD MINING CO.

Dead. Formerly had an office at 215 Dearborn St., Chicago, Ills.

STATE COMMERCIAL DEVELOPMENT CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. J. E. Wharton, president. Lands are claims north of Butte. Idle and apparently moribund.

STATE LINE COPPER MINING CO. **WYOMING.**

Dead. Reorganized, circa 1904, as State Line Mining Co. Formerly at Encampment, Carbon Co., Wyo. Described Vol. IV.

STATE LINE MINING CO. **WYOMING.**

Office: 300 Century Bldg., Denver, Colo. Mine office: Encampment, Carbon Co., Wyo. D. W. Aupperle, president; Hon. S. M. Elwood, vice-president; W. W. Wemott, secretary and treasurer. Organized, circa 1904, with capitalization $1,500,000, shares $1 par, as a reconstruction of the State Line Copper Mining Co. Lands, 17 claims, area 340 acres, near the Colorado line, showing a 3′ vein of ore, giving assays of 21% copper, from 17 pits and shallow shafts of 10′ to 60′ depth. Company started a crosscut tunnel and apparently is in controversy with an adjoining company, over titles. Idle.

STAUFFER CHEMICAL CO. **CALIFORNIA.**

Office: San Francisco, Cal. Mine offices: Kennett, Shasta Co., Cal., and Oakland, Alameda Co., Cal. Chas. E. Kunze, manager; Geo. F. Graves, superintendent. Oakland property, 80 acres, known as the Alma mine, developed mainly by tunnels, produces cupriferous pyrite, carrying 1.5 to 3.5% copper, up to 50% sulphur, and up to $2.50 gold per ton, occurring in lenses between serpentine and metamorphosed chert, in a belt traced 3,000′. The Shasta county property is the Summit group, lying northwest of the Mammoth, in the Backbone district, taken over, 1908, under bond and lease, from the Phœnix Security Co.

STEAMBOAT MINING CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Idle several years.

STEAMBOAT MINING & MILLING CO. **COLORADO.**

Mine office: Steamboat Springs, Routt Co., Colo. Lands, in the Copper Ridge district, show a 30′ vein, carrying a narrow paystreak of high grade copper ore.

STEMP SPRINGS COAL & POWER CO. **WYOMING.**

Office: 55 High St., Oshkosh, Wis. Works office: Copperton, Carbon Co., Wyo. Employs 35 men. E. E. Mellens, president; Henry L. Larsen, vice-president; H. O. Granberg, secretary, treasurer and general manager; preceding officers, M. Brinton and J. S. Armstrong, directors; E. M. Sanders, superintendent; J. H. Glazier, mine superintendent; O. C. Finkelnburg, engineer. Organized Nov. 21, 1905, under laws of Wyoming, with capitalization $250,000, shares $1 par. Company reported, September, 1908, having $20,000 cash on hand, with no liabilities.

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Lands, 762 acres, patented, being 640 acres of coal lands and 122 acres of copper lands, latter including a smelter site, in the Battle Lake district. Copper property shows fissure veins in schist and contact deposits between diorite and quartzite, of which one, of 11′ estimated average width, traceable circa 3,000′, carries copper-nickel sulphides, opened by a 155′ shaft and a 273′ tunnel. The coal lands carry 3 beds of coal, of 3′ to 6′ thickness, at intervals of circa 75′. A 15′ waterfall is leased, for 20 years, from the Jackpot Mining Co., with privilege of renewal. Equipment includes a 40-h. p. steam plant at the mine, with a 3-drill Ingersoll-Sergeant air-compressor. Buildings include a 38x40′ log machine and carpenter shop and a 16x24′ smithy.

The smelter, 20 miles from a railroad, has a 60-ton McDonald furnace, planned to turn out 50% matte, or pimple metal of about 80% copper tenor. The smelter has a 100-h. p. steam plant. Company plans continuous development and blowing in the smelter.

STEMWINDER MINE. **BRITISH COLUMBIA.**

Owned by Dominion Copper Co., Ltd.

STEPHENSON-BENNETT CONSOLIDATED MINING CO. **NEW MEXICO.**

Office: 515 Keith & Perry Bldg., Kansas City, Mo. Mine office: Organ, Donna Ana Co., N. M. J. I. McCullough, president and general manager; C. B. Gill, vice-president; S. Lehman, secretary; F. M. Johnson, treasurer; preceding officers, G. A. Chapin, T. S. Semple and H. B. Holt, directors; Hugh Yale, mine foreman. Organized 1889, under laws of New Mexico, and capitalization since increased to $2,000,000, shares $1 par.

Lands, 17 claims, 2 miles south of Organ, in the Organ Mountains, 15 miles from the Santa Fé railway, showing granite and limestone carrying silver veins, also ore bodies with strong copper indications, developed by a 350′ two-compartment shaft, and a 2,000′ drainage tunnel. The lower level of the shaft is said to show an ore body of 5′ to 40′ width, with a 500′ chute carrying argentiferous and auriferous copper ore.

Equipment includes a steam plant, with 3 boilers, 2 hoists good for 500′ each, and a 10-drill Ingersoll-Rand air-compressor.

Buildings include a smithy, engine-house, compressor-house, warehouse, charging-house, boarding-house, office, store and 17 dwellings.

The concentrator, of 50 tons daily capacity, built of wood, has 2 jaw crushers, 2 jigs and 4 Wilfley tables.

STEPHENS PEAL COPPER & GOLD MINING CO., LTD. **IDAHO.**

Mine office: Wallace, Shoshone Co., Idaho.

STEPTOE LEAD & COPPER CO. **NEVADA.**

Office: care of Wm. H. Tibbals, secretary, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. A. J. Davis, president; J. J. Whittaker, vice-president; H. P. Clark, treasurer; preceding officers and M. C. McEntire, directors. Organized 1907, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 4 claims, in the Duck Creek district, northwest of Ely and about 2 miles from the Steptoe smelter.

STEPTOE MINING CO. **NEVADA.**

Dead. Property sold, Sept. 4, 1902, to New York & Nevada Copper Co. Formerly at Ely, White Pine Co., Nev.

STEPTOE VALLEY MINING & SMELTING CO. **NEVADA.**

Office: 165 Broadway, New York, N. Y. Works office: McGill, White Pine Co., Nev. Silas W. Eccles, vice-president and manager; Thos. Cox, general superintendent. Organized circa January, 1907, under laws of Maine, with capitalization $10,000,000. Is controlled, through joint ownership of shares, by Nevada Consolidated Copper Co. and Cumberland-Ely Copper Co., which are controlled by American Smelters Securities Co., which is controlled by Ameri-

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can Smelting & Refining Co. Lands and improvements cost $4,115,821.02, to end of 1907, and the completed plant is estimated as likely to cost approximately $10,000,000.

Lands are 8 square miles, with water rights pertaining thereto, the company, with great foresight, having secured a large area, in order to prevent damage suits from agriculturists, because of smelter fumes. The lands are on the eastern side of Steptoe Valley, on the slope at the foot of the Schell Creek range, 14 miles northeast of Ely and 22 miles from the mines, on the line of the Nevada Northern railway. The smelter site is 320 acres, in a parallelogram one mile long and one-half mile wide, on a hillside having a grade of about 10%, permitting terracing of the works and handling material by gravity throughout. Lands carry water rights to Duck Creek, on the eastern slope of the hill, also water rights to the McGill ranch, estimated as capable, jointly, of furnishing water for a 25,000-ton plant.

The reduction plant has all main buildings of steel frame, and is excellently planned and equipped. At the end of 1908 the plant was of 4,500 tons daily capacity, but is so designed that it can be increased to an ultimate daily capacity of 20,000 tons.

The ore-bins, of timber, about 300′ in length, are in three 6,000-ton units, located about one mile from the smelter. Ore is drawn from the bottom of the bins by belt-conveyors, which take it to small distributing bins, at the head of each section of the mill.

The sampling mill, at the southern end of the yard, has a gyratory crusher, Blake crusher, 1 pair of rolls, 3 Vezin samplers, 1 trommel and 2 conveyors.

The mill, nearly one mile from the smelter, is of steel, 338x567′ in size, in terraces, supported by beams of reinforced concrete. The mill is planned to have, eventually, 10 units, first rated at 1,250 tons daily capacity each, and later planned to be of 1,333 tons daily capacity each, but which actually will have an average capacity of nearly or quite 1,500 tons each, giving the mill an ultimate capacity of circa 15,000 tons daily. Three of the 10 units were completed, and in use, at the end of 1908, each being subdivided into a right-hand and left-hand section, each section being 94′ 6″ wide and 338′ 5″ long, not including the bins, giving a floor area of about 43 square feet per ton of daily ore capacity. The sections are duplicates and each can be operated independently.

The following description of one section will serve as a description of every section: From the distributing bin ore passes to a trommel having ⅞″ apertures, oversize going to 15x36″ rolls and undersize to a ⅝″ trommel, the rolls delivering crushed ore to an elevator, which returns the product to the screening system. Ore from the second trommel passes to a second set of 14x36″ rolls, which deliver the product to an elevator, while undersize goes direct to an elevator discharging into a trommel of ⅜″ size, from which oversize goes back to the second set of rolls, thence returning with the regular flow of material, undersize going to 2-mm. trommels, and oversize to a third set of 14x36″ rolls, which deliver their product to an elevator, in the same manner as the second set of rolls. After crushing, the 2-mm. product goes to 8 Richards vortex classifiers, giving coarse and fine products, from 2 spigots, the coarse concentrates being treated by 5 jigs, which make finished concentrates and a hutch-product that is treated on 7 Wilfley tables, which make finished concentrates, and tailings that go to Huntington mills for regrinding. The fine concentrates of the Richards classifiers go to 10 Wilfley tables making finished concentrates, middlings and tailings, the middlings, together with those from the Wilfleys treating coarse concentrates, and the tailings from the jigs, being combined and taken to 3 Callow settling tanks, from which thickened pulp is reground in four 6′ Huntington mills, crushing to 60-mesh size. The 60-mesh

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product from the Huntington mills is elevated to the screening floor, where it joins the overflow from the Richards classifiers, going to a dewatering tank, and thence to five 24" Callow 60-mesh screens, oversize going back to Huntington mills for regrinding, and being returned thence to screen, undersize, together with the overflow from the dewatering tanks, going to a set of 5 V-boxes. The spigot product of the V-boxes goes to 19 Wilfley tables, and the overflow to 10 Callow settling tanks, thickened pulp from which is fed to 20 Wilfley tables, the Wilfleys treating the spigot and overflow products, making finished concentrates, tailings and middlings, latter retreated, those of the first series of tables going to 8 Callow tanks, on the vanner floor, giving a pulp treated by eight 6x16' Frue vanners making concentrates, concentrates from the second set of Wilfleys going to 8 Callow tanks, thickened product from which is treated by a second set of eight 6x16' Frue vanners. Overflow from the third Wilfley settling tanks, together with that from the first and second vanner tanks, goes to a series of 8 tanks for final settlement, these tanks giving a product which passes to a third set of eight 6x16' Frue vanners. Concentrates from the Wilfley tables and vanners go to 2 tanks, 28' in diameter and 6' deep, water draining until tanks are filled. Beneath the tanks are railroad tracks, and concentrates are discharged into cars, the tanks being filled and unfilled alternately. Concentrates are handled throughout the mill by sluicing through launders, and are collected in tanks, and removed therefrom by Blaisdell excavators. Overflow from the mill goes to slum-ponds for settling.

The ore treated by the mill is friable, hence liable to make an unduly large proportion of slimes, but sliming is obviated, to a considerable extent, by very careful screening and crushing to 2-mm. size before any jigging is attempted. The Nevada Consolidated ores carry an excess of silica, and the Cumberland-Ely ores carry an excess of iron, giving, in combination, a good furnace charge. The mill was said, July, 1908, to be concentrating Nevada Consolidated ores about 10 into 1, and Cumberland-Ely ores about 4 into 1, effecting an average saving of 70% of assay values, raw ores assaying about 2 to 2.5% copper from the Nevada Consolidated, and 2.5 to 3% from the Cumberland-Ely.

The calcining department, 228' in length, of steel frame, has sixteen 18' McDougall roasters, of about 40 tons daily capacity each, which reduce the sulphur tenor of the ore to about 7.5%. Limestone flux is added to the ores before roasting, and hot calcines are trammed directly to a reverberatory smelter, or, when necessary, to a 1,500-ton brick and steel storage-bin, which serves as a balance-wheel between the calcining and smelting departments. The McDougall roasters discharge fumes into a double flue, each part of 300 square feet cross-section and 500' in length, leading to a brick stack 250' high, of 18' inside diameter.

The smelter, of about 1,000 tons daily capacity, had 2 units completed and a third nearing completion, with work begun on a fourth, at the end of 1908. The smelter was designed by Walter G. Perkins and constructed under his supervision. Each group of furnaces has independent flues and chimneys. There is one 42x240" blast-furnace, for resmelting converter slags and a small quantity of raw ore, so planned that it can be enlarged, if desired, to 4x80' in size. The blast-furnace is 13' above the ground-level, with a height of 16' from the tuyeres to the charging floor, operating with a 10' column charge and 24 to 30 oz. blast pressure. The furnace has separate water-jackets with 4 tuyeres, each with its own blast-box and independent air and water connections, so that any jacket may be removed by breaking three simple connections. Charging is done by cars dumped pneumatically, as at the Washoe works, and matte is tapped into ladles, on cars, for conveyance to the converter department, slag being granulated and sluiced away.

The furnace building has two 19x111' reverberatory furnaces, with room

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for a third, these being of about 250 tons daily capacity each. The reverberatories have 8x19′ grates, and ashes are sluiced to a cinder plant, for recovery of partly burned carbonaceous fuel, similar to that of the Washoe works. Each reverberatory has two 400-h. p. boilers, arranged in parallel, with suitable by-passes, instead of tandem, and each furnace has two charge-hoppers, each with 3 holes, for ore, and one charge-hopper with 4 holes for coal. The reverberatories have a flue of 300 square feet section, 200′ long, doubling back through a dust-chamber of 1,000 square feet section, 200′ in length, leading to a 300′ brick chimney, 15′ in diameter.

The converter building, 120x170′ in size, has 3 stands, operated electrically, with 96x115″ shells, of barrel type, of about 8 tons capacity each. Molten matte from the reverberatories is brought to the converter department in ladles, on cars running on a track behind and above the converters, which are charged through a chute, while the shells remain in position for blast, and silicious ores are charged into shells on the same plan as molten matte. The hoods from the converters lead to a flue of 100′ square section, 200′ in length, running to a 100′ stack of 10′ inside diameter. Blister copper is poured into a conveyor casting machine, which takes the pigs through a cooling tank, and delivers them to a loading platform, above which are air-hoists on a monorail system, for handling the pigs. Converter product is blister copper averaging 99.2% in tenor. Slag is poured into a casting machine, and bricks delivered to a bin, whence taken to the blast-furnace for resmelting, and slag skulls are broken in a 12x24″ Blake crusher, before going to the blast-furnace slag-bin.

The power-house, 136x320′ in size, has eight 400-h. p. Babcock & Wilcox boilers, with American automatic stokers. Equipment includes two 750-kw. and two 1,000-kw. Bullock generators, developing a 600-volt alternating current, used in the works, but stepped up for transmission to the mines. Blowing engines include an Allis-Chalmers 6,000′ blower and a No. 10 Connersville 12,000′ cross-compound blower, both direct-connected to compound condensing Corliss engines. A Laidlaw-Dunn-Gordon air-compressor, of 1,000 cubic feet capacity, furnishes converter blast.

The works have about 12 miles of standard-gauge railroad track, and ore and material are transported by small steam locomotives.

Miscellaneous buildings at the smelter include a 75x160′ car-shop, doing general repairing for the Nevada Northern railway; a machine-shop of steel frame and concrete blocks, a carpenter-shop and warehouse. The administration buildings are arranged in a semicircle facing west, with the general office in the center, supported by a large assay office and laboratory, and flanked by the mess-house and dwellings for heads of departments, the arrangement being pleasing to the eye, as well as eminently utilitarian.

The works were started, on a test run, April, 1908, and the first shipment of finished copper was made in August, in which month production was 1,371,261 lbs. fine copper. For November, 1908, production was 2,963,000 lbs. fine copper, of which the Nevada Consolidated made 1,491,000 lbs. and the Cumberland-Ely 1,372,000 lbs., the Nevada Consolidated ore yielding a net extraction of about 36 lbs. fine copper per ton, and the Cumberland-Ely circa 48 lbs. per ton. The Steptoe works are among the largest and most complete in the world, and are well designed, well equipped and well managed.

STERLING COPPER CO. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz.

STEUBENVILLE & JALISCO MINING CO. **MEXICO.**

Office: Steubenville, Ohio. Letter returned unclaimed from former mine office, Hostotipaquillo, Ahualulco, Jalisco, Mex. Organized 1906, with capitalization $1,000,000. Idle and apparently moribund.

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STEVENS COPPER CO. **ARIZONA.**

Office: care of Fred Enos, secretary, Bridgeport, Conn. Mine office: Clifton, Graham Co., Ariz. Henry Setzer, president; Chas. D. Hawley, vice-president; Frederic S. Hunt, treasurer; Chas. E. Stevens, superintendent. Lands, 39 claims, area 780 acres, circa 2 miles from Metcalf. Country rock is granite, overlaid by Cambrian quartzite and Silurian limestone, with much faulting, and intrusive porphyritic dykes, ores occurring near the fault-lines. Shipped ore, early 1906, running 12 to 30% copper, to the Shannon smelter. Property considered promising. Presumably idle.

STEVENS PEAK COPPER MINING CO. **IDAHO.**

Dead. Formerly at Mullan, Shoshone Co., Idaho.

STILLAGUAMISH & SULTAN MINING CO. **WASHINGTON.**

Office: 606 Bailey Bldg., Seattle, Wash. Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Richard Sykes, president; J. W. Clise, vice-president and general manager; Willis B. Herr, secretary. Organized Sept. 22, 1892, under laws of Washington, with capitalization $3,000,000, shares $50 par. Lands, 15 claims, area 275 acres, in the Stillaguamish district, with 1,400′ of mine openings, showing low grade auriferous copper ore. Idle since 1905 and apparently moribund.

STILLMAN COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

STOBIE MINING CO. **ONTARIO.**

Mine office: Desbarats, Algoma, Ont. James Stobie, president; A. B. Upton, vice-president and general manager; John Lear, secretary and treasurer. Organized 1900, under laws of Ontario, with capitalization $1,000,000, shares $1 par. Lands, 134 acres, in Block O, Johnson township, Algoma, Ontario, showing a vein of 3′ to 5′ width, carrying chalcocite, bornite and chalcopyrite. A carload of ore, shipped 1901, gave smelter returns of 18% copper. Idle since circa 1901 and apparently moribund.

STOCKMAN COPPER, LTD. **TRANSVAAL.**

Letter returned unclaimed from former office, Silesia Bldg., Main St., Johannesburg, Transvaal. Mine office: Turffontein, Pretoria, Transvaal. H. J. Hofmeyer, W. Gordon and H. A. Stockman, directors. Organized circa November, 1907, under laws of Transvaal, with capitalization £3,000. Property is a copper prospect on Farm Rietfontein No. 282. Idle and apparently moribund.

STOCKTON COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Burney, Shasta Co., Cal.

STOCKTON COPPER MINING CO. **COLORADO.**

Office: 312 Bank of Commerce Bldg., Minneapolis, Minn. Mine office: Salida, Chaffee Co., Colo. C. T. Bergh, president; J. W. Allan, secretary; A. E. Chilson, manager. Has a 225′ tunnel, giving a fair showing of carbonate ore, with occasional native copper. Idle.

STOCKTON COPPER MINING CO. **MONTANA.**

Dead. Formerly at Radersburg, Broadwater Co., Mont. Described Vol. II.

STODDARD COPPER CO. **ARIZONA.**

Dead. Was succeeded, January, 1906, by Stoddard Mines Co. Formerly at Stoddard, Yavapai Co., Ariz. Fully decribed Vol. VI.

STODDARD MINES CO. **ARIZONA.**

Office: 225 Fifth Ave., New York, N. Y. Mine office: Stoddard, Yavapai Co., Ariz. Employs 15 men. W. H. Reynolds, president; Hon. Isaac T. Stoddard, vice-president; C. M. Stoddard, secretary and treasurer; J. S. Murphy, general manager. Organized January, 1906, under laws of Arizona, as successor of Stoddard Copper Co., with capitalization $100,000, shares $1 par; fully issued. Annual meeting, in January.

Lands, 6 claims, patented, area 105 acres, known as the Binghamton mine,

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some distance from a railroad, showing fissure veins in schist, opened by a 500' tunnel and shafts of 600' and 190', with circa 4,000' of workings. Mine was discovered 1882, and reopened, June, 1906, by present company.

Equipment includes a 50-h. p. steam plant, with 2 hoists and a 2-drill air-compressor, and there are 6 mine buildings. Company reports that good ore bodies are being developed on the 600' level. Property considered promising.

KUPFERERZBERGWERK STOLZENBURG. **LUXEMBURG.**

Mine office: Stolzenburg bei Diekirch, Luxemburg.

STONE CREEK COPPER MINING & MILLING CO. **MONTANA.**

Dead. Formerly at Dillon, Beaverhead Co., Mont. Described Vol. V.

STONEWALL COPPER CO. **ARIZONA.**

Dead. Was a swindle, perpetrated by the notorious Wm. F. Wernse gang, of St. Louis. Formerly at Pima, Graham Co., Ariz.

STORA KOPPARBERG BERSLAGS AKTIEBOLAG. **SWEDEN.**

Office, mines and works: Falun, Kopparberg's län, Sweden. E. J. Ljungberg, director; Lars Yngström, assistant director and general manager; Th. witt, mining engineer; K. A. Akerblom, superintendent leaching plant. Capitalization 9,600,000 kroner, shares 1,000 kroner par. Net earnings, 1907, were 2,377,987 kroner.

Lands, 5 claims, 3 patented and 2 unpatented, area 43 hectares. Mine was worked as early as A. D. 1288, and presumably earlier, oldest privileges of the present company dating from Feb. 24, 1347.

Lands include several mines and many ore bodies, largest being the Storrgrufa, 370 meters long by 220 meters wide, and about 320 meters deep, mostly mined out, leaving an open pit circa 220' deep. Ore is chalcopyrite, containing selenium and bismuth, giving average returns of 2.7 to 3% copper, 10 to 15 grams silver and 2.5 to 3 grams gold per ton. Has 14 shafts, with aggregate depth of 1,800 meters, deepest being 343 meters, with about 33 kilometers of tunnels. The copper mine employs about 100 men, and gives a yearly production of about 45,000 tons of ore, which, after hand-cobbing, yields about 15,000 tons of leaching ore.

The roast stalls are one-half kilometer from the mine, and the leaching plant is one-half kilometer beyond the furnaces, all connected by tram-line. The roasted ore is crushed with salt, reroasted and leached with dilute sulphuric acid, in tanks, metallic contents of the leach-water being precipitated on scrap iron, as cement copper, which is dissolved in sulphuric acid and turned out as bluestone. Yearly production averages circa 300 kgs. silver, 80 kgs. gold and 1,250 metric tons bluestone, equivalent to 300 tons fine copper. Company conducts extensive industrial operations, owning and operating iron and steel plants, a pulp-mill, paper-mill, sawmill, etc., and is developing an extensive water-power on the Dala river. Is one of the best managed and most successful industrial enterprises of Sweden.

STORRGRUFA MINE. **SWEDEN.**

Owned by Stora Kopparberg Berslags Aktiebolag.

STRATTON GOLD & COPPER MINING & MILLING CO. **COLORADO.**

Office: Salida, Colo. Mine office: Turret, Chaffee Co., Colo. R. F. Stratton, president; F. S. Green, vice-president; Dr. J. F. Roe, secretary; Geo. Sullivan, treasurer. Organized 1905, under laws of Colorado, with capitalization $500,000, shares $1 par. Lands, 16 claims, in 2 groups, the Stratton group of 11 claims, area 220 acres, being in the Badger Creek district of Frémont county, and the Copperopolis group of 5 claims being near Turret. The Stratton group has a 1,400' crosscut tunnel, with back of 900', showing ore assaying up to 46% copper. The Copperopolis group is said to have a 600' shaft, showing an 8' vein giving ore assaying well in copper. Company said to plan a leaching plant.

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STRICKLEY-MONTEZUMA MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. W. J. Strickley, superintendent, at last accounts. Has auriferous copper ores, and steam power. Idle several years and apparently moribund.

STRONG COPPER CLAIMS CO. **OREGON.**

Dead. Lands sold, circa 1901, to Waldo Smelting & Mining Co. Formerly at Waldo, Josephine Co., Ore.

STRONG COPPER MINING CO. **WYOMING.**

Office: 210 Grant Ave., Laramie, Wyo. Mine office: Leslie, Albany Co., Wyo. Employs 15 men. N. E. Corthell, president; M. E. Stickney, vice-president; Dr. I. R. Swigart, secretary, treasurer and general manager; E. P. Baker, mine superintendent. Organized Jan. 17, 1903, under laws of Wyoming, with capitalization $1,000,000, shares $1 par; issued, $837,959. Annual meeting, first Wednesday in January. Lands, 16 claims, unpatented, area 260 acres, circa 14 miles northeast of Laramie, reported to show a fissure vein in pegmatite, which perhaps is a pegmatite dike, and contact deposits between limestone and granite, latter, of 7′ estimated average width, carrying malachite, chalcocite, bornite, chalcopyrite, galena and wuulfenite, giving average assays of 4% copper, 5 oz. silver and $3.60 gold per ton, with some lead and molybdenum. Mine has about 20 shallow pits, a 335′ shaft and a 450′ tunnel, with circa 1,300′ of workings, estimated by management to show 10,000 tons of ore, mainly chalcopyrite, with considerable chalcocite on the 250′ level, the vein carrying 2′ to 7′ of concentrating ore, with occasional paystreaks of ore of smelting grade.

Equipment, burned July, 1907, has been replaced by an 80-h. p. steam plant, including a 25-h. p. hoist and a 3-drill Norwalk air-compressor. There are 6 mine buildings, and company plans a concentrator.

DAVID A. STUART. **PERÚ.**

Office and mine: Quicachaca, Yauyos, Lima, Perú. Property, near the coast, in the first mountain range back of Lima, carries argentiferous copper and lead ores, also coal.

SUBENI COPPERS (NATAL), LTD. **NATAL.**

Office: Pietermaritzburg, Natal. Mine office: Vryheid, Zululand, Natal. J. M. Calderwood, M. I. M. M., consulting engineer. Organized July, 1908, under laws of Transvaal, with capitalization £45,000, shares £1 par. Of the capital stock, £15,000 was issued for working capital, and £24,000 was issued to the vendors, leaving £6,000 unissued.

Lands, circa 2,000 acres, freehold, on the Subeni river, about 42 miles south of Vryheid.

Property shows granite, with bodies of schist carrying 2 copper veins, of 4′ to 8′ width, containing bornite and chalcopyrite, developed to depth of circa 150′ by shafts and tunnels. Ore was discovered 1879, but operations were suspended during the Boer war, and the native rebellion. Active work was begun August, 1908, but a shipment, 1907, of 150 tons of hand-picked ore, is said to have returned an average of 30% copper. Formation is said to be somewhat disturbed and ore pockety, but property is considered not devoid of promise.

SUCCESS COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Quartzite, Yuma Co., Ariz. Fully described Vol. VII.

SUCCESS MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Leslie Bailor, vice-president and assistant manager; H. F. Samuels, president and general manager; O. H. Linn, mine superintendent. Property is the Monitor mine, held under bond and lease, with 700,000 shares of the 1,000,000 shares capitalization of the Monitor in escrow, at a price understood to be about $150,000. Bond and lease expire July 1, 1910, and by the terms of the agreement, the Success company must

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expend $60,000 on development work, sinking shaft 300′ additional and making 1,600′ of lateral openings. Net smelter returns are to be held by trustees, to be returned to operators, up to $60,000.

SUCCESS MINING CO. **WASHINGTON.**

Dead. Formerly at Conconully, Okanogan Co., Wash.

SUDBURY MINING CO. **BRITISH COLUMBIA.**

Office: Spokane, Wash. Mine office: Deadwood, Boundary district, B. C. Jas. Schiewe, president; preceding officer, J. D. Whitels, A. S. Elder, W. C. Reeder and W. O. Lewis, directors. Organized April, 1907, under laws of Washington, with capitalization $250,000. Lands, one-half mile from the Sunset mine of the Dominion Copper Co., have 2 shafts, one, of 60′, being said to have a good showing of low grade copper ore. Has electric power. Property considered promising.

SUERTE MINING CO., S. A. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Harry Lane, president; John F. Evans, vice-president; W. R. Peters, secretary; Louis Lease, treasurer and general manager. Organized 1908, under laws of Mexico. Lands, 60 hectares, in the Sierra Santa Cruz, west of La Cananea. Began development circa September, 1908, by shaft.

SUGAR LOAF MINING CO. **SOUTH DAKOTA.**

Dead. Formerly at Custer, Custer Co., S. D. Described Vol. VII.

SULITELMA AKTIEBOLAG. **NORWAY.**

Office and works: Helsingborg, Malmöhus Län, Sweden. Mine office: Sulitjelma, Nordland, Tromsö, Norway. Employs circa 2,000 men. Lord-Lieut. G. Tornerhjelm, president; Consul Nils Persson, vice-president and general manager; Sture Person Henning, assistant general manager; Vice-Consul C. Ingelsson, secretary; preceding officers, Aug. Sylvan, Thure Röing, R. M. B. Schjölberg, C. E. Hedström, Hon. Albert Berg von Linde, Prof. Hjalmar Sjögren and Ivar Person Henning, directors; Holm Holmsen, general manager; Fr. Carlson, mine superintendent; P. Kjölseth, mill superintendent; J. Westlake, smelter superintendent; L. D. Jenssen, engineer.

Organized 1890, under laws of Sweden, with capitalization 3,000,000 kroner, increased, 1906, to 6,000,000 kroner, and again increased, 1908, to 8,000,000 kroner, shares 500 kroner par. Paid an 8% dividend, 1905, amounting to 240,000 kroner, and paid total dividends, to end of 1905, of 1,800,000 kroner. Annual meeting, in May.

Lands, 253 claims, area 55 acres, also a 1¼-acre millsite, and 193 square miles miscellaneous lands, more or less extensively mineralized, in the Fauske district of Nordland, mainly in the Skjerstad division of Nordland, Tromsö. Lands include the Sulitjelma, Carlotta, Geken and Altens groups of mines. The Sulitjelma, discovered 1875 and opened 1887, which has become the principal copper mine of Norway, shows mica-schist of lower Silurian age, with eruptive flows of greenstone conformable with the schists. Ore bodies occur as extended lenses, very persistent in strike and depth, on the contact of schists with metamorphosed amphibolite and olivine gabbro, lenses having a generally east and west strike, with dip of 10° to 45° with the horizon. There are 18 known ore bodies, of which 15, under development, range 15′ to 36′ in width, traceable 450′ to 2,200′, deepest proven to depth of 2,300′, carrying exclusively cupriferous iron pyrites, averaging 3% copper, 45% sulphur and 0.5 oz. silver per metric ton.

Development is mainly by tunnel, there being one shaft of 280′ depth and 9 tunnels, the names and number of feet of workings of the latter, at end of 1905, being as follows: Ny-Sulitelma, 8,940′; Hanka-Bakken, 1,640′; Giken, 15,800′; Carlotta, 11,100′; Måns-Petter, 2,450′; Bursi, 700′; Koch, 2,740′; Tornerhjelm, 3,000′; No. Nine, 2,160′. The mine has total openings of about 12

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miles, showing 2,502,000 metric tons of ore, with 953,000 tons blocked out for stoping, in 1906. Electric underground haulage is used exclusively, with 2 kilometers of track in the mines.

Ores, as mined, are divided into two classes, the first or smelting grade carrying 4 to 8% copper, while the second or export grade carries 1.5 to 4% copper and an average of 45% sulphur, the average tenor of all ores mined being about 3% in copper and 45% in sulphur. Of the sulphur ore exported, about half is fines and half lumps, sent to Helsingborg, Riga, Antwerp, Ghent and various ports in Great Britain.

Equipment includes a 970-h. p. water power plant, 1,220-h. p. electric plant, 780-h. p. air plant and 10-h. p. gasoline plant, with 400 h. p. developed at the mine, 390 h. p. at the mill and 560 h. p. at the smelter. Equipment includes 13 hoists and one Ingersoll-Sergeant, one Burchard and 3 Schramm air-compressors, with an aggregate capacity of 28 drills. There are 25 air-drills and one Temple electric air-drill.

Mine buildings are of wood, the machine-shop having an area of 1,290 square feet, carpenter-shop 1,291 square feet, and smithy 1,722 square feet. There are 2 sawmills, a general store, school, church and Good Templars' lodge, with a large number of dwellings, the company owning a total of 320 buildings.

There is an extensive system of aërial tramways, with 15 stations and 2 power stations, the tram system including a 4-mile line to the Jakobesbakken mine, which is to be operated more extensively in the future.

The concentrator, of wood, area 37,950 sq. ft., is equipped with 8 Blake crushers, a 15' Krupp Grusonwerk centrifugal crusher, 9 rolls, 91 Hartz jigs, 26 Lührig and Ferrari concentrators and 24 vanners. There also is a 1,000-ton Elmore vacuum oil concentration plant, with 12 units, in a separate mill of 10,000 sq. ft. area.

The smelter, at Fagerlid, 2 to 5 miles from the various mines, receiving ore therefrom by aërial trams, has a daily capacity of 160 tons. Equipment includes a 50-ton water-jacket blast-furnace, one reverberatory furnace, two 50-ton pyritic smelting converters of the Knudsen type, and one converter stand, with 10 shells of the Manhes type, taking 7.5 metric ton charges. First-fusion product is a matte of 30 to 40% copper tenor, and final product is blister copper assaying 99.2% in tenor, sent, for refining, to the Helsingborg Kopparverks Aktiebolog, at Helsingborg, Sweden, where there is a leaching plant, in connection with the works. Ores smelted average 6 to 8% copper, 32 to 34% sulphur, 34 to 36% iron and 2 to 4.5% alumina, with traces of lime and magnesia. The smelter uses for conversion the Knudsen discontinuous pyritic process, which largely utilizes the calorific value of the sulphur, and entails small coal consumption, giving very satisfactory results. By reason of improvements made, 1907, the loss of copper in smelting amounts to about 10% only, slags being said to run only 0.2 to 0.3% copper, as against a loss of about 15% formerly, and conversion costs are said to be under $1 per metric ton.

Miscellaneous enterprises of the Sulitelma include 7 steamers, 2 tugs, 40 barges and a 13-kilometer private railway system, known as the Sulitjelma-banen, of 750 mm. gauge, equipped with 3 locomotives and 120 freight cars.

Fuel consumption and costs were as follows, in 1907: 3,600 cords of wood at the mine and 260 cords at the smelter, costing 10.5 kr. per cord; 1,500 metric tons coke at the smelter, costing 31 kr. per ton; 690 tons coke and 6,620 tons soft coal, costing 18 kr. per ton; 7,400 gallons petroleum.

Production has been as follows: 605 metric tons fine copper and 90,000 tons cupriferous pyrites, exported to sulphur burners, carrying 2,442 metric tons fine copper, in 1904; 447 tons fine copper from 10,479 tons ore smelted and copper exported in pyrites giving a total output of 6,225,856 lbs. fine copper

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in 1905; 589 metric tons fine copper and circa 2,800 tons copper contained in pyrites exported, in 1906; 1,384,486 lbs. fine copper, secured from circa 1,900 tons of ore smelted, and 102,000 metric tons cupriferous pyrites exported, averaging 3% copper, giving gross production of 8,140,562 lbs. fine copper, in 1907. During 1907 the Kaafjord mines, in Alten, produced 4,150 tons cupriferous pyrites, yielding circa 1,050 tons of concentrates, shipped to the Sulitelma for smelting. The management is progressive, and the Sulitelma has by no means reached the limits of its productive capacity, though already much the largest copper producer of Norway, and one of the leading copper mines of Europe, while giving every prospect of increased production for the future.

SULTANA-ARIZONA COPPER CO. **ARIZONA.**

Office: 1356 First National Bank Bldg., Chicago, Ills. Mine office: Kelvin, Pinal Co., Ariz. John B. Mecham, president and general manager; Dr. H. W. Pierson, vice-president; C. H. Seamans, secretary and treasurer; preceding officers, W. Esty Curtis, L. G. Bronson, J. W. Nye and John D. Riley, directors; Jerry T. Harrington, resident manager and superintendent; H. C. Erman, consulting engineer. Organized June 5, 1906, under laws of Arizona, with capitalization $2,500,000, shares $1 par, apparently as a reconstruction of the National Mining & Development Co. Annual meeting, first Tuesday after first Monday in June.

Lands, 19 claims, 1 patented, area 380 acres, also three 15-acre millsites. Company also reports holdings of 30 acres of gold and silver lands, in the Ures district of Sonora, Mexico.

The Arizona lands, said to have been bought for $120,000, are in the Riverside district, across the Gila river from Kelvin, including the Riverside and Bryan groups. Property is said to show 7 different veins, which management says probably will unite at depth, of which 5 veins have been more or less developed. Property also is said by company to have 12 copper veins and 4 silver veins. The 5 veins under development are said to be 18" to 6' wide, and are estimated to average 4' 6" width, with a generally NW. and SE. trend, showing the usual oxidized ores above, with sulphide ore, mainly chalcopyrite, in the lower workings. Property is said to show a 4' vein, averaging 15% copper, in the upper levels, and a 6' vein, in the lower levels, carrying chalcopyrite, from which shipments to the Humboldt smelter have returned 8.7 to 10.6% copper. Average tenor of ore of all veins is estimated by company at 10% copper and 4 oz. silver per ton, which is too high.

Development is by 5 shafts, of 40' to 300' depth, and by 7 tunnels, of 50' to 264' length, with various open-cuts, giving a total of circa 3,500' of workings, of which about 1,000' were made during latter half of 1907. Company estimates 40,000 tons of ore in sight, with 30,000 tons blocked out for stoping, and there are several thousand tons of low grade ore, of fair copper tenor, on the dumps.

Equipment includes a steam plant with one hoist, and it is planned running a 1-mile aërial tram across the Gila river, to the railway station at Kelvin. Company plans a concentrator, of 200 to 300 tons daily capacity.

Company was said, October, 1907, to have settled its indebtedness, preparatory to resumption, and, early 1908, was making small but regular shipments of ore, of 12 to 20% copper tenor, to El Paso smelter. Some ore was shipped before property was owned by present company.

SULLIVAN-ARIZONA COPPER CO. **ARIZONA.**

Letter returned from former office, Joliet, Ills. Mine office: Kelvin, Pinal Co., Ariz. John B. Mechem, president; Chas. W. Seaman, secretary and treasurer. Organized circa March, 1907, with capitalization $2,000,000, shares $1 par. Possibly succeeded by Sultana-Arizona Copper Co.

SULLIVAN COPPER DEVELOPMENT CO. **ARIZONA.**

Office: Duluth, Minn. Mine office: Paradise, Cochise Co., Ariz. Geo. H.

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Crosby, manager. Lands are claims adjoining the holdings of the Manhattan Development Co., in the Chiricahua Mountains. Idle.

SULLIVAN GOLD & COPPER MINING CO. **MONTANA.**

Mine office: Kalispell, Flathead Co., Mont. Idle some years.

SULPHIDE COPPER CO. **COLORADO.**

Office: P. O. Box 358, Denver, Colo. Mine office: Crested Butte, Gunnison Co., Colo. J. C. Lewis, president; Frank Jerome, vice-president; Geo. S. Ryan, secretary; Geo. N. Wheeler, treasurer; Horace Miller, manager. Lands, in the Rock Creek district, have 75′ and 170′ tunnels, in argentiferous copper ore. Idle some years.

SULPHIDE MOUNTAIN MINING & MILLING CO. **WASHINGTON.**

Office: care of Hon. E. C. Trimble, Seattle, Wash. Mine office: Orient, Ferry Co., Wash. Lands include the Pomeroy mine, on Sulphide Mountain, 10 miles northeast of Orient, in the Colville reserve, opened by sundry open-cuts and a 200′ shaft, showing ore giving good assay values in copper, lead, silver and gold. Idle.

SUMAS MINING CO. **WASHINGTON.**

Mine office: Sumas, Whatcom Co., Wash. W. W. Jones, president; Mrs. M. Record, secretary. Lands, near the head of Swamp Creek, show auriferous copper ores. Idle several years.

SUMITOMO COPPER CO. **JAPAN.**

Office: Kitahama, Higashiku, Osaka, Japan. Mine office: Niihama, Iyo, Shikoku, Japan. Works office: Shisakajima-Ochigun, Iyo, Shikoku, Japan. M. Suzuki, director-in-chief; T. Shidachi and Kinkichi Nakata, directors; R. Fujio, chief auditor; K. Yukawa, manager; Munio Kubo, vice-manager; T. Matsumoto, sub-manager; S. Maki, sub-manager and mine superintendent; T. Hagio, superintendent; Keijiro Nakamura, smelter superintendent.

Lands, 3 claims, area 6,353 acres, also a 5-acre millsite, 33,452 acres timber lands and 575 acres miscellaneous lands, in the Besshi district. Area of the Besshi mine proper, on Besshi Mountain, 4,400′ in height, is 209 acres. The timber lands carry large plantations of fir, set out yearly, since 1879, which have become available for mine timber, 15 to 20 years' growth being required. Water supply is taken from the Tokuriu river.

The Besshi mine shows graphitic, chloritic and sericite schists, carrying a bedded deposit of 4′ to 10′ thickness, with an average of 7′, having a strike of N. 30° E. and average dip of 45° NE., traceable 9,000′ and proven to depth of 3,000′, with workings exceeding 6,000′ in length. The bedded vein occurs in alternate layers of chloritic and graphitic schist, each enveloped in a quartz-schist known as "habu," with interstratification of piedmontite schist, step-faults, running east and west, and nearly parallel, giving frequent throws of 10′ to 20′, with a maximum throw of 50′. The ore is an intimate mixture of chalcopyrite and pyrite, sometimes occurring as partial segregations in pyrite, banded with schist, averaging, as mined, circa 4% copper, brought up, by dressing, to an average copper tenor of about 5.5%.

The Besshi mine, near Kyoto, in the northwestern part of the island of Shikoku, has been in the ownership of the Sumitomo family since its opening, A. D. 1690, and was making more than 3,000,000 lbs. fine copper yearly at the close of the Seventeenth Century, being, at that time, perhaps the largest copper producer of the world. The mine is opened by the Toyen shaft of 1,784′ depth, sunk at an incline of 49°, with 9 levels opened, largest production being from the 6th and 7th levels, the shaft connecting on the 8th level, at depth of 1,300′, with the new Tonaru crosscut tunnel, of 6,123′ length. There are other crosscut tunnels, of 430′ and 4,172′ length. The mine has a system of natural ventilation, by which hot air from the valley, entering through the Tonaru tunnel, escapes through the mouth of the Toyen incline

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shaft, near the top of the mountain, the air current being regulated by lattices. The mine is well timbered, with a tram-line on each level, and ore is extracted by overhand stoping, guncotton being used mainly for blasting, with a little dynamite and occasional gunpowder. The mine has electric pumps, forking water from the lower workings into a large sump on the 8th level, whence it is discharged through the Tonaru tunnel, which is lighted throughout by electricity, and has the terminal station of an aërial tram at its portal. The mine has circa 50,000′ of workings, with about 2,500,000 tons of ore blocked out for stoping. The company plans driving a fourth tunnel, of about 2 miles length, and sinking a 1,900′ vertical shaft to connect therewith.

Mining equipment includes a 740-h. p. installation having three 200-h. p. hoists, good for 1,200′ depth each, 3 Rand air-compressors and 2 Leyner and 3 Schramm air-compressors, with 6 Schramm air-drills and 5 Leyner air-drills. Owing to the method of ore extraction through the tunnel, no exceptionally powerful machinery is required.

As the mine, tunnel, mill and works lie on successive levels, the fullest possible advantage is taken of gravity in all operations, resulting in a great saving of power.

The crushing plant, of wood, built 1906, at the mouth of the Tonaru tunnel, is of 800 tons daily capacity, equipment including one 50-h. p. and two 40-h. p. Blake jaw crushers. Ore assortment is by hand-labor, there being no machinery, otherwise than the crushers.

Owing to complaints by farmers of damage from copper-laden waters, a cementation plant has been installed, and considerable copper is precipitated on scrap iron, the production of regulus amounting to upwards of 200 tons yearly.

Leading from the portal of the Tonaru tunnel is a 3,600-meter Bleichert aërial tram, to Hateba, with longest span of 600 meters, having an hourly capacity of 90 tons, at an average speed of 2.5′ per second. At Hateba is the terminus of a railway running to Niihama, the nearest port. The connections between the mine and shipping wharf include the 6,123′ Tonaru tunnel, circa 2 miles of aërial tram and 5½ miles of railway, a total of about 9 miles. The mine has 3 aërial trams, of 2,276′, 5,200′ and 5,178′ lengths, respectively.

The company owns 2 private railroads, of 9.73 miles total length, of 3′ gauge, equipped with 10 locomotives, 10 box-cars and 184 ore-cars.

A hydro-electric power installation, on the Tokuriu river, transmits electric energy to the central plant, at Niihama, whence power is distributed to the mine, mill, shops and smelter. The company plans a new hydro-electric installation, to utilize a flow of 30 cubic feet per second, deliverable under a 2,000′ head.

The general shops, at Niihama, about midway between the mine and smelter, include a foundry making castings up to 5 tons in weight, extensive carpenter-shops, machine-shops, boiler-shops and smithies, these works not only making ordinary repairs, but turning out a considerable part of the machinery and castings used at the mines, works and smelter.

The Besshi smelter formerly was at Niihama, but, owing to serious damage to neighboring farmers from smelter fumes, the entire reduction plant was transferred, 1906, to the Island of Shisakajima, 12 miles from Niihama, only the general shops remaining at the old smelter site.

The new Shisakajima reduction plant, built at a cost of about 4,000,000 yen, is one of the most modern in existence, both in design and equipment. Ore is received by vessel at a wharf, where unloaded by a 20 ton crane, into cars that are hauled up an incline to the top of the smelting works, cars being

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operated in counterbalance. The works are laid out in 7 terraces, gravity being utilized throughout.

The smelter has 786 open stalls, for roasting ore and matte, about one-fourth of the capacity being required for matte, each of the stalls being of 30 tons capacity, roasting of raw ore requiring an average of 30 days. The calcining stalls are connected with a central high chimney. The smelter proper has four 160-ton rectangular water-jacket blast-furnaces, and two 17-ton reverberatory furnaces for refining, one being used as a spare. There also are 4 sets of Atebuki furnaces using an old Japanese process, improved by the Sumitomo company, for the conversion of matte, these having a daily capacity of 32 tons of roasted matte each, one being used as a spare. Product is blister copper averaging 99.8% in tenor, carrying only about 0.015% silver and 0.0003% gold per ton. About 20% of the product is sent to the Osaka rolling mill, owned by the Sumitomo family, and a greater part of the remainder forwarded to Kobe, where it is exported, mainly to Europe. The smelter has three No. 4 and three No. 6 Connersville blowers, for furnace blast, and an air-compressor for the converter department. Barren quartz pebbles are used for fluxing, no silicious ores being available for the purpose.

Fuel used at the mine is coal, and fuel at the smelter is coal, coke and waste gases from coke-ovens. The company has a coking plant, at Niihama, with 72 brick kilns, with a daily capacity of 55 tons, using coal from the Keeki mine, at Kiushiu. Cost of coal is $2.70 to $3.50 per short ton, according to grade, and $4.70 per short ton for coke. Requirements are about 4,725 tons yearly of bituminous coal of best grade and 27,340 tons of ordinary bituminous coal, in addition to coke for the smelter.

The company owns a very extensive fleet of vessels, including 2 steamers for passengers and package freight, 2 tugs, 1 steamer for carriage of coal, and 81 sailing vessels, with 20 sailing vessels held under charter. The company operates a passenger line, with 2 steamers, plying between Niihama and Kobe, a distance of 125 miles.

The company's miscellaneous enterprises are very extensive, including a large number of warehouses and stores, and there is a branch of the Sumitomo bank at Niihama. There is a main hospital with 4 branches, and the company maintains five elementary schools for children of its workmen.

The Sumitomo company employs about 6,000 people, of whom about 10% only are women.

Production was 11,973,833 lbs. fine copper in 1906; 11,674,582 lbs. in 1907 and circa 12,000,000 lbs. in 1908. No copper mine in the world, of its size, has a better smelting equipment than the Besshi, and the management is highly progressive and efficient in all departments.

SUNSET COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Mayer, Yavapai Co., Ariz. Apparently is controlled through stock ownership by, or has been sold outright to, Consolidated Copper Creek Mining Co. Lands, in the Copper Creek district, circa 20 miles east of Mayer, are said to show a vein of 75' width, traceable for several miles, which may be an exaggeration. Has a 50' two-compartment shaft, planned to be sunk 500', with 135-h. p. boiler, hoist and 8-drill air-compressor.

SUNSET COPPER CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Princeton, Boundary district, B. C.

SUMMIT COPPER MINING CO.

Office: care of Daniel Sinclair, Yakima, Wash. Organized, early 1907, under laws of Washington, with capitalization $1,000,000.

SUMMIT GOLD & COPPER MINING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Laurier, Ferry Co.,

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Wash. Lands show a wide vein of low grade ore, carrying a 4' paystreak giving good assay values in gold and copper. Idle.

SUMMIT MINING & MILLING CO. **WASHINGTON.**

Office: Davenport, Wash. Mine office: Keller, Ferry Co., Wash. C. H. Neal, president; C. A. Gray, secretary. Has a 100' shaft, showing argentiferous and slightly auriferous copper ore, giving assays of about $60 per ton. Idle several years and apparently moribund.

SUMPTER SMELTER. **OREGON.**

Owned by Oregon Smelting & Refining Co.

SUN-ANCHOR COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. L. W. Tennant, president; Geo. Kuntzmann, secretary and treasurer. Capitalization $1,000,000. Lands, 3 claims, area 60 acres, on Green Mountain, near the Moon-Anchor. Idle several years and presumably moribund.

SUNDOWN MINE. **AUSTRALIA.**

Mine office: Stanthorpe, Southern Queensland, Australia. Lands are on Ballandean Run, circa 20 miles from Stanthorpe. Property includes a tin mine on the western side of Little Sundown Creek, on which work is in progress, also a copper mine that has been idle for several years.

SUNIK MINES. **RUSSIA.**

Mine office: Evlach, Transcaucasia, Russia. Property is in the Zanghezur district, on the Tiflis & Baku railroad, 30 miles from Evlach and near the Persian line. Ore is mainly chalcopyrite, with occasional bornite, both slightly auriferous and argentiferous, and a little native copper. Property shows a system of 20 known veins, of 7" to 4' width, cutting andesite and diabase, with fault fissures, carrying ore of about 7% average copper tenor, as mined. Development is mainly by tunnel and the workings are of a primitive nature, deepest being about 130'.

SOCIEDAD COLECTIVA C. y J. SUNDHEIM. **SPAIN.**

Office: Huelva, Spain. Mine office: Puebla de Guzmán, Huelva, Spain. Is an incorporated co-partnership between Don Carlos Sundheim de la Cueva and Doña Justa Sundheim de la Cueva. Wm. Guthrie Bowie, manager; Jorge Riecken, mine superintendent. Property includes the Cabezas del Pasto, Sierracilla del Tamujoso and Malagon mines.

The Cabezas del Pasto includes 6 mining concessions, area 104 hectares, with about 300 hectares of adjoining lands, having 12 shafts, deepest 104 meters, with circa 6,000 meters of workings. Ore developed for immediate extraction is estimated at 750,000 tons of pyritic ore and 1,500,000 tons of cupriferous schists. Lenses apparently increase in size with depth. Ore is extracted by overhand stoping, and dry-walling is used in depleted stopes. Ores carry 1.5 to 5% copper, 40 to 52% sulphur and 40 to 44% iron, and the schists range 0.25 to 30% in copper tenor. All pyritic ore above 1.5% copper, and all schists above 10% copper, are exported. The lower grade ores are lixiviated at the mine, and the washed sulphur ore is exported to France. The mine water carries up to 9 kgms. copper in solution per cubic metre, mostly saved by cementation. The cement copper is washed and classified, best quality averaging 98.5% copper, which is the best grade of cement copper produced anywhere. Mining by overhand-stoping and rock filling is said to prove safer and cheaper than open-cast operations. Surface plant includes Robey hoisting and pumping engines, and the mine has a tramline of 76-cm. gauge, also an aërial tram to the wharves at La Laja, on the River Guadiana.

The Sierracilla del Tamujoso was a small producer under former operators, but ore is complex, requiring special treatment, and the property has been idle for some years.

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The Malagon is a group of government concessions, showing good outcrops, with many old workings, but is idle also.

SUNLIGHT MINING CO. **ARIZONA.**

Dead. Was merged in Great Belcher of Arizona Co. Formerly at Providence, Yavapai Co., Ariz.

SUNLIGHT MINING & MILLING CO. **COLORADO.**

Dead. Formerly at Eureka, San Juan Co., Colo.

SUN & MOON MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. R. C. Bonney, general manager. Lands carry auriferous and argentiferous copper and lead ores. Has steam and electric power and a 50-ton cyanide plant, employing circa 75 men.

SUNNY CORNER SILVER MINING CO. **AUSTRALIA.**

Mine office: Sunny Corner, N. S. W., Australia. Is primarily a silver mine, ores carrying an average of 1% copper, copper being used as a carrier for making an argentiferous copper matte. Copper production, when working, was circa 75,000 lbs. yearly. Idle several years.

SUNNYSIDE COPPER MINING CO. **WYOMING.**

Dead. Formerly at Riverside, Carbon Co., Wyo.

SUNRISE COPPER CO. **WYOMING.**

Mine office: Sunrise, Laramie Co., Wyo. O. L. Vincent, president; H. P. Jarrad, secretary. Organized, September, 1902, under laws of Wyoming. Lands, about 11 miles from Sunrise, were worked originally for iron ore. The copper ores carry gold and silver values. Mine produced, 1881-1893, ore valued at $209,282. Idle.

SUNSET COPPER MINING CO. **WASHINGTON.**

Office: Glens Falls, N. Y. Operating office: Everett, Wash. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash., September, 1908, at a time when the company claimed to be working 6 men. H. C. McNutt, president and general manager; A. G. Selinghana, secretary and treasurer; W. W. Black, also reported by company as general manager; preceding officers and E. M. Melzger, trustees; B. J. Gallitspa, superintendent; Etienne E. Ritter, engineer. Organized 1897, under laws of Washington, with capitalization $3,000,000, shares $1 par, said to have been increased, circa 1906, to $4,000,000, but company reports, 1908, a capitalization of $3,000,000 only. Company reported, Sept. 3, 1908, liabilities of $55,000, with $5 cash on hand. Annual meeting, second Tuesday in January.

Lands, 36 claims, 18 patented, reported as of 780 acres area, which is impossible, as the area of 36 claims would be only a trifle more than 720 acres. Lands include the Sunset group of 23 claims, well timbered, on the eastern side of the north fork of the Skykomish river, about 5 miles from Index, opposite the Ethel group. The Mountain Side group of 7 claims has circa 400′ of tunnels.

The Sunset mine shows granite, carrying parallel fissures, varying, on surface, from mere seams to several feet in width, said to be traceable up to 1,000′, the smaller veins being short-lived, and disappearing entirely at shallow depth. The main vein of the Sunset, of 3′ to 17′ width, is claimed to be richest where widest, carrying mainly auriferous chalcopyrite, at and near surface, and being reported to carry considerable argentiferous bornite at depth, which seems reversing the usual order of things. Gangue is quartz, decomposed at surface, but solid at depth. Company reports ore as averaging 12% copper and 8 oz. silver per ton, with small gold values, but returns from 300 tons of selected ore, sent to the Tacoma smelter, were only 9% copper. Development is by a 596′ tunnel, with circa 1,800′ of workings.

Equipment includes several small shops, bunk-houses and a small saw-

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mill. A water power is said to have been developed. The mine is said to have a 6½-mile tram, to Index. Work was begun on a concentrator, at the foot of the tram-line, but apparently the mill was not completed. The ore slimes badly in concentration.

The exceedingly devious methods of promotion followed by this company, under various managements, none good, were fully described in Volumes IV and V. Apparently the present management should not be held responsible for all the lies of its predecessors. Neither company nor property is regarded with especial favor.

SUNSET MINING & MILLING CO. **ARIZONA.**

Office: 719 Majestic Bldg., Detroit, Mich. Letter returned unclaimed from former mine office, Dos Cabezos, Cochise Co., Ariz. Frederick C. Deinzer, president; Eugene F. Bradt, vice-president; Frank A. Rasch, secretary; Hon. Carl Franke, treasurer; preceding officers, Geo. Greening, Edward J. G. Lauer, Fredk. Knorr and Oscar R. Marx, directors; Geo. H. Wilson, superintendent. Organized 1904, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, area 200 acres, circa 10 miles from Willcox, having shafts of 64′ and 100′, showing argentiferous copper ore. Company sued a Calumet broker for $20,000 damages for offering stock at 25 cents, when company was asking $1 per share. Management is composed of men of good standing, the vice-president being a practical and capable mining man.

SUNSET NATIONAL MINING CO. **MONTANA.**

Mine office: Homestake, Jefferson Co., Mont. R. L. Stevens, manager. Lands, 2 groups, one of 2 patented claims, area 35 acres, and one of 70 acres, about 4 miles north of Homestake, developed by a 250′ tunnel, showing ore assaying 5% copper, 4.4 oz. silver and $3.20 gold per ton.

SUPERIOR-ALTA MINING CO. **UTAH.**

Office: care of Walter L. Maas, secretary and manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. A. J. Jacobson, president; L. A. Jeffs, vice-president. Capitalization $300,000, shares $1 par. Idle several years.

SUPERIOR-BONANZA MINING CO. **MEXICO.**

Office: Calumet, Mich. Mine office: Ímuris, Magdalena, Sonora, Mex. A. S. Cox, chairman; R. E. Lopez, secretary; Wm. Gmahling, treasurer; John E. Penberthy, consulting engineer; Chas. Hanley, superintendent. Organized March, 1907, with shares $10 par, as successor of Sonora Bonanza Mining Co.

Lands, 135 hectares of mineral lands, with extensive holdings of miscellaneous lands, circa 35 miles south of Nogales, showing a prominent gossan of 10′ average width, traceable 1½ miles, giving quite uniform assays of $6 to $7 gold per ton, the underlying vein, of 6′ to 10′ average width, showing a 3′ paystreak carrying argentiferous galena, chalcopyrite and wulfenite, with occasional free gold. Has 2 shafts, of circa 450′ depth each, 1 showing at bottom a 12′ vein carrying 3 to 5 oz. silver and $5 to $10 gold per ton. The San Miguel property, having a broken formation, was idle at last accounts.

Equipment includes steam plant with 3 boilers, 2 hoists, 2 pumps, air-compressor and an electric light plant. Water is secured from a well, and stored in a reservoir. Improvements include a general store, dwellings for workmen, lime-kiln, small brick plant and a small concentrator. Property considered promising.

SUPERIOR & BOSTON COPPER CO. **ARIZONA.**

Office: Houghton, Mich. Mine office: Globe, Gila Co., Ariz. Wm. G. Rice, president; John H. Rice, vice-president; John R. Pimlott, secretary and treasurer; preceding officers, Hon. Norman W. Haire and George R. Hill, directors; Frank H. Probert, consulting engineer in charge; W. E. Carter, superintendent.

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Organized Nov. 23, 1906, under laws of Arizona, with capitalization $1,500,000, increased, Sept. 5, 1908, to $2,000,000, shares $10 par. Had 1,585 shareholders of record, Sept. 15, 1908. Fiscal year ends Sept. 30. State Street Trust Co., Boston, registrar; Boston Safe Deposit & Trust Co., transfer agent. Shares, late 1908, were being listed on the Boston Stock Exchange.

Statement for fiscal year ending Sept. 30, 1908, gave $225,392 received from assessments Nos. 2 and 3; $247,610 from sale of additional stock issued; $1,399.02 from interest, and $18,341.61 received from sales of ore. Expenditures for the year included $143,010.20 for development and general expenses. $25,000 for commission for underwriting the new stock issue, $17,017.19 for construction and equipment, and $3,368.10 for patents and miscellaneous expenses, with a $132,800 payment on lands, leaving a balance on hand of $292,842.76, of which $278,690.11 was cash. Accounts payable were $11,195.56. Purchase price of company's lands was $365,000, and final payment thereon, $160,344.20, was made Oct. 15, 1908.

Lands, 45 claims, 19 patented, others in process of patenting, area circa 800 acres, including the Globe & Arizona holdings of 22 claims, bought for $320,000, and an adjoining group of 21 claims, bought for $46,000, giving a compact tract, east of and adjoining the Arizona Commercial mine and properties of the Old Dominion. Lands are about 4,200′ above sea-level, and circa 800′ above Pinal Creek at Globe, hence the mine should not be as wet, at depth, as is the case with the Old Dominion. The property carries ample limestone and iron ore for fluxes. The company also has an option on the Collins-Doyle group of 6 claims, immediately north of and adjoining the Great Eastern mine, which property carries the extension of the Old Dominion vein, and is considered promising.

The property shows Pinal schist, overlaid by circa 600′ of quartzite, which, in turn, is covered, conformably, by circa 500′ of Globe limestone, showing intrusions of diabase, causing extensive mineralization. The property shows two dominant lines of faulting, the main series, which runs northeast and southwest, including, from north to south, the Old Dominion, Great Western or Black Hawk, Limestone, Quo Vadis, Black Oxide and Iron King faults, or veins, these being intersected, at nearly right angles, by another series of faults, of later origin, apparently but slightly mineralized. Of the veins named, three show ore in commercial quantities.

Work was begun January, 1907, and Oct. 31, 1908, the mine had 6,374′ of workings, exclusive of stopes. Assessment work has been done along unusual but highly commendable lines, by sinking 2-compartment shafts, well timbered, at the common end-line of adjoining claims, or, where possible, at the intersecting corners of four claims, thus securing results of actual value for expenditures usually made merely to hold possessory title. Ultimately it is planned to connect the workings, on all veins, by main crosscuts, between the two working shafts, driving crosscuts at vertical intervals of 200′, these serving as the main transportation avenues for ores developed, and giving cheap extraction while providing for handling heavy ore tonnages.

The oxidized zone apparently is of 500′ to 600′ depth, which indicates an extensive zone of secondary enrichment carrying chalcocite and bornite, presumably to be followed by chalcopyrite, at great depth. The leached zone carries mainly carbonate ores, with the bottom workings showing considerable chalcocite, ore increasing rapidly in quantity and copper tenor with depth. The property has all the ores and fluxes required for a good furnace mixture.

The Great Eastern mine, which is the principal property, as developed, and the only producer as yet, has a 420′ shaft, made from an old vertical shaft cut down, and is poorly located, hence eventually must be replaced by a larger shaft to the north, but will serve to develop the property to greater

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depth, and will suffice for a considerable production. Levels have been opened at depths of 100', 300' and 400', the upper levels showing leached ore, of little commercial importance, but the 400' level has a chute of commercial ore 230' long, from the eastern boundary of the Arizona Commercial, beyond which the vein carries small lenses of commercial ore, at irregular intervals, for 361' in length, these indicating commercial ores at a little greater depth, while on the sub-level, 60' deeper, the ore chute is 320' long, proving that it pitches east on the Superior & Boston, making ground rapidly at depth. On the bottom level considerable chalcocite is shown, on both the foot and hanging walls, chalcocite being found in rapidly increasing proportions, with depth. The Great Eastern mine had about $500,000 worth of ore developed, September, 1908, and was a producer of about 40 tons of high-grade ore daily, at the end of 1908, stopes being carried only 3 sets high. The Great Eastern mine is not especially wet, but has been given a new Prescott pump, in anticipation of an increased inflow of water at greater depth.

The Limestone shaft is 318' deep, with levels at 100', 200' and 300', the bottom level carrying a 4' footwall streak of commercial ore, each successive level showing an improvement in both width and character of ore, with prospects of large and rich ore bodies at somewhat greater depth.

The Gardner incline shaft, begun Apr. 4, 1908, at the southern end of the property, on the Black Oxide vein, has 3 compartments, each 5x10' in size, timbered with 10x10" timber, and was 435' deep Sept. 30, 1908. Plats have been cut for levels at depths of 100', 200' and 400'. A crosscut, late 1908, was 44' in the Black Oxide vein, without reaching the footwall. The Black Oxide vein apparently is a continuation of the Buckeye fault, on which the Old Dominion has opened extensive mines on the Buckeye, Carrie and True Blue claims. Equipment of the Gardner shaft is temporary, and it is planned to replace it by permanent equipment with capacity for sinking circa 1,000'.

The portal of the Black Oxide tunnel is about 1,000' southwest of the Limestone mine, the tunnel cutting the Black Oxide vein at 670', giving a 400' back, with drifts of 96' and 397', both in the oxidized zone, showing a vein filling of micaceous hematite, carrying up to 2% copper, indicating sulphide ore below, and showing a small chute of shipping ore. The Black Oxide is 280' east of the True Blue mine of the Old Dominion, from which high-grade ore has been mined, by leasers, for several years.

The Iron King vein, parallel with the others, shows a good iron gossan, and has an old 70' shaft, in leached ledge matter.

Equipment includes hoists at each shaft, with 5,000-gallon and 12,000-gallon oil tanks at the Great Eastern mine, petroleum being used extensively for fuel. Buildings include a power-house at the Great Eastern, smithy, warehouse, barn and 12 two-room cottages, for workmen.

The Great Eastern shaft is reached by a 350' spur of the Arizona Commercial Railroad, over which supplies are received and ore shipped.

The company's property has an excellent site for a smelter, easily accessible by a railroad, and with ample water supply available, but further development will be secured before the matter of building a reduction plant is given serious consideration.

Production was begun February, 1908, within thirteen months after the company started work, with shipments to El Paso smelter, and, beginning May 1, 1908, the company shipped circa 1,000 tons of ore monthly, secured mainly from development work, to the Globe and El Paso smelters. For fiscal year ending Sept. 30, 1908, production was 6,624 tons of ore, yielding net, after deduction of smelting and transportation charges, $48,210.39, an average net return of $7.28 per ton. Ore produced ranged in copper tenor from 5.4% in February to 10.64% in September, and in silver tenor from 2.8 oz. silver in

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February to 7.24 oz. in September, the ore improving steadily in both copper and silver contents. Production for calendar year 1908 was circa 1,350,000 lbs. fine copper. For September, 1908, production was 88 tons blister copper, netting circa $2,500 above all expenses. In November, 1908, a shipment of 54 tons of ore, from the bottom level of the Great Eastern, returned 12.8% copper and 11.8 oz. silver, and the last shipment of 1908, in December, gave returns of 16% copper and 20 oz. silver per ton, the steadily increasing percentages of copper and silver being due to the great improvement in ore bodies secured at depth.

The company's financial position is notably strong, and the ability of the property to make considerable ore shipments so quickly, from development work, speaks eloquently both for the mine and its management. The Superior & Boston is a property of exceptional promise and has an excellent management.

SUPERIOR COPPER CO. **ARIZONA.**

Dead. Formerly at Tucson, Pima Co., Ariz. Described Vol. VI.

SUPERIOR COPPER CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Quincy A. Shaw, Jr., president; Rodolphe L. Agassiz, vice-president; Geo. A. Flagg, secretary and treasurer; Jas. MacNaughton, general manager; preceding officers, Alex. Agassiz and Francis W. Hunnewell, directors; Jas. Biscombe, superintendent.

Organized July 23, 1904, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Is controlled, through ownership of 50,100 shares, bought Dec. 31, 1906, by Calumet & Hecla Mining Co. At end of fiscal year, Apr. 30, 1908, had cash assets of $155,231, with total liabilities of $5,846.

Lands, 400 acres, in Section 15, T. 54 N., R. 34 W., between the Baltic and Isle Royale mines, and just east of the Section 16 mine of the Atlantic. The property carries circa 60,000′ of the strike of the Baltic amygdaloidal bed, with room for 3 or 4 shafts, and has a light overburden, the lode being proven by trenches, at intervals of 1,000′, these showing an amygdaloidal bed of 35′ to 40′ average width, having extensive carbonate stains, due to weathering, with a little fine copper near surface. Property has been trenched to the Eastern Sandstone.

The mine is opened by 2 shafts, No. 1, at the north, which is the only shaft of importance, being sunk in the footwall, insuring solid ground, but necessitating opening the bed by short crosscuts at each level, and, owing to the great width of the bed, it is necessary to crosscut along the drifts, at 100′ intervals. As a rule, the drifts are carried approximately in the center of the bed, with a view to giving a fair average of values. The Baltic amygdaloid, where opened in the Superior, carries copper impregnations in the footwall, always an evidence of strong mineralization, and there is a conglomerate bed, about 20′ in the footwall, which carries a small amount of copper. The stamp-rock is remarkably deceptive in its appearance, as the copper oxidizes readily, and rock is of little promise, after broken a few weeks, but shows much stamp-copper on fresh fractures. The mine shows a marked improvement with depth. Owing to an intervening triangle of land, owned by other interests, between shafts Nos. 1 and 2, they cannot be connected until the 12th level is reached.

No. 1 shaft, circa 1,200′ south of the northern boundary of the property, and about 1,000′ deep, began drifting on the 10th level December, 1908, this showing a lode up to 95′ in extreme width, the shaft having about one mile of workings, at the end of the year. There is an 18′ horse of trap on the 6th level, which disappears on the level below. This shaft shows improving values with depth, the bottom levels being the best in the mine.

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No. 1 shaft has a frame shaft-rockhouse, of the same type as at Nos. 17 and 18 on the Osceola amygdaloidal bed at the Calumet & Hecla, equipment including a Westinghouse engine and 2 crushers. The hoist, good for depth of 1,500′, was taken from No. 20 shaft of the Calumet & Hecla.

No. 2 shaft, 2,540′ southwest of No. 1, and circa 2,400′ from the southern boundary, sunk circa 40′ in the footwall, at an angle of 53°, was 235′ deep at the end of 1908. Work was resumed, July, 1908, when the shaft was cut down to 3-compartment size. This shaft has only a temporary equipment, and shows no copper, because sunk in the footwall.

Mining equipment includes a combined boiler and engine-house, with room for 5 boilers, hoist, and 10-drill and 18-drill air-compressors, all in the power-house, the boilers having been brought from the old Calumet & Hecla power plant at Lake Linden.

Buildings include a warehouse, smithy, changing-house, office and a number of dwellings for employes.

No. 1 shaft is connected with the main line of the Atlantic Railway by a 7,000′ spur, built 1908.

The Superior has a 2-year lease on 2 heads of the Atlantic mill, giving a stamping capacity of about 700 tons daily. The first mill test, made December, 1908, was on circa 950 tons of rock, remaining after discarding about 40% of rock broken for the test from the breasts of the 4 drifts on the 7th to 10th levels, inclusive, and returned 48 lbs. mineral, equal to 35 lbs. fine copper, per ton, of rock stamped, in addition to which there were heavy tailings losses, amounting to 7 to 10 lbs. of fine copper per ton, which probably can be gradually reduced by adjustment of the washing apparatus at the mill, as the Atlantic plant was devised and adjusted for handling lighter copper. It is not likely that the Superior will average 35 lbs. fine copper per ton, but it gives every promise of making a very fine mine, of the same general class as the Baltic and Champion, opened a short distance southward, on the same lode. The mine is capable of supplying easily 500 tons of stamp-rock daily, and at the end of 1909 should be opened sufficiently to supply 1,000 tons daily.

SUPERIOR COPPER CO., LTD. **ONTARIO.**

Office: 10 Adams Blk., Sault Ste Marie, Ont. Mine office: Superior Mine, via Algoma Central Railway, Algoma, Ont. Employs 258 men. Ralph M. Dyer, president; W. H. Teare, vice-president; F. C. Smith, secretary and general manager; Emory W. Clark, treasurer. Organized Sept. 13, 1901, under laws of Ontario, with capitalization $1,500,000, increased, 1903, to $2,000,000, and again increased, 1907, to $3,000,000, shares $10 par; issued, $2,434,120. Levied assessments, to Sept. 1, 1908 ,of $52,972.75, and on that date had $25,872 cash on hand, with $12,700 liabilities. The company was organized as non-assessable, but stock was rendered assessable by special act of the provincial parliament of Ontario. Annual meeting, second Thursday in June.

Lands, 11 claims, area 800 acres, 8 claims, of 680 acres area, being crown-granted. Property, in an unorganized mining district of Algoma, shows granite and chloritic schists, carrying 2 fissure veins, of 10′ and 70′ estimated average widths, traceable circa 7,000′, opened by shafts of 90′, 95′, 115′, 45′, 90′ and 400′, with about 20 pits and trenches, giving a total of 2,155′ of workings, estimated to show 212,000 tons of ore, with same amount blocked out for stoping, which figures seem high. Ore is mainly chalcopyrite, with some chalcocite, having a quartzose gangue, formerly estimated to average 3% copper, 1 oz. silver and $2.50 gold per ton, but estimated, by present management, to average 4% copper, 1 oz. silver and 40 cents gold per ton.

Equipment includes a 150-h. p. steam plant, with 2 hoists and a 12-drill Ingersoll-Sergeant air-compressor. There are 19 buildings, including an engine-

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house, smithy, 20x40′ wooden machine-shop, changing-house, boarding-house and dwellings.

The 50-ton wooden concentrator has 2 jaw crushers, 2 rolls, 6 Hancock jigs and 4 Wilfley tables.

The property is connected with the Algoma Central Railway by a 4.2-mile standard-gauge private line, laid with 80-lb. steel rails, and equipped with 1 locomotive and 3 cars.

The mine closed down, August, 1904, and resumed circa 1908. Management plans a 500-ton concentrator. Property considered promising.

SUPERIOR MINING CO. **NEW MEXICO.**

Office: El Paso, Tex. Mine office: Lordsburg, Grant Co., N. M. Daniel W. Reckhardt, manager. Lands are in the Shakespeare Range, near Lordsburg. Company begun operations 1899, and in 1900 shipped some ore to El Paso smelter. Was idle at last accounts, but said to plan resumption.

SUPERIOR MINING CO. **NEW MEXICO.**

Dead. Formerly at Cerillos, Santa Fé Co., N. M.

SUPERIOR MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. E. Dow, manager. Lands, 8 claims, adjoining the St. Joe, with workings said to show ore assaying 2% copper, 35.5% lead, 29.6 oz. silver and 60 cents gold per ton. Company is said to plan sinking a shaft on the Lark side of the mountain.

SUPERIOR MINING CO. **WASHINGTON.**

Office: 407 Truax Bldg., West Superior, Wis. Letter returned unclaimed from former mine office, Berlin, King Co., Wash. J. P. Simon, president and treasurer; B. A. Baerlocher, secretary and superintendent; preceding officers and W. D. Dwyer, directors. Organized 1902, under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, 4 claims, area 80 acres, and a millsite, 4 miles south of Berlin, in the Miller River district, opened by a 140′ tunnel, showing a 5′ to 8′ fissure vein, carrying some oxidized copper ores, but mainly auriferous, argentiferous and cupriferous pyrite, with talcose gangue, associated with galena, assaying circa 6% copper, .7 oz. silver and $1 to $30 gold per ton. Idle for some years, except for annual assessment work.

SUPERIOR-MONTANA COPPER MINING CO. **MONTANA.**

Office: 604 Rookery Bldg., Spokane, Wash. Mine office: Superior, Missoula Co., Mont. Employs 6 men. L. G. Nash, president; W. P. Smith, vice-president; S A. Matthews, secretary and treasurer; D. A. Buchanan, general manager; L. P Audrle, superintendent; preceding officers are the directors; W. M. Stephen, engineer. Organized July 1, 1907, under laws of Washington, with capitalization $1,500,000, shares $1 par; issued, $175,000. Reported $11,500 on hand Sept. 18, 1908. Annual meeting, August 15th.

Lands, 12 claims, unpatented, area 230 acres, 2 miles from Superior and one mile from C., M. & St. P. Railway, in an unorganized district of Missoula county, showing 2 ore bodies in diabase, of 35′ estimated average width, traceable 7,500′, carrying auriferous chalcopyrite and pyrite, estimated to average 7.3% copper, 6 oz. silver and $14.67 gold per ton, with a trace of lead. Development is by shafts of 30′ and 70′, and a 220′ tunnel, with 1,260′ of workings, estimated to block out 171,000 tons of ore for stoping, which estimate is excessive. Has 4 mine buildings. Company plans continuous development, building a sawmill and a one-mile aërial tram, installing a plant with steam power, air-compressor and hoist, and building a concentrator. Property considered promising.

SUPERIOR & MONTANA MINING CO. **UTAH.**

Office: 317 Quincy St., Hancock, Mich. Mine office: Alta, Salt Lake Co., Utah. Edw. Ulseth, president; Chas. Chynoweth, vice-president; W. Frank James, secretary; John Holman, treasurer; preceding officers, Michael Foley,

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Thos. Bastian and John J. Leserve, directors; Anthony O. Jacobson, manager. Organized circa February, 1907, with capitalization $3,000,000, shares $5 par.

Lands, circa 90 acres, known as the Columbus-Wedge group, near the Columbus Consolidated, supposed to carry the Howland contact of the latter, and the fissure system of the South Columbus, having a 100′ shaft showing good ore.

Montana lands, 7 claims, area 140 acres, well watered and timbered, held under bond and lease, circa 25 miles from Red Rock, Beaverhead county, Montana, showing veins interbedded in gneiss, carrying azurite and malachite, with quartz gangue. A vein of about 30″ width, opened by a 90′ shaft, gave ore assaying 0.75 to 5.75% copper, from 1 to 3.4 oz. silver, and up to 10.3 oz. gold per ton. The Montana lands probably will be surrendered.

SUPERIOR & NEVADA GOLD MINING CO. **NEVADA.**

Office: 221 Breunig Blk., Superior, Wis. Mine office: Searchlight, Lincoln Co., Nev. Hon. W. E. Hailey, president; D. N. Morgan, vice-president; L. Thomas, treasurer; B. J. Thomas, secretary; G. W. Huntington, general manager. Organized July, 1906, under laws of Arizona, with capitalization $1,500,000. Lands, 4 claims, area 80 acres, at Searchlight, known as the King Solomon group, slightly developed by tunnel, said to carry a 5′ vein, showing argentiferous and auriferous copper and lead sulphides, with silicious gangue, assaying circa 7% copper and 2 oz. gold per ton. Also has 4 claims, area 80 acres, at Crescent, Lincoln county, Nevada, apparently undeveloped.

SUPERIOR & PITTSBURG COPPER CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs circa 750 men. Chas. Briggs, president; Capt. Jas. Hoatson, first vice-president; Capt. Thos. Hoatson, second vice-president; Louis W. Powell, third vice-president and general manager; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; preceding officers, Thos. F. Cole, Geo. E. Tener, Chas. d'Autremont, Jr., Chester A. Congdon and Henry R. Rea, directors; H. B. Paull, auditor. Organized June 30, 1906, under laws of Minnesota, with capitalization $20,000,000, shares $10 par; issued, $15,000,000. Company was formed as a merger of the Calumet & Pittsburg Mining Co., Junction Mining Co., Pittsburg & Duluth Mining Co. and Lake Superior & Pittsburg Mining Co. Company ended 1908 owing the Calumet & Arizona circa $1,000,000, borrowed money. Quick assets, Jan. 1, 1908, were $759,150.50, with liabilities of $1,275,087.66, giving a balance of liabilities, in excess of quick assets, of $515,937.16. Company and its predecessors have expended about $12,000,000 on lands, development and equipment.

Lands, 100 claims, patented, largely fractional, area 1,354 acres, including 44 claims, area 629 acres, formerly held by Lake Superior & Pittsburg; 21 claims, area 325 acres, formerly held by Calumet & Pittsburg; 17 claims, area 215 acres, formerly held by Pittsburg & Duluth, and 18 claims, area 185 acres, formerly held by the Junction. The major portion of the Junction tract is covered by Bisbee conglomerate, flanked on either side by porphyry and limestone.

The property shows extensive areas of leached ore, predicating large bodies of rich ore at depth, as in the adjoining Calumet & Arizona and Copper Queen mines. The Superior & Pittsburg has many large and promising ore bodies, with much barren ground, but early efforts were partially mistaken, as very little good ore has been shown in the upper workings, though fine ore has been developed, considerably deeper than anticipated, but the work required to get it was well worth the trouble. The mine made 28,332′ of new openings during 1907, and is drained entirely through the Junction shaft. The property, as a whole, has 5 main shafts, which are connected with each other, and with the shafts of the Calumet & Arizona.

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The Cole shaft, formerly known as No. 2 Lake Superior & Pittsburg, was sunk nearly 1,000′ by the former owners, and was cut down to 3-compartment size, 8x24′ in outside measurement, and retimbered, by the present management, work being begun, simultaneously, on 10 levels, and performed in record-breaking time. This shaft was 1,480′ deep at the end of 1907, and apparently was not deepened, 1908. The Cole shaft also affords the principal avenue of ore extraction from that part of the mine formerly owned by the Pittsburg & Duluth. The shaft shows considerable ore bodies on the 900′, 1,000′ and 1,100′ levels, ore improving with depth. This shaft has Prescott and Cameron station pumps, caring for a flow of 225 gallons per minute, and, at the end of 1908, was shipping 7 carloads of ore daily.

Equipment at the Cole shaft includes an 800-h. p. steam plant, burning petroleum, and a 16-drill air-compressor. There is a 16x42″ Nordberg quadruple-cylinder incline-frame double-drum hoist, capable of raising 12-ton loads from a half-mile depth, hoisting 3-deck cages carrying 3-ton cars, operating in balance, or singly, as desired, and the engine can be altered to hoist from a depth of 2,500′. Buildings at the Cole shaft include a framing-mill, smithy, office and changing-house.

No. 1 Lake Superior & Pittsburg shaft is a relic, left by former owners, of no particular use to the present company, the shaft being of small size and shallow depth.

No. 3 Lake Superior & Pittsburg shaft, 1,000′ deep, is on the Uncle Sam claim, south of the Cole shaft, and has been idle several years.

The Briggs shaft, 1,271′ deep at the end of 1907, is circa 2,000′ south of the Junction shaft, and about 3,000′ east of the Lowell shaft of the Copper Queen. This shaft shows tremendous bodies of the leached ore that has been found capping the big ore bodies of adjoining mines. The first level, at 910′, shows 600′ of good ore. The Briggs shaft has an 8″ air-line, and two 12″ water-columns, with 3 pumps.

Equipment at the Briggs shaft includes a steel gallows-frame, and a power plant, installed 1906, having 7 boilers, 5 of 250-h. p. each, burning crude petroleum, with a powerful hoist and an 18-drill Sullivan straight-line air-compressor.

The Hoatson shaft, on the Del Norte claim, circa 2,500′ from the Briggs shaft, has 4 compartments, and was 1,427′ deep at end of 1907, collar being 150′ higher than that of the Junction shaft. This shaft shows tremendous bodies of leached ore, with some cuprite and other oxidized ores, on the 12th level, and in the bottom workings carries high grade oxides and sulphides, similar to those found in the Lowell shaft of the Copper Queen. At the end of 1908 stations were being cut, on the 1,400′ and 1,500′ levels, and the Hoatson shaft was producing, daily, 2 carloads of oxidized ores, and 6 carloads of sulphide ores. There is a 1,000-gallon pump on the 1,300′ level.

Equipment at the Hoatson shaft includes a 50′ gallows-frame and a double-drum hoist, good for 1,500′ depth. The power plant has 6 boilers, and there is a framing mill, which is a duplicate of that at the Oliver shaft of the Calumet & Arizona.

The Congdon shaft, developing the Pittsburg & Duluth tract, on the Black Bear claim, only 650′ from the Calumet & Arizona mine, is 1,267′ deep, and out of commission, as the territory can be worked to better advantage through the Cole shaft. The Congdon shaft has a 1,000-gallon pump, in a station on the 1,000′ level. Surface equipment includes a 300-h. p. steam plant, with a 12x36″ double-drum hoist and a 5-drill straight-line air-compressor.

The Powell shaft was begun, late 1908, on the line of the Hope and Wagner claims of the Calumet & Arizona, on ground formerly owned by the Pitts-

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burg & Duluth. Equipment includes a Hendrie & Bolthoff double-drum hoist, Sullivan air-compressor and two 75-h. p. Atlas boilers.

The 4-compartment Junction shaft, 1,535′ deep at the end of 1908, is sunk on the boundary line of the Calumet & Pittsburg and Junction tracts. The 1,300′ level shows a great deal of ore assaying up to 9% copper, and the 1,400′ level, at the end of 1908, showed ore assaying above 11% copper, supposed to be a continuation of the ore body on the 1,300′ level of the Hoatson shaft. The Junction was shipping, at the end of 1908, from both the 1,300′ and 1,400′ levels.

The entire mine is drained through the Junction shaft, which also has to assist in unwatering adjoining properties. The pumping station on the 1,200′ level has pumps of 4,500 gallons capacity per minute, and handles the water of the entire mine. A pumping station on the 1,500′ level, completed late 1908, has a 2,500-gallon Prescott pump, transferred thereto from the 1,200′ level.

The Junction has a 75′ steel gallows-frame, planned for 5 compartments. The power plant includes a 16x42′ Nordberg 4-cylinder incline double-frame hoist, good for 1,500′ depth, which is a duplicate of that at the Cole shaft. There also are 12x14″ and 12x15″ auxiliary hoists, and 2 cross-compound air-compressors, of 12 drills aggregate capacity, with ten 250-h. p. marine boilers, and three 5,000-gallon tanks for storage of petroleum. There is a large machine shop at this shaft.

The property is served by the El Paso & Southwestern Railway, which reaches all the main shafts and shops of the mine.

Ore is smelted by the Calumet & Arizona, a sister company. Production, 1906, was 9,084,875 lbs. fine copper, 32,564 oz. silver and 143 oz. gold, the precious metals, valued at $21,941, amounting to average of $4.80 per ton of finished copper. Production, 1907, was 111,710 tons of ore smelted, returning 9,691,405 lbs. fine copper and 55,464 oz. silver, with a small amount of gold, the precious metals returning $33,401.20, equal to $6.90 per ton of copper.

Despite the great cost of developing this mine, and the unusual length of time taken, it is a valuable property, of much promise, though it has taken much more time and money to open than anticipated by anyone, at the start. The management is excellent.

SUPERSTITION MOUNTAIN MINING CO. **ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. Geo. Woodbury, superintendent. Lands, 30 claims, circa 30 miles north of Florence, showing promising copper outcrops.

SURE THING GOLD-COPPER MINING & SMELTING CO. **WASHINGTON.**

Dead. Succeeded, circa 1905, by Clipper Mining Co. Formerly at North Bend, King Co., Wash. Described Vol. V.

SURPRISE EAGLE MINING CO. **MONTANA.**

Office: Silver Bow Blk., Butte, Mont. Mine office: Boulder, Jefferson Co., Mont. T. D. Thomas, president and general manager; Jas. W. Roe, vice-president; Sidney E. Roberts, secretary. Capitalization, $1,500,000. Lands, 2 claims south of the Elkhorn mine, and 4 claims south of the Baltimore mine.

SUTTON MINING CO. **NEW MEXICO.**

Office: Elgin, Ills. Mine office: Lordsburg, Grant Co., N. M. R. A. Fritz, manager. Property is the Last Chance mine, in the Pyramid district, having a 100′ shaft showing a 7′ vein carrying gray copper.

SVANO COPPER & SULPHUR MINES (NORWAY), LTD. **NORWAY.**

Office: Gresham House, Old Broad St., London, E. C., Eng. Organized June 22, 1907, under laws of Great Britain, with capitalization £15,000, in 25,000 preferred and 5,000 deferred shares, of 10s. par each. Was organized to

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acquire a mining concession on the island of Svanöen, on the southwestern coast of Norway. Presumably idle.

SWAKOPMUNDER MINEN-GESELLSCHAFT. — **GERMAN SOUTHWEST AFRICA.**

Office: Schellingstrasse 4, Berlin, W9, Germany. Mine office: Corob, via Swakopmund, German Southwest Africa. Capitalization 36,000 marks. Property is sundry slightly developed copper prospects. Idle and presumably moribund.

SWANSEA CONSOLIDATED MINING CO. — **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jesse Knight, president. Organized circa June, 1908, under laws of Utah, with capitalization $1,000,000, shares $1 par, as a merger of the Swansea and South Swansea Mining companies.

SWANSEA EXTENSION MINING CO. — **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. A. L. Thomas, president; Hon. O. W. Powers, vice-president; Heber M. Wells, secretary and treasurer. Organized circa June, 1908, under laws of Utah, with capitalization $100,000, shares 10 cents par.

SWANSEA MINING CO. — **MEXICO.**

Dead. Lands sold, September, 1905, to Ronquillo Copper Co. Formerly at La Cananea, Arizpe, Sonora, Mex.

SWARTHMORE CONSOLIDATED MINING CO. — **COLORADO.**

Office and mine: Eldora, Boulder Co., Colo. Employs 10 to 70 men. Chas. B. Galbreath, president; Harvey Hanes, vice-president; J. E. Carpenter, secretary; Paul Barriclow, treasurer; H. H. Carpenter, general manager. Organized July, 1907, under laws of Colorado, with capitalization $3,500,000, shares $1 par; issued, $3,000,050, as a merger of the Swarthmore Copper Co. and Enterprise Mining Co.

Lands, 17 claims, 11 patented, area circa 60 acres, in the Grand Island mining district of Boulder and Gilpin counties. Property includes the Golden Fleece mine, having 2 ore bodies under development, one, of 8′ estimated average width, carrying auriferous and argentiferous chalcopyrite, calaverite and sylvanite, the copper ores being estimated to average 3 to 5% copper and 3 to 4 oz. silver, with fair gold values. Milling ore is estimated to carry $10.84 and smelting ore $24 per ton, in average metallic values. Development is by 5 shafts, deepest 403′, and by tunnels of 800′, 1,000′ and 2,000′, estimated to give 63,000 tons of ore blocked out for stoping. Equipment includes two steam plants, one with a 60-h. p. hoist and 12-drill air-compressor. There are 4 new mine buildings.

SWARTHMORE COPPER CO. — **COLORADO.**

Dead. Merged, circa 1907, in Swarthmore Consolidated Mining Co. Formerly at Eldora, Boulder Co., Colo.

SWASTIKA COPPER CO. — **ARIZONA.**

Office: Long Beach, Cal. Mine office: Jerome, Yavapai Co., Ariz. N. Pike, president; Walter Thompson, vice-president; T. C. Jordan, secretary. Organized December, 1907, under laws of Arizona, with capitalization $3,000,000, shares $1 par, as successor of Long Beach & Arizona Mining Co. Reorganization was said to have been effected to eliminate certain stock interests, on account of an alleged illegal stock issue.

Lands, 10 claims, including 3 held under bond and lease, circa 10 miles south of Jerome, carrying auriferous copper ore, opened by a 150′ tunnel and shafts of 150′ and 250′. The Rawhide group, 7 claims, near Yaeger Cañon, 8 miles southwest of Jerome, is opened by shafts of 150′ and 165′. Idle since November, 1907.

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SWASTIKA COPPER MINING CO. **MONTANA.**

Office: Missoula, Missoula Co., Mont. Mine office: Superior, Missoula Co., Mont. Employs 8 men. Thos. N. Marlowe, president; J. W. MacDonald, vice-president and general manager; Geo. E. Marlowe, secretary; Thos. N. Marlowe, treasurer; E. P. Kribs, engineer. Organized July, 1907, under laws of Montana, with capitalization $150,000, shares 10 cents par; fully issued.

Lands, 10 claims, unpatented, area 200 acres, and a 5-acre millsite, well timbered, in the Carter district, showing 2 parallel veins, of 6" to 8" in width, traceable one-half mile, carrying paystreaks of 2" to 4", containing malachite, bornite and chalcopyrite, said to give assays of 17 to 32.5% copper, 1 to 2 oz. silver and from a trace to $6.40 gold per ton, and estimated, by company, to average 35% copper, 112 oz. silver and $6.40 gold per ton. Development is by tunnels of 60', 160' and 270', with 12 trenches. Company plans continuous development.

SWASTIKA COPPER & SILVER MINING CO. **ARIZONA.**

Office and mine: Tucson, Pima Co., Ariz. W. K. Royce, president; D. H. Cochran, vice-president; J. S. Hopley, secretary; J. M. Ormsby, treasurer. Capitalization $1,500,000, shares $1 par. Lands, 24 claims, unpatented, including the Swastika group of 14 claims and the Calendar group of 10 claims, circa 3 miles south of Olive camp. The Swastika group carries silver-lead ores and the Calendar group silver-copper ores. Has 360' of workings, and employs horsepower.

SWEDEN COPPER CO. **WASHINGTON.**

Dead. Merged, circa 1903, in Mt. St. Helens Consolidated Mining Co. Formerly at Spirit Lake, Skamania Co., Wash.

SWISHELM DEVELOPMENT CO. **ARIZONA.**

Mine office: Benson, Cochise Co., Ariz. Lands, 40 claims, in the Swishelm Mountains. Idle and presumably moribund.

SWISS GIRL MINING CO. **ARIZONA.**

Dead. Lands sold, circa 1901, to Baumann Copper Co. Formerly at Dewey, Yavapai Co., Ariz.

SYCAMORE MINING, SMELTING & DEVELOPMENT CO. **ARIZONA.**

Office: Fort Worth, Tex. Mine office: Jerome, Yavapai Co., Ariz. C. G. Stover, president; H. Martin, vice-president and superintendent; W. P. Williams, secretary and treasurer; preceding officers, Henry O'Toole, H. Brown and C. R. Knutson, directors; Max Winchel, foreman. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par.

Lands, on the Verde River, are distant from Jerome 4 miles in an air-line, and 13 miles by wagon road. Mine has a 325' two-compartment shaft, bottomed in low grade chalcopyrite, assaying 1 to 3% copper, which probably will be abandoned by reason of trouble from gases and foul air. Has secured ore assaying 7% copper, 6 oz. silver and $18 gold per ton. Equipment includes necessary mine buildings and a good steam plant. Was diamond drilling at last accounts.

SYLVANIA GOLD & COPPER MINING & MILLING CO. **WYOMING.**

Dead. Formerly at Centennial, Albany Co., Wyo.

SYNDICATED DEEP MINES, INC. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Republic, Ferry Co., Wash. L. W. Anderson, president; M. J. Costello, vice-president; J. E. McFarland, secretary and treasurer; J. L. Harper, general manager and chairman executive board; Neil Cochrane, superintendent. Organized September, 1907, under laws of Washington. Lands include the Lone Pine-Surprise and Pearl Consolidated mines, also a bond and lease on the Manila mine, which is said to show considerable copper. Property was reopened and shipments to Granby smelter begun, March, 1908. Plans sinking shaft to depth of 1,000'.

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SYNDICATED DEEP MINES, INC. **WASHINGTON.**

Office: Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Organized 1906, with capitalization $1,500,000, shares $1 par. Lands, 6 claims, circa 6 miles northwest of Saltese. Presumably idle.

TABATACACHI MINING CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. R. O. Fife, superintendent. Has auriferous and argentiferous copper ores.

TABLAS-FINANA COPPER CO., LTD. **SPAIN.**

Dead. Voluntarily wound up, December, 1901. Formerly at Tablas, Granada, Spain.

TABLE MOUNTAIN COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Kelvin, Pinal Co., Ariz. Is controlled by Arimex Consolidated Copper Co., through ownership of 85% of stock issue. Lands, 27 claims, in the Bunker Hill district. Long idle and of small promise.

COMPAÑIA MINERA EL TABOR y ANEXAS. **MEXICO.**

Office: Mexico, D. F. Mine office: Asientos, Ocampo, Aguascalientos, Mex. Antonio Morfín, president; Bruno Newman, manager. Has secured ore assaying up to 43% copper, with good silver and gold values.

SOCIEDAD BENEFICIADORA DE METALES DE TACNA. **CHILE.**

Works office: Tacna, Tacna, Chile. Organized Jan. 10, 1901, under laws of Chile, with capitalization 68,250 pesos, shares 250 pesos par. Property is a smelter, which, in 1903, treated 4,066 metric tons of ore, producing therefrom 731,960 kilograms of ejes averaging about 50% copper tenor, carrying 806,839 lbs. fine copper.

TACOMA CO. **BRITISH COLUMBIA & WASHINGTON.**

Office: Tacoma, Wash. Mine offices: Van Anda, Texada Island, B. C., and Darrington, Snohomish Co., Wash. A. Grant, general manager. Capitalization $3,000,000, reduced from $5,000,000. Paid a $35,000 dividend, Apr. 2, 1907.

Lands include a gold-copper mine at Darrington, idle for several years, 208 acres of iron ore lands on Redonda Island, British Columbia, 4,000 acres of lands carrying coke and coal in Washington, and the Marble Bay mine, area 640 acres, crown-granted, which was bought for $150,000. Profits from the mine are said to have paid for the property in 3 years. Mine, about one-fourth mile from the Cornell and Copper Queen mines, has ores of similar character and occurrence, found mainly in large chutes, carrying argentiferous bornite and chalcopyrite, averaging circa 5% copper, 2 oz. silver and $1 gold per ton. Development is by several tunnels and shafts, main shaft being 860′ deep, with 10th level, opened at bottom, showing auriferous bornite of good tenor in both copper and gold, values increasing with depth. Shaft has a 90′ gallows-frame, with steam and electric power.

A concentrator, of 150 tons daily capacity, is connected by a 2,125′ aërial tram with ore bunkers on Sturt Bay, but has been idle several years, ore being hand-selected on sorting tables, before shipment. The Marble Bay property includes a limestone quarry and 4 kilns, with daily capacity of 300 barrels of lime. Mine employs 60 men, and in 1907 shipped 6,237 tons of ore, carrying circa 600,000 lbs. fine copper, production being only about 60% of normal because of a miners' strike and low price of copper. Mine considered valuable and management good.

TACOMA SMELTING CO. **WASHINGTON.**

Office: 71 Broadway, New York, N. Y. Works office: Tacoma, Pierce Co., Wash. Employs 675 men. W. R. Rust, president, treasurer and general manager; Edw Brush, vice-president; D. Craig, secretary; F. W. Clark, assistant manager; L. J. W. Jones, general superintendent; preceding officers and

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E. B. Braden, directors; T. R. Wilkinson, refinery superintendent; Roger Taylor, assistant superintendent copper smelter; R. F. McElveney, assistant superintendent lead smelter.

Organized 1898, under laws of Washington, with capitalization $500,000, shares $1 par. Is controlled, through stock ownership, by American Smelters Securities Co.

Lands include an extensive and well located smelter site, 6 miles from Tacoma, on Puget Sound. The property is on tidewater, and tidal flats are being reclaimed, by filling in with slag. There are extensive wharves, with ore-bunkers and automatic devices for unloading cargoes, a small electric tramline connecting the wharves with all departments of the works.

The smelter, of 1,200 tons daily capacity, built originally of 300 tons capacity, for lead ores only, now treats lead mattes, and copper, lead, silver and gold ores and concentrates from the entire western coast of North America, and even does a considerable business on South American ores.

The smelter has three 60-ton mechanical roasters, and two 10-ton hand-roasters, in addition to which a limited amount of ore is heap-roasted. There are 6 blast-furnaces, including four 100-ton stacks, used for lead smelting, and a 400-ton water-jacket blast-furnace for copper, 42x160″ at the tuyeres, with forehearth 14′ in diameter and 4′ high, holding 60 tons of molten matte. A 36″ cupola remelting furnace, with outside settler, can treat 75 tons of 50% matte daily. The reverberatory furnaces are of 350 tons daily capacity, and there is a circular slag-casting machine, having 144 tilting molds. The 1,000′ dust-flues of the blast and reverberatory furnaces lead to a 306′ stack, of reinforced concrete.

The converter department, equipped with a 30-ton electric traveling crane, has 2 stands and six 72x100″ shells, of barrel type.

The works include a 35-ton electrolytic refinery, having a 20-ton electric traveling crane, for handling anodes and cathodes.

The works use electric power mainly, a 40,000-volt current, transmitted to the works, being stepped down, at the plant, to 100 volts, for use. The works require about 2,000 electric h. p., and fuel is petroleum, brought from the oil fields of southern California in tank steamers. The lead furnaces have blast furnished by 3 Connersville blowers, driven by a 200-h. p. Westinghouse induction motor.

The management of the Tacoma smelter is progressive, and the metallurgical practice good, this being one of the most important custom smelters on the Pacific coast.

TADERGOUNT MINE. **ALGERIA.**

Mine office: Takitount, Philippeville, Algeria. Is owned by Stora, Fietta et Cie. Property carries veins of tetrahedrite, presumably argentiferous, also oxidized copper ores in schist and limestone. Mine, slightly developed, has been abandoned at various times, owing to excessive inflow of water. In 1905, with a force of 30 men, produced 150 tons of ore, sent to St. Louis de Rhône, France, for smelting.

TAKARA MINE. **JAPAN**

Office: Takara-mura, Minami-tsurugori, Kai, Japan. Production has been as follows: 417,123 lbs. fine copper in 1903; 541,065 lbs. in 1906, and 327,266 lbs. in 1907.

TAKILMA SMELTING CO. **OREGON.**

Office: P. O. Box 1487, Colorado Springs, Colo. Works office: Takilma, Josephine Co., Ore. Chas. L. Tutt, president; K. R. Babbitt, vice-president; J. A. Hull, secretary and treasurer; Geo. Crerar, manager; C. J. Murphy, superintendent. Organized under laws of Colorado, with capitalization $250,000, shares $10 par.

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Lands, 175 acres, 160 acres patented, also a 160-acre smelter site, with total holdings of 335 acres, in the Waldo district, including the Queen of Bronze and Cowboy mines. The mining property shows diorite and serpentine, carrying several veins, with north and south strike, of which 3 are more or less developed. The company has a sawmill.

The Queen of Bronze mine carries heavy auriferous copper sulphides, said, by a former management, to assay 12 to 60% copper, which figures would undoubtedly be cut heavily by the present owners. Development is by a 150′ shaft, and by tunnels of 200′, 640′ and 150′, with several thousand feet of workings, estimated, 1906, to show circa 20,000 tons of oxidized and sulphide ores, giving average assays of circa 8% copper and $2.50 gold per ton, with some ore up to 50% in copper tenor.

The Cowboy mine, developed by a 310′ tunnel connecting with a 160′ incline shaft, carries mainly oxidized ores.

The smelter, at Takilma, receiving ore by wagon and tram-line, has a 125-ton water-jacket blast-furnace, making matte averaging 45% copper, 2.5 oz. silver and $2.50 gold per ton, shipped to the Tacoma smelter for refining. The fuel supply is somewhat uncertain, and in 1907 the works imported Japanese coke, packed in 100-lb. bags.

Owing to heavy rains in fall and winter, causing impassable roads, the smelter is worked only in summer, the nearest railroad point being Grants Pass, 42 miles distant During the active season 60 teams are employed, to haul out matte and haul in coke and supplies.

Production, 1905, was 7,543 tons of ore smelted, yielding 1,563 tons of matte, of about 45% copper tenor, indicating average returns of 8% copper from ore smelted. Production, 1907, was 499,662 lbs. fine copper. The management is good, and with rail connections, very badly needed, the property should become of some importance.

TALISMAN MINING CO. **UTAH.**

Dead. Former office was at Salt Lake City, Utah, with officers as follows: T. B. McKeon, president; Jas. Ingebretzen, vice-president; J. W. Stringfellow, secretary and treasurer; preceding officers and Frank Knox, directors. Was organized 1906, with capitalization $300,000, shares $1 par. Lands were 11 patented claims, carrying mainly silver and silver-lead ores. Was merged, October, 1908, in Cedar-Talisman Consolidated Mines Co. Formerly in Beaver county, Utah.

TALLAPOOSA COPPER MINES. **GEORGIA.**

Dead. Succeeded, Jan. 24, 1905, by Georgia & Tennessee Copper Co. Formerly at Temple, Haralson Co., Ga.

COMPAÑIA DE MINAS I BENEFICIADORA DE TALTAL. **CHILE.**

Office: Valparaiso, Chile. Mine office: Taltal, Antofagasta, Chile. Organized May 31, 1902, under laws of Chile, with capitalization 500,000 pesos, shares 10 pesos par

TALTAL RAILWAY CO., LTD. **CHILE.**

Office: 32 Great George St., Westminster, London, S. W., Eng. Works office: Taltal, Antofagasta, Chile. Organized circa 1907, as successor of Pacific Smelting Co., Ltd.

Lands, in the Canchas district, 30 miles from Taltal, carry a fissure vein of circa 40″ width, showing carbonate copper ores, with ferruginous gangue, the property being but slightly developed, at last accounts.

The smelter, rebuilt and blown in March, 1904, is served by the Taltal railway, a spur of which enters the works, the main line of which runs near the mine. The smelter has revolving calciners, an 80-ton water-jacket blast-furnace, 30x72″ at the tuyeres, 2 reverberatory furnaces, and a casting furnace. Production, 1905, under old management, was circa 3,700,000 lbs. fine copper.

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TALYSARN COPPER MINES, LTD. **WALES.**

Mine office: Nanttle Vale, Talysarn, Carnarvon, Wales. Organized Feb. 23, 1907, under laws of Great Britain, with capitalization £60,000, shares £1 par.

TAMA MINE. **CORSICA.**

Mine office: Bastia, Corsica. In 1906 produced 385 tons of sulphide copper ore, shipped to Great Britain for reduction.

TAMARACK JUNIOR MINE. **MICHIGAN.**

Owned by Osceola Consolidated Mining Co.

TAMARACK MINING CO. **MICHIGAN.**

Office: 303-199 Washington St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Works office: Hubbell, Houghton Co., Mich. Employs circa 1,500 men. Albert S. Bigelow, president; Hon. Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; preceding officers, Edw. S. Grew, J. Henry Brooks, Jos. S. Bigelow and David N. Anthony, directors; Wm. J. Uren, general superintendent; John T. Been, assistant superintendent; Chas. D. Hohl, chief engineer; John T. Reeder, general clerk and purchasing agent; Wm. Harris, chief clerk; A. Lincoln Burgan, mill superintendent; H. B. Claussen, superintendent motive power; E. J. Waters, chief mining captain; John Rowe and Wm. Rosevear, mining captains.

Organized 1882, under laws of Michigan, with capitalization $1,500,000, shares $25 par. Began dividend payments, 1888, and, to end of 1908, paid 43 dividends, aggregating $9,420,000. Dividends were $300,000 in 1906 and $420,000 in 1907. Loss on operations, 1907, was $249,277, and operations 1908 probably resulted in a small deficit. Annual meeting, first Thursday in May.

Lands, 1,120 acres, in Sections 10, 11, 14 and 15, Town 56 North, Range 33 West, also the Cliff mine, in Keweenaw county, a millsite on Torch Lake, and miscellaneous timber lands and other realty, giving total landed holdings of 8,640 acres.

The Tamarack mine proper is a tract of very irregular outline, bounded on all sides by lands of the Calumet & Hecla, and the mine is opened on the underlays of the Calumet conglomerate and Osceola amygdaloidal beds. The mine was planned by the late Capt. John Daniell, who conceived the idea of opening the underlay of the conglomerate by a deep vertical shaft. Actual work of sinking No. 1 shaft was begun 1882, and the conglomerate was cut, 1885, three and a half years later, at a depth only 10′ greater than the estimate of Capt. Daniell, made before the first sod was removed.

The mine is opened by 5 shafts. The South Tamarack includes shafts Nos. 1 and 2, the original openings, while Nos. 3 and 4 are known as the North Tamarack, and No. 5, the newest shaft, is about midway between the north and south workings. Nos. 3 and 5 shafts are connected on a level that is the 38th in No. 5 and the 16th in No. 3. All shafts are connected underground, giving improved ventilation. The mine, as a whole, uses about 75 power drills, and, in 1907, made 6,221′ of new openings. Sub-levels are opened to save excessive use of timber, and stope-drifts are opened, 12x12′ in size. Rock-chutes are in use, saving much timbering. The entire system of mining has been changed, and stopes are now left with light timbering, permitting the workings to cave after ore is extracted. Since the earthquake of 1905, the inflow of water has been considerably increased. The company's operations are conducted extensively on the Osceola amygdaloid, as well as on the Calumet conglomerate, the latter showing decreased values with depth.

No. 1 shaft, 3,409′ deep, not deepened for some years, cuts the Calumet conglomerate at depth of 2,270′, and also cuts the Osceola amygdaloid, at about 1,000′ greater depth. In this shaft, as in all others, the various levels are reached by crosscuts, except at the actual point of intersection, this applying to both the conglomerate and amygdaloidal beds. The normal productive

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capacity of No. 1 shaft is 400 tons daily. This shaft has 2 Nordberg direct-acting duplex pumps, on 6th and 9th levels, these having Corliss steam-ends, each with capacity to lift 600 gallons per minute from the 9th level. A fire that broke out January, 1906, on the 22d level of No. 2 shaft, burned itself out, August, 1907, in No. 1 shaft, lasting for 19 months, after which No. 1 shaft was repaired and retimbered. This fire cost about $200,000. Equipment of No. 1 includes a powerful hoist, good for the life of the shaft.

No. 2 shaft, 4,355′ deep, not deepened for several years, is a short distance northeast of No. 1, and was straightened and retimbered, 1904, being given a double lining, with the inner wall braced against the outer by timbers of varying lengths, which can be shortened or replaced from time to time. The fire in this shaft, 1906-1907, caused considerable damage, and necessitated retimbering, but the shaft has been a producer since Jan. 16, 1907. No. 2 has a powerful hoist and the management plans swinging Kimberley skips under the cages.

No. 3 shaft, 5,253′ deep, nearly a mile north of No. 1, is the deepest in the world, a 30′ winze sunk near the shaft having its bottom 3′ more than a mile vertically below the earth's surface. This shaft cuts the Calumet conglomerate at a vertical depth of 4,185′, where the bed is 20′ to 25′ wide, but irregular in values, and far from rich, though payable, as a rule, normal productive capacity of the shaft being circa 1,000 tons daily. A sub-shaft, starting from the 14th level, was begun, 1908. No. 3 shaft has mechanical haulage on the 15th, 16th, 17th, 31st, 32d and 35th levels. Haulage is by endless rope, with an engine actuated by compressed air, and the management plans installing a larger haulage engine, 1909, on the 18th level.

No. 3 shaft has an Allis-Chalmers hoist, formerly having a double conical drum, of 13′ 6″ diameter at either end and 36′ 9″ diameter in the center, the cable winding over specially built-up runs of steel, affixed to the surface of the drum, which worked in counterbalance. A new drum replaced the old, 1907, the discarded drum being nearly worn out. About 20,000 rivets were removed in replacing the drum, as the old drum had to be raised and the hubs taken off, and the shaft, weighing 65 tons, also had to be raised. The new drum is similar to that of No. 5 shaft, being semi-conical, with 18′ maximum diameter. The old hoist raised, on test, a 10-ton load, vertically, at a speed of 55 miles per hour, and, running at that rate, the cage was stopped in a distance of 75′. Equipment at No. 3 shaft includes a 60-h. p. fan, 10′ in diameter, with blades 3′ 6″ wide, capable of supplying 192,000 cubic feet of free air per minute, to the depth of the shaft, not only ventilating the mine, but also aiding in reducing the temperature, which otherwise would be nearly 90° F., in the bottom levels. There is a 32x72″ Nordberg auxiliary hoist, with an 18′ 6″ drum having lathe-turned grooves for coiling the cable, this hoist being used for lowering and raising men and timber in No. 4.

No. 4 shaft, 600′ northeast of No. 3, is 4,450′ in depth, and has not been deepened since bottomed, 1895. Occasional good ground is shown, but the shaft, as a whole, is poor. Underground connection is had with No. 3, giving ventilation, and an emergency exit. No. 4 shaft is used exclusively for hoisting water, lowering and raising men, and for purposes of ventilation and safety. A new concrete lining was substituted, 1904, for the old wooden timbering through the overburden. The old shafthouse was replaced, 1908, by a new frame structure, and a large ventilating fan was taken from No. 1 and installed at No. 4 shaft.

No. 5 shaft, about 3,300′ southwest of No. 4, and about midway between the Old Tamarack and North Tamarack workings, is the newest and largest shaft in the mine, being 5,089′ deep. Sinking was begun Aug. 2, 1895, and the conglomerate was cut Dec. 20, 1901, at vertical depth of 4,062′, the late

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Capt. Wm. E. Parnall having foretold the depth within 12′, and the time required within 11 days, when the work was begun, 6 years previously. This shaft is connected underground with the workings to the north and south.

No. 5 shaft is 7x29′, inside measurement, with 5 compartments in a row. The three central compartments, 5′x7′ 2″ each, are used for cages. One of the end compartments, also used for a cage, is 7′ 2″x5′ 4″, the extra 4″ being allowed for timber strain, while on the other side of the shaft is a compartment 3′x7′ 2″ for ladders, pipes and wires. The 10x14″ wall-plates of this shaft are 29′ 2″ long, and the 5x7″ runners, serving as guides for the cages, are 16′ to 22′ in length. Instead of lag-screws being countersunk, the runners have a central groove, 2″ wide and 1½″ deep, running from top to bottom on both sides of each of the 4 hoisting compartments, these grooves providing for the escape of loosened lag-screws, without damage to cages or runners. The shaft openings have automatic covers that lift for passage of the cages. In sinking this shaft, 83 separate trap, amygdaloidal and conglomerate strata, all barren, were cut before the Calumet conglomerate was reached. The north drifts on the 35th, 36th and 37th levels have been carried to the Calumet & Hecla boundary. As a whole No. 5 shaft is decidedly low in grade, although the conglomerate is of good average width.

The shafthouse and rockhouse at No. 5, built by the Wisconsin Bridge & Iron Co., at a cost of nearly $100,000, are on separate foundations and are separately framed and braced, although apparently standing as one building, 56x120′ on the ground, with an extreme height of 131′. The foundations are exceptionally massive, and the girders and framing are of unusual strength, to withstand the great strains caused by hoisting heavy cages, and the operation of powerful rock-breaking machinery. These buildings required about 700 tons of steel and 100 tons of corrugated iron siding in construction. Although 10 carloads of lumber were used in the building, no wood is exposed, except in the floors, asbestos sheathing-paper being used elsewhere to protect the wood, thus rendering the building practically fireproof. The rockhouse has 3 Portage Lake crushers of the reciprocating jaw type, with room for 5 more when needed.

Surface equipment at No. 5 is the most extensive at any shaft, including engine-house, boiler-house and compressor-building of redstone, with steel truss roofs. The engine-house has 2 duplicate 6,500-h. p. Nordberg hoists, each with four 36″ high-pressure cylinders, having 72″ stroke. The drums are 24′ in diameter, in the center, tapering to 16′ at the ends, each half carrying 6,500′ of 1½″ steel cable, the hoists operating in counterbalance, and being capable of raising, from 6,000′ depth, a net load of 6 tons of rock, this having a gross weight, with cage and cable, of about 12 tons. The hoists cost $60,000 and $90,000 respectively. The boiler-house has six 200-h. p. Burt boilers, with 84″ shells, and two 115′ brick-lined self-supporting steel smokestacks. Coal is delivered to the boiler-room from a railroad trestle.

The 50x75′ redstone compressor-house at No. 5 has a 35-drill Ingersoll-Sergeant 2-stage cross-compound air-compressor, with 18″ and 34″ steam cylinders and 36″ stroke, and a 100-drill triple-expansion Nordberg compressor with 19x53x48″ steam cylinders and 2-stage air cylinders of 18x27x48″.

The electric plant at No. 5 shaft has a 150-kw. generator, and transmits energy to all branches of the mine. Miscellaneous buildings at No. 5 shaft include a stone dry and smithy, and there is an extensive timber yard, on ground filled and graded for the purpose, the site having been swampy originally. There is a large machine-shop, doing work for practically all of the Bigelow mines.

Water for steaming purposes and domestic use is pumped from Lake Superior, against a head of nearly 700′. The pumping station, nearly 5 miles

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northwest of the mine, is 60x80′ in size, of brick with steel frame, housing two 1,250,000-gallon pumps, that take water from a 40′ well on the lakeshore, connecting with a tunnel driven 480′ under the bed of the lake, with intake about 35′ below water-level. Water is delivered by the pumps into 2 steel tanks, of 42′ and 65′ diameter, standing on the highest ground of the mine location, these having a combined storage capacity of 200,000 gallons, water being distributed through the mains from these standpipes, and to the Osceola mine location also.

The company owns and operates a hospital, 60x60′ in size, with 2 stories, basement and attic, basement and first floor being of selected Lake Superior redstone, upper story and attic of wood, with interior finish of selected quarter-sawed Georgia pine. The building has a sun-veranda, elevators and indirect steam heating.

There is a private branch telephone exchange, with instruments at the principal pump stations in the mine, and in the various offices, shops and mills.

The company has made tentative plans for a large central electric power plant, at Dollar Bay, on Portage Lake, but, owing to uncertainty as to the control of several of the Bigelow mines, now in dispute, this matter has been held in abeyance.

The Cliff mine, owned by the Tamarack, includes the Cliff proper and the South Cliff, which were connected underground, June, 1908, on the 3d level. The Cliff mine, only a short distance northeast of the Ojibway, is the oldest mine in the Lake Superior district, having been opened 1846, closed 1870, and reopened 1872, but abandoned 1878. The Cliff paid dividends of $2,518,620, from 1849 to 1879, inclusive. The mine was opened on a fissure vein, which was pretty thoroughly worked out before the property was abandoned, and produced much silver, perhaps the most of any Michigan mine.

The Tamarack secured a complete geological cross-section of the Cliff tract, by diamond drilling, 1903-1907. The property carries about 20 amygdaloidal beds, under the greenstone bluff, which is such a prominent feature of the landscape, rising to a height of several hundred feet. The Cliff lands presumably carry the northern extension of the Kearsarge lode. The old Cliff mine had 4 shafts, No. 1 being at the base of the bluff, No. 3 at the edge of the hill, and No. 4 several hundred feet back to the north, all in line, on the fissure vein, while the Avery shaft, sunk 40′ to the eastward, was used formerly for men, timber and pumps. Work was begun, through No. 1 South Cliff shaft, about 1,000′ south of the Avery shaft, and in line with Cliff shafts Nos. 1, 3 and 4. Old No. 1 South Cliff shaft had been idle circa 50 years, and was 462′ deep. The shaft had been unwatered, June, 1908, down to the 6th level, leaving 2 more levels to unwater. The Avery shaft is 480′ deep, with 12 levels, opened at 40′ intervals. In 1907 the management partially cleaned out No. 3 shaft, and on the 3d level, at depth of 177′, drifted on 5 amygdaloidal beds, or "floors," as they were termed formerly, by the old company. In 1908 the management extended a crosscut, on the old Cliff fissure, southeast, and a considerable distance northwest, to the old works under the greenstone, cutting about 20 cupriferous amygdaloidal beds, several of which have given stamp tests, and seem worthy of further investigation, showing several bunches of fair stamp-rock, but the lodes prove, so far as opened, extremely bunchy, and irregular in values. In 1907 the Cliff mine did 1,046′ of drifting. Equipment at No. 1 shaft includes a shaft-rockhouse.

Buildings at the Cliff include a power-house, with duplex hoist, 5-drill air-compressor and boilers, a smithy, changing-house, combination office and warehouse, boarding-house and a number of dwellings. The Cliff mine is reached by the Keweenaw Central railway.

The old waste-burrows of the Cliff, which are extensive, were leased, on

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royalty, to Henry Warren, who built an 8-stamp gravity mill, but this did not result profitably. Expenses of the Cliff mine, 1907, were $57,214.53, charged directly to operating expenses of the Tamarack company.

The Tamarack has 2 stamp-mills, on Torch Lake, a little more than a mile south of the Calumet & Hecla mills, these having 5 compound heads and 2 simple heads, latter idle, the 5 compound heads being capable of caring for all rock crushed at present. The mills have a combined daily capacity of circa 3,500 tons of conglomerate rock. Stamp-heads are fitted with 8" mortar-grates, opening into ¼" mesh revolving screens, with Parnall-Krause hydraulic discharges. The stamps have Nordberg crushing rolls, to care for raggings from the mortars, these rolls having rigid journals, with independent wash for each set. Finisher jigs have been replaced by Wilfley tables.

No. 1 mill has 5 Allis heads, 3 of which are compounded, and this mill has a steel trestle approach. No. 1 boiler-house has four 200-h. p. Pratt boilers, operated at a steam pressure of 150 lbs. per square inch.

No. 2 mill has 2 steeple-compound Allis-Chalmers stamps, with a traveling crane, and No. 2 boiler-house has seven 200-h. p. boilers.

The joint pumphouse of the Tamarack and Osceola mines has two 40,000,000-gallon pumps and one 15,000,000-gallon pump. The two larger pumps, which are duplicates, have triple-expansion steam ends, with 22", 40" and 60" cylinders of 52" stroke, and the water end has three 30" plungers and a 42" discharge pipe. The foundation for the newest large pump is 25' deep, in solid sandstone.

The mills have a 30x90' machine-shop, of sand-lime brick, with steel roof, and there are a number of dwellings for employes at the millsite.

The Tamarack and Osceola mines have joint wharves, and steel coal-sheds with unloading apparatus, at Dollar Bay, on Portage Lake, these being among the most extensive in the district.

Tamarack mineral is smelted at Dollar Bay, by the Lake Superior Smelting Co., which is controlled by the Tamarack, Osceola and Isle Royale companies, under the same general management. All mineral is transported from mills to furnaces in hopper-cars, saving the former cost of barreling.

Production has been as follows: 657,920 tons of rock stamped, yielding 15,286,093 lbs. fine copper, with an average return of 23.2 lbs. per ton, in 1903; 642,320 tons rock stamped, yielding 14,961,885 lbs. fine copper, an average of 23.3 lbs. per ton, in 1904; 750,120 tons rock stamped, yielding 15,824,008 lbs. fine copper, an average of 21.1 lbs. per ton, in 1905; 389,680 tons rock stamped, yielding 9,832,644 lbs. fine copper, an average of 25.2 lbs. per ton, in 1906; 533,600 tons rock stamped, yielding 11,078,604 lbs. fine copper, an average of 20.8 lbs. per ton, in 1907. Production was circa 13,500,000 lbs. fine copper in 1908.

Gross costs of mining and stamping, per ton of rock, and cost of finished copper, per pound, have been as follows: $2.32 per ton and 11.5 cents per pound, in 1903; $2.42 per ton and 12.98 cents per pound, in 1904; $2.39 per ton and 13.37 cents per pound, in 1905; $3.62 per ton and 14.37 cents per pound, in 1906; $3.28 per ton and 15.82 cents per pound, in 1907. The mine made copper, 1901, for 9.1166 cents per pound, and in 1907 there was a falling off of 4.4 pounds fine copper per ton of rock stamped. The Tamarack always has been an expensive mine to work, and costs have increased, unavoidably, with depth, and the mine has suffered severely from fires. Under normal circumstances, the Tamarack is capable of earning small profits, and the management is to be commended for its vigorous efforts toward lessening costs, in all departments. The Cliff mine, while north of the proven zone of paying mines in Keweenaw county, is but a short distance from mines that are developing well, and is a property of considerable promise.

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FUNDICIÓN TAMBORAQUE. **PERÚ.**

Works office: Pacococha, Junín, Perú. Lizandro A. Proaño, owner and manager. Property is a smelter, built circa 1906, having a 40-ton water-jacket blast-furnace, 120 kilometers from Callao, at elevation of 9,820′. The Mina Germania, having the same owner, has a 3′ to 6′ vein, carrying ore assaying 7 to 16% copper and 10 to 20 oz. silver per short ton.

TAM O'SHANTER MINING CO., LTD. **IDAHO.**

Office: Spokane, Wash. Mine office: Osburn, Shoshone Co., Idaho. John H. Wourms, president; David C. Coates, secretary; Chas. Gammell, superintendent. Capitalization $1,000,000, shares $1 par. Lands, 7 claims, 1½ miles south of Osburn, between the Chester and Vortex groups, in the Evolution district. Property has a vein of 5′ to 12′ width at surface, traceable circa 2,000′, carrying highly argentiferous gray copper, opened by an 80′ tunnel and a 50′ shaft, showing ore carrying silver, copper and lead values.

TANGANYIKA CONCESSIONS, LTD. **RHODESIA.**

Office: 31 Clement's Lane, London, E. C., Eng. Mine office: Kansanshi, Rhodesia. Tyndale White, chairman; Robt. Williams, managing director; L. Scotland, secretary; John G. Watson, manager in Africa; Allan Gibb, general engineer; Thos. Boyne and F. E. Stubt, assistant engineers; J. H. Hayden, mine manager; John R. Farrell, consulting engineer.

Organized Jan. 20, 1899, under laws of Great Britain, with capitalization £525,000, increased, later, to £1,000,000, shares £1 par. Debentures, £2,600,000 authorized, par £8, at 5%; issued, £1,500,000. Property consists of a 45% share interest in the Union Minière du Haut Katanga; a 65% interest in the Kansanshi mine, balance being owned by British South African Co.; a 90% interest in the Benguella Railway Co., and a 40% interest in the Katanga Railway Co. The principal operating company is the Union Minière du Haut Katanga, to which the Tanganyika Concessions sold the Ruwe gold mine and the Busanga, Kasonso and Chienzi tin mines.

Lands originally were 2,000 square miles, north of the Kafue and Zambesi rivers, in the Katanga district, near the Congo Free State boundary, also 2,000 acres for railroad and steamship terminals, at the southern end of Lake Tanganyika, and a 5-year concession, that expired 1905, to explore extensive areas of the Congo Free State, and to work any discovered mine for 30 years, with option of extending the period of working to 99 years. In the Congo Free State 72 large mining concessions were located, the company estimating that 5 of these claims show 15,000,000 long tons of 4% copper ore, most of which could be extracted open-cast, and, on another group, the company estimates 1,500,000 tons of ore, of 13% copper tenor. The Congo Free State properties have been disposed of to the Union Minière du Haut Katanga, in which the Tanganyika company holds a large share interest. The company also has an interest in various discoveries in Katanga, until 1911, and mineral prospecting rights, expiring 1912, to circa 120,000 square miles in Angola. The properties in the Katanga district are in a rolling country, having a healthy climate for equatorial Africa, with good water and an abundance of wood. The diamond drill has been used extensively, proving large ore bodies, though some of the ore is highly silicious, and apparently will require special treatment for economical reduction. Mr. Williams estimates the average ore tenor of all mines at 10% copper, with some mines carrying ores averaging up to 20% copper.

The principal copper mines of the company, in various stages of development, are the Kansanshi, Kolwezi, Kambobe, Kabalela, Kakanda, Likasye, Fungurume and Star of the Congo, principal development being on the Kansanshi mine.

The Kansanshi mine lies at an elevation of about 5,000′, near the Congo-

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Zambesi divide, 12 miles from the Congo Free State boundary, in northwestern Rhodesia. The Kansanshi is an old property, worked open-cast, by natives, for centuries, the mine showing trenches and pits for a distance of circa 6,000', these varying in width from 1' to 75', and in length from 1,000' to 1,200', with an extreme depth of 50', there being 6 principal lines of workings, varying from 3' to 30' in width, from 5' to 30' in depth, and from 300' to 1,300' length.

Country rock of the Kansanshi is sandstone, overlying limestone and schist, the sandstone being micaceous and fissile in places, elsewhere soft and clayey, through partial decomposition, the sandstone being more or less charged with malachite, occurring as speiss, the upper portions carrying malachite and chrysocolla, with occasional occurrences of azurite and melaconite, and some cuprite, with silicious gangue, carrying considerable manganese dioxide in the superficial portions. The ferruginous matter in the gangue is chiefly limonite, usually somewhat ochrous, but occasionally hard and compact. Surface ores are mainly malachite, said by Mr. Farrell to show no evidence of having resulted from alteration of sulphides in place, the results leading him to the opinion that the malachite was deposited from hot solutions, coursing in fissures. The ore, as a whole, carries an excess of about 25% silica, and will require heavy fluxing, for which purpose iron ore and limestone are not far distant.

The Kansanshi mine has 5 shafts, sunk in old trenches, on ore bodies of 1' to 16' width. The main shaft, of 300' depth, is on "D" reef, of 8' to 10' average width, opened for a distance of circa 1,000', on the 85' level, ore being massive, with copper impregnations in sandstone for 5' to 10' on either side of the vein, ore being mainly malachite, with an average sampling of 18.7% copper and circa $2 gold per long ton. The deeper workings show a little chalcocite and chalcopyrite, associated with limited quantities of pyrite, but the base zone has not been reached, and the depth of the oxidized zone is unknown, as yet. A second level has been opened in this shaft, at depth of 134'. In the Kansanshi mine, "E" reef, of 2' to 3' width, has been opened for circa 500' distance, on the 85' level, and a new reef, of about 4' width, has been opened for nearly 500' on the 85' level.

The Kolwezi mine, opened by shaft, has been probed by diamond drill borings, showing a continuation of the copper beds to considerable depth.

The Kambobe No. 2 mine has 2 shafts, H and I, of about 100' depth each, with crosscuts said to prove an ore body of nearly 200' width.

The Fungurume mine has 4 short tunnels, one of which is said to have penetrated 191' of ore.

The Likasye mine, slightly developed by tunnel, apparently is idle.

The Star of the Congo mine is said to have ore of better average tenor than the Kansanshi, and it was said, 1907, that developments had exposed 800 tons of 8% ore, which, with assorting, would be self-fluxing.

There are small test smelters at the Kansanshi and Kolwezi mines, latter having a small blast-furnace, and test smelting was begun, circa January, 1908. According to Mr. Williams, the company planned selection and dressing of ore, so that only about 1 ton in 5 would be sent to the smelter, and it is obvious that the ore, as mined, requires concentration.

The Benguella railway, of 330 kilometers length, planned to be about 1,000 miles long, when completed, running from Lobito Bay to a smelting site on the Lualaba river that is centrally located as to the mines, had 100 miles completed and opened for traffic, early 1908. The railroad is planned to cost circa £4,000,000, complete.

Transportation between the principal mines and the terminus of the Rhodesia railway is by 3 traction engines, and the company endeavored, 1908, to induce the Rhodesia railway to build a line to the Star of the Congo mine,

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instead of to the Kansanshi mine, serving the latter with a branch line. The company hopes to secure railroad connections in 1909.

The Tanganyika Concessions, Ltd., modestly claims to possess the greatest copper deposit in the world. This possibly is the case, but, while the deposits are of much promise, their exact status remains to be proven by further development, and extensive smelting operations, and the properties, while of undoubted value, must be considered overestimated. Mr. Williams estimated, 1907, that with copper at £50 per long ton, the Katanga mines had $100,000,000 in values developed, and estimated the cost of production and delivery at £25 per long ton of finished copper, which figures are considered not only excessive as to tonnage, but much lower as to costs than are warranted. Mr. Farrell's original estimate of costs was £12 per ton of finished copper, in Katanga, but this estimate is considered entirely too low, and there is no likelihood that the company can produce copper, in the interior of Africa, at any such ridiculous price, and if the company succeeds in making copper for three times the estimated cost of 2.6 cents per pound, it will be doing very much better than the average copper mine, and the profits will be ample. The Tanganyika Concessions, Ltd., is considered a property of exceptional promise, but its management, while efficient, is entirely too much given to inflated estimates of tonnage, and unduly depreciated estimates of probable costs.

COMPAÑIA MINERA TARAPACÁ DE COLLAHUASI. **CHILE.**

Office: Valparaiso, Chile. Mine office: Collahuasi, Tarapacá, Chile. Organized Jan. 10, 1906, under laws of Chile, with capitalization £50,000, shares £1 par.

TARTANA, LTD. **AUSTRALIA.**

Office: London Bank Chambers, Creek St., Brisbane, Queensland, Australia. Mine office: Chillagoe, Queensland, Australia. H. M. Hicks, chairman; G. S. Murphy, auditor; E. Austin Bell, secretary. Organized under laws of Queensland, with capitalization £120,000, shares 5s. par. Lands, 230 acres, leasehold, on the Walsh river, circa 30 miles northwest of Chillagóe, showing large deposits of auriferous and argentiferous copper oxides and carbonates. A small parcel of hand-selected ore returned 15% copper. Idle several years.

TASMAN-COMSTOCK, CONSOLIDATED. **TASMANIA.**

Mine office: Queenstown, Montagu Co., Tasmania. P. Briggs, manager. Lands, on the western slope of Mount Lyell, have 3 tunnels, lowest showing a green schist carrying copper ore of fair grade. In 1906 shipped 20 tons of silicious ore to London, for special treatment. Employs 6 men.

TASMAN & CROWN LYELL EXTENDED MINING CORPORATION, N. L. **TASMANIA.**

Offices: 47 Queen St., Melbourne, Australia, and Palmerston House, London, E. C., Eng. Mine office: North Mount Lyell, Montagu Co., Tasmania. Tom Agg Hills, chairman; C. Barclay Holland, London director; John Branden, Melbourne secretary; E. Habben, London secretary; Edw. Carter, mine manager. Organized August, 1889, and reorganized Apr. 24, 1906, under laws of Victoria, with capitalization £150,000, shares £1 par.

Lands, 3 claims, area 181 acres, leasehold, in the North Mount Lyell district, opened by 3 tunnels, longest 400′ and 1,453′, showing sulphide ore occurring as impregnations in schist. An 8′ vein carrying a little native copper, succeeded by copper sulphides, was discovered, 1908. Ores are chalcopyrite and galena, said to give average assays of 7% copper and 15% lead. Employs 10 men.

TASMANIA COPPER MINING & MILLING CO. **COLORADO.**

Office: 603 Provident Bldg., Philadelphia, Pa. Mine office: Winfield, Chaffee Co., Colo. D. B. Dance, vice-president; G. Albert Smyth, secretary; Edw. O. McHenry, treasurer. Organized Apr. 20, 1898, under laws of Colorado,

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with capitalization $1,000,000, shares $1 par. Lands, 13 claims, area circa 250 acres, in the La Plata district, with about one-half mile of underground openings, estimated to show 750,000 tons of auriferous and argentiferous galena, sphalerite and chalcopyrite, which is too much. Has a 25-ton pyritic smelter. Idle and presumably moribund.

TASMANIAN COPPER CO., LTD. **TASMANIA.**

Office: 348 Winchester House, London, E. C., Eng. Operating office: 15 Patterson St., Launceston, Tasmania. Mine offices: Rosebery, Dundas Co., Tasmania, and Blinman, Flinders Co., South Australia. F. L. Cox, chairman; E. M. King, chairman local board; W. L. Hoyt, general manager; Jos. G. Coldwells, London secretary; A. Simon, local secretary; G. Barker, mine manager. Organized Jan. 13, 1897, with capitalization £325,000, shares £1 par. Debentures, £12,500, at 10%, issued June, 1905, redeemable 1915, at par, or earlier at 50% premium. Company offered £30,000 new debentures, late 1908.

Tasmanian lands are 386 acres, on Mount Black Bear, near the Stitt river, in the North Dundas district, including the Rosebery and Ring River mines, also a 5-acre smelter site, all in the West Coast district. The Rosebery mine has an ore body of 24′ estimated average width, traceable circa 3,000′, that apparently is a replacement of country rock along a line of fault fissuring, having a schistose footwall, heavily impregnated with pyrite, and carrying a paystreak of 6″ to 5′ width for length of circa 500′, with ore assaying 8.76% copper and 1.75 oz. silver per long ton. The ore is a complex sulphide, including auriferous chalcopyrite, sphalerite and galena, from which the zinc values have been lost heretofore, no process in use having succeeded in recovering all of the metallic values. The Rosebery mine is developed by tunnels, longest 644′. Ore reserves were estimated by the company, 1905, at 158,400 long tons, and production, at last accounts, was circa 1,000 long tons monthly. The company is said to plan a smelter at the Rosebery mine.

South Australian lands include the Blinman mine, and about 50 other small mines and prospects, in the Blinman and Yudnamutana districts, latter including the Sliding Rock mine, area 78 acres, on the south side of Sliding Rock Creek, 14 miles from Beltana, and the Yudnamutana, Leigh Creek and Warra Warra mines. The district is arid, and considerable trouble is experienced, in the dry season, from inadequate water supply. The South Australian holdings also include 7 coal properties, area 10,000 acres, 40 miles from the Blinman mine.

The Blinman mine, area 120 acres, with 320 acres of mineral ground adjoining, is in the Flinders range, 272 miles north of Adelaide, and was bought 1902. The Blinman mine, opened 1862 and reopened circa 1899, carries ore bodies of irregular value in micaceous limestone, only the richer portions being smelted, the bulk of ore produced requiring concentration. The mine is said to have produced considerable ore of 8% average copper tenor, concentrated to about 23% for shipment to the smelters, in addition to which small quantities of hand-picked ore, of 30 to 40% copper tenor, have been shipped. The mine has a 450′ main shaft, and ore reserves were estimated, June, 1904, at 58,500 tons. The Blinman has a smelter with a 150-ton blast-furnace, at Leigh Creek, north of the mine, making matte of 50 to 55% copper tenor, when in operation.

Production of the Blinman mine was 5,524 long tons of ore, yielding 337,075 lbs. fine copper, in 1904, and 898,240 lbs. fine copper during the first half of 1907. Average return of ore smelted, first half of 1905, was about 4.35% copper. The Blinman mine was closed down December, 1907, and company was said, 1908, to have definitely abandoned its properties in South Australia.

TASMANIAN METALS EXTRACTION CO. **TASMANIA.**

Works office: Rosebery, Montagu Co., Tasmania. A. J. Thynne, manager. Organized 1908, under laws of Great Britain, with capitalization £350,000,

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shares £1 par. Company plans erecting an extensive custom smelting plant, of circa 400 tons daily capacity.

TASMAN LYELL COPPER CO., LTD. **TASMANIA.**

Dead. Absorbed, March, 1903, by Lyell-Comstock Consolidated Copper Co., Ltd. Formerly at North Mt. Lyell, Montagu Co., Tasmania. Described Vol. IV.

TASMAN LYELL PROSPECTING ASSOCIATION, N. L. **TASMANIA.**

Dead. Formerly, circa 1891-1897, at North Mt. Lyell, Montagu Co., Tasmania.

TATERI MINE **JAPAN.**

Mine office: Nosakagawa-mura, Yoshino-gori, Yamato, Japan. A very small producer, making, circa 1901, about 40,000 lbs. fine copper yearly.

TATLAYOCO LAKE COPPER CO. **BRITISH COLUMBIA.**

Office: care of C. R. Howard, secretary, Spokane, Wash. A. M. Riley, treasurer; A. H. Shepard, manager; Jos. B. Lindsley, attorney; preceding officers and F. P. Greene, trustees. Organized circa 1907, with capitalization $5,000,000, shares $1 par. Lands, 3 groups, area 300 acres, in the vicinity of Tatlayoco Lake, in the Nanaimo district, circa 160 miles northwest of Vancouver, near the British Columbia border. One group is said to show a mountain of cupriferous pyrite, averaging 1% copper, with combined gold and silver values of $1.50 per ton. Another group is said to have a vein 75′ to 200′ wide, traceable 3,000′, with a 20′ paystreak, said to average 5% copper and $2 per ton in combined gold and silver values, opened by a 110′ tunnel. Property is also said to show ores of iron and antimony.

TAUNTON-NEW BEDFORD COPPER CO. **MASSACHUSETTS.**

Office and works: New Bedford, Bristol Co., Mass. Henry M. Lovering, president; Clarence A. Cook, vice-president and agent; Henry F. Bassett, treasurer. Is a consolidation of the Taunton Mfg. Co., New Bedford Copper Co. and Revere Copper Co. Has extensive copper and brass rolling mills.

TAYLOR'S COPPER, LTD. **UTAH.**

Office: 221 Herald Bldg., Salt Lake City, Utah. Mine office: Moab, Grand Co., Utah. W. D. Bohm, manager; preceding officer, W. B. Taylor, J. R. Lobb, Edmund M. Slatter and C. P. Drennen, directors. Organized Nov. 20, 1906, under laws of Montana, with capitalization $2,500,000, shares $5 par. Property is the Big Indian mine.

TAYLOR COPPER MINES CO., LTD. **ONTARIO.**

Office: care of Robt. H. Taylor, president, Sault Ste. Marie, Mich. H. P. Taylor, secretary. Property is in Algoma, Ontario, east of Sault Ste. Marie. Expended about $30,000 in exploratory work. Idle since circa 1903.

TECOLOTE COPPER CO. **NEW MEXICO.**

Dead. Succeeded by Las Vegas Copper Co. Formerly at Las Vegas, San Miguel Co., N. M.

TECUMSEH COPPER CO. **MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Employs circa 60 men. A. Agassiz, president; Col. T. L. Livermore, vice-president; Geo. A. Flagg, secretary and treasurer; Jas. MacNaughton, manager. Organized Feb. 3, 1880, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $1,373,975. Is controlled, through ownership of 54,249 share of the outstanding stock issue of 54,959 shares, by La Salle Copper Co. Ended fiscal year Apr. 30, 1908, with a debit balance of $128,953.

Lands, 560 acres, in a very irregular tract lying next south of the Osceola mine, carrying circa 400 acres of the underlay of the Kearsarge amygdaloidal bed. Work was done first on the Calumet conglomerate, where a shaft of about 1,000′ depth found no payable copper. A shaft of circa 2,300′ depth, on the Osceola amygdaloid, begun 1899, was abandoned November, 1902, being found

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practically barren of copper, but recent developments to the northward, at depth, in No. 6 shaft of the Osceola mine, indicate the possibility of good ground on the Osceola bed, at greater depth than yet reached in the Tecumseh shaft.

The Tecumseh carries about 1,800′ of the strike of the Kearsarge lode, and has 2 shafts thereon.

No. 1 shaft, of 3 compartments, 6x18′ in size, sunk diagonally on the plane of the lode, was circa 1,400′ deep, early 1908, showing a bed of about 15′ average width, giving a promising showing of copper. Equipment includes a hoist, good for 2,000′ depth, raising 3-ton skips, and a 15-drill air-compressor.

No. 2 shaft, 1,000′ north of No. 1, was started Aug. 30, 1905, and was abandoned, 1907.

Production, under a former management, was begun circa Nov. 1, 1906, at the rate of about 100 tons of rock daily, but was soon discontinued. Production, for year ending Apr. 30, 1908, was 59,875 lbs. fine copper, secured from rock mined previous to 1907.

TEHAMA MINING CO. **CALIFORNIA.**

Dead. Formerly at Ingot, Shasta Co., Cal. Described Vol. VI.

TELEMARKEN COPPER MINING & SMELTING CO., LTD. **NORWAY.**

Office: 43 Finsbury House, Blomfield St., London, E. C., Eng. Mine office: Mo, Bratsberg Amt, Norway. Chas. McCully, general director; Herbert McCully, manager; J. S. Sargent, secretary. Organized May 21, 1906, under laws of Great Britain, with capitalization £100,000, shares £1 par; issued, £80,000. Debentures, £2,000, at 6%. Paid a dividend of 7½%, March 15, 1907.

TELESFORO COPPER CO., LTD. **SPAIN.**

Dead. Name changed, June, 1907, to General Company of Spanish Mines, Ltd. Formerly at Cortegana, Huelva, Spain.

TELKWA MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Aldermere, Skeena division, Cassiar district, B. C. Lands include the Duchess and Countess claims, carrying apparently parallel bodies of argentiferous copper ore, with values mainly in silver. Development on the Duchess claim includes a 60′ tunnel and several open-cuts, showing a 6′ vein of copper ore.

TELKWA MINING, MILLING & DEVELOPMENT CO. **BRITISH COLUMBIA.**

Mine office: Aldermere, Skeena division, Cassiar district, B. C. Lands show an ore body of circa 50′ width, carrying a hanging-wall paystreak of chalcopyrite and specular iron ore, with a 150′ open-cut, on the Anna-Eva claim, showing copper carbonates, pyrite and hematite.

TELLER MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Ores carry gold, silver, lead and copper. Presumably idle.

TEMAGAMI COPPER CO **ONTARIO.**

Office: Toronto, Ont. Mine office: Temagami, Nipissing, Ont. Organized 1907, under laws of Ontario, with capitalization $2,000,000. Is said to have secured a 92′ diamond drill core of good ore.

TEMPEST MINING & SMELTING CO. **OREGON.**

Dead. Formerly at Alamo, Umatilla Co., Ore.

FUNDICIÓN TEMPLEMAN, LTD. **CHILE.**

Dead. Voluntarily liquidated, July, 1902. Formerly at Antofagasta, Chile. Described Vol. III.

TENABO-MOHICAN MINES CO. **NEVADA.**

Mine office: Tenabo, Lander Co., Nev. H. L. Sanborn, secretary and treasurer. Lands, 320 acres, developed by a shaft showing argentiferous copper

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ore of low average tenor. Equipment includes a steam plant with hoist and air-compressor.

TENDERFOOT MINING CO. **WYOMING.**

Dead. Formerly at Douglas, Converse Co., Wyo. Described Vol. VII.

TEN LAKES MINING CO. **CALIFORNIA.**

Mine office: Edgewood, Siskiyou Co., Cal. Lands, 10 claims, circa 9 miles west of Edgewood, on Mount Eddy, showing 2 parallel fissure veins, in gabbro, crossed by 2 transverse veins, opened by tunnel and a 12′ pit, latter showing auriferous and argentiferous chalcopyrite, assaying 11 to 30% copper, 2.5 to 15 oz. silver and $5 to $28 gold per ton.

TENNESSEE COPPER CO. **TENNESSEE.**

Office: 334-11 Broadway, New York, N. Y. Mine office: Copper Hill, Polk Co., Tenn. Employs 1,200 men. J. Parke Channing, president; Fredk. Lewisohn, vice-president; E. C. Westervelt, secretary; Julius H. Susmann, treasurer; preceding officers, Henry H. Rogers, Albert Lewisohn, Walter Lewisohn, Walter S. Henry and Jas. Philips, Jr., directors; B. Britton Gottsberger, general manager; N. H. Emmons, assistant general manager; Walter L. Stevens, general superintendent; John Edwards, mine superintendent.

Organized Apr. 26, 1899, under laws of New Jersey, with capitalization $5,000,000, shares $25 par. Debentures outstanding, Dec. 31, 1907, $400,000, in $1,000 first-mortgage 20-year bonds at 5%, dated July 1, 1902. National City Bank, New York, and Old Colony Trust Co., Boston, transfer agents. Trust Company of America, New York, and State Street Trust Co., Boston, registrars. Shares are listed on the Boston Stock Exchange. Annual meeting, last Thursday in February.

Net profits and dividends have been as follows: $417,565 profits and $218,750 dividends, in 1903; $186,966 profits and $218,750 dividends, in 1904; $452,106 profits and $218,750 dividends, in 1905; $824,231 profits and $250,000 dividends, in 1906; $800,634 profits and $650,000 dividends, in 1907; $500,000 dividends in 1908, giving total dividends, to Dec. 31, 1908, of $2,025,000. During 1907 the company expended $728,067.11 for construction account, of which $504,525 was for the acid plant, and $114,000 for improvements at the smelter.

Lands, 2,080 acres, with 11,000 acres miscellaneous lands, in the Ducktown district. Ore was first discovered, and mining begun, circa 1850, and the mines were operated regularly, previous to the American Civil War, which caused their suspension. Lands include the Burra Burra, London, Polk County and Tennessee mines, latter idle; also the Eureka iron mine, operated, under lease, by the Virginia Iron, Coal & Coke Co., which, 1907, extracted 39,498 long tons of iron ore.

Property shows pre-Cambrian metamorphosed mica-schist, carrying 6 series of lenticular ore bodies, of which 3, under development, show extensive gossans, originally having a little oxidized ore near surface, which was mined out, years ago. The lenses range 30′ to 70′ in width, and 500′ to 2,000′ in length, with an average depth of 400′, carrying chalcopyrite, associated with pyrite, in quartz gangue, ore ranging in tenor from 2 to 4% copper, circa 40% iron, 27% sulphur and 15% silica, with very small quantities of gold and silver. As zinc and other refractory elements are lacking, the ore is excellently adapted to cheap and close concentration, and also smelts well, giving very clean slags.

The mines are extensively developed, there having been made 2,026′ of new openings and 15,050′ of diamond drill borings, in 1907, giving ore reserves estimated at 2,292,369 tons, with probable additional ore to the extent of 1,030,000 tons, giving total probable reserves of 3,322,369 short tons, Jan. 1, 1908.

The principal property is the Burra Burra mine, yielding about 60% of the

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total ore production. This mine has 2 old shafts, known as the Hiwassee on the south and the McPherson on the north, with a new main shaft, of circa 800′ depth, sunk in the footwall, at an angle of 75°, with levels opened at 100′ intervals below the first, which is 172′ below the collar of the shaft, and at the end of 1908 the shaft was being sunk to the 7th level. The Burra Burra has circa 2 miles of workings, not including depleted stopes, and shows a lense of 30′ to 85′ width, for a length of 3,000′, between Hiwassee and McPherson shafts, on the 3d level. Crosscuts are driven from the shaft to the ore, on each level, and connections made between levels by winzes opposite the shafts, from which stopes are started by cutting out about 30′ below the level above, leaving floors of that thickness between levels. Drifts are driven every third level only, for exploration, and at 100′ intervals diamond-drill holes are bored, into both foot and hanging walls, to determine the width of the ore body.

The London mine has a 588′ shaft, with 5 levels opened, on a lense of 25′ to 75′ width, which is 500′ long on the first level.

The Polk County mine has a 385′ vertical shaft, with 3 levels opened, and was preparing to open the 4th level, at end of 1908. The ore body is 20′ to 90′ in width, and of undetermined length and depth.

The Burra Burra has a wooden shafthouse, 127′ high, with a crushing plant. The shafthouse has 3,000-ton bins, ore being fed from receiving bins to an 18x36″ Blake crusher, which discharges to 36″x33′ Robins belt-conveyors, leading to 2,000-ton storage bins, the conveyor-belts being used as picking tables, and, as far as possible, all barren rock is removed from the crushed ore. Equipment includes 42x144″ screens and a 180-h. p. engine, the plant having a daily crushing and assorting capacity of circa 2,000 tons, ore being reduced to 4″ size. There are similar shafthouses at the London and Polk county mines.

The power plant at the Burra Burra includes a brick building housing engines, air-compressors and boilers. There is an 18x32″ Nordberg first-motion hoist, with 2 conical drums, each of 7′ minimum and 9′ maximum diameter, with 5′ face, hoisting 5-ton skips, and a man-car, similar to those of the Lake Superior district, with 1⅛″ steel cable. The power plant has 2 Nordberg 2-stage air-compressors, each of 2,000 cubic feet capacity per minute, and there is an electric light plant. The boiler plant has four 150-h. p. Babcock & Wilcox boilers, with Murphy automatic stokers.

Buildings at the Burra Burra mine include a machine-shop, carpenter-shop, smithy and a large changing-house. The office building is at the Burra Burra mine, and, in addition to about 60 dwellings for workmen, the company maintains a clubhouse for unmarried members of the staff. The company maintains a 20-room hospital, with a medical, surgical and nursing staff.

The company's private railway has 7½ miles of main line, including branches to the 3 mines, with 4½ miles of sidings and spurs. The track is of standard gauge, laid with 65-lb. steel rails, connecting with the Louisville & Nashville railway, at Copper Hill, with an extensive yard for interchange of cars between the lines. Equipment of the railway includes four 105,000-lb. Schenectady locomotives, and 63 thirty-ton ore cars.

The reduction plant is at Isabella Junction, a little north of the old Tennessee mine, and 1 to 5 miles from the other mines of the company. The works do a very small amount of custom smelting. The plant, designed and built by Mr. Channing, is admirably planned, material being handled throughout by gravity, and the works were greatly enlarged, 1905, and an acid plant added, 1907.

The furnace building is of steel, with storage bins of 10,000 tons capacity for ore, and 800 tons for coke, with storage for flux and furnace products requiring retreating. Smelter charges are drawn from bins, into side-dumping

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cars, of 44 cubic feet capacity, hauled by electric locomotives, there being 4 tracks under the bins, with scales for weighing charges, the tracks circling around the furnaces, so that a train loaded on any track under the bins may be dumped on either side of any furnace. There are 7 blast-furnaces, 3 of 56x180" size at the tuyeres, and four 56x270", with height from tuyeres to charge-floor of 18', and 3' 6" from tuyeres to sole-plates, which are of cast-iron, water-cooled. The furnace building also has a 25-ton refining furnace. Each blast-furnace has a circular settler, 16' in diameter, lined with firebrick, with chrome brick around the tap-holes, skimming into slag-pots of 105 cubic feet capacity, hauled by electric locomotives, slag being used for railroad ballast.

Smelting is in two stages, the first-fusion product being a matte of 15% copper tenor, which is cooled in beds, on the slag-dump, broken up and hauled to the smelter-bins. Flux for first fusion is quartz only, and the second-fusion product, for which flux is both limestone and quartz, is a matte averaging circa 32% only in copper tenor, which goes to the converters, furnaces taking an unusually heavy blast, of 50 oz. per square inch pressure, air consumption, per ton of ore smelted, ranging from 70,000 to 90,000 cubic feet. The two fusions require a coke charge of only 6.5 to 7%, by weight, of the ore smelted, equal to about 5% of the total charge. The process of smelting was changed radically, in 1905, when semi-pyritic smelting was substituted for the old method of preliminary roasting. Despite reduced production for two years, and the cost of enlarging the smelting plant, the results of semi-pyritic smelting have proven most satisfactory. In 1908 the first-fusion matte, formerly averaging only about 15% in tenor, ran up to about 19% copper, and there seems a possibility that, in time, a single fusion may provide matte of tenor suitable for the converters.

The converter department has two 40-ton electric traveling cranes handling matte, with 4 stands and 15 shells, each 84x126" in size, of the Leghorn trough type. The converter slags are poured into the blast-furnace settlers, the small amount of white metal collecting in the ladle bottoms being poured back into converters in blast, and, in this way, the only converter slags re-smelted are skulls formed in the ladles during cooling. Product of the converters is 210-lb. pigs of blister copper, of 99.4% average copper tenor, shipped mainly to Europe, as blister copper, electrolytic refining being unnecessary, because as a rule there are no precious metal values worth saving, and no impurities of importance requiring elimination.

The powerhouse at the smelter is of steel frame, with brick walls. There are two 250-kw. 500-volt D. C. Westinghouse generators, direct-connected to Nordberg tandem-compound engines, run non-condensing, exhaust steam going to a Wheeler closed feedwater heater, for heating boiler feed. Furnace blast is supplied by 3 Nordberg duplex cross-compound piston blowing engines, of 20,000 cubic feet capacity per minute each, and 3 similar engines of 30,000 cubic feet capacity per minute. There are independent mains to each furnace, but these are to be replaced by a common blast-main, above the charge-floor, with connections to each cupola. Air for converters is supplied by 2 Nordberg air-compressors, furnishing 10,000 cubic feet per minute, at 12 lbs. pressure. There is a 110-kw. 250-volt Keystone generator, direct-connected to a Ball tandem compound engine, for electric lighting. The boiler plant includes four 250-h. p. and two 550-h. p. Babcock & Wilcox boilers, with Murphy automatic stokers, the two larger boilers having Foster superheaters. Both coal and ashes are handled mechanically by a bucket and chain conveyor, coal being drawn from an overhead steel bunker.

Miscellaneous buildings in connection with the reduction plant include a smithy, plate-shop, carpenter-shop, pattern-shop and foundry.

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Water supply is secured from the Ocoee river, the pumping station, at the river bank, having two 10" Worthington 2-stage pumps, belt-driven by motors, delivering 2,800 gallons per minute to large storage tanks above the smelter. Overflow from the water-jackets of the blast-furnaces passes over a cooling tower, from which the water for condensers is taken, surplus water flowing to a settling pond and storage reservoir, which has an auxiliary pumping plant.

The smelter being located in the extreme southeastern corner of the state of Tennessee, prevailing winds carry the bulk of the fumes into the state of Georgia, which brought suit against the company in the Federal courts, resulting in the decision, by the latter, that the Tennessee Copper Co. must eat its smoke. As a result the company has built one of the most complete acid plants in existence, this having cost, to the end of 1908, more than $1,000,000, with a rated capacity of 120,000 tons yearly of 60° Beaumé sulphuric acid, but planned to be increased to a capacity of 250,000 to 300,000 tons yearly. The acid plant, begun 1906, and completed November, 1907, was put into full operation early 1908, but was not entirely satisfactory, the most serious trouble being due to the failure of the original blast-furnace tops, due to excessive heat. Some changes in the plant were made during the latter half of 1908, when it was running at the rate of only about 4,000 tons production monthly.

As the furnace gases contain sulphur dioxide, sulphur trioxide, carbon dioxide, oxygen and nitrogen, in percentages varying considerably, special methods of control have been found necessary, to maintain the volume of production of suitable gas. Fumes from the blast-furnaces go to a brick-lined balloon flue, or into a concrete flue below and immediately back of the furnaces, both discharging into a dust-chamber 209′ long, 30′ wide and 20′ high, at the end of which is a radial brick stack, 325′ high, of 25′ inside diameter. Dust is removed from the chamber by two 12" conveyor-belts, placed in a tunnel underneath. In essential features the acid plant is similar to other works, the main difference being the source of gas supply, which, in this case, is taken from the concrete flue back of the blast-furnaces. The works have 2 Glover towers and 4 Gay-Lussac towers, all of unusual size, and there are 10 steel storage tanks, of about 7,000 tons capacity, into which acid is discharged from the works, and from which it is drawn into 55-ton steel tank-cars for shipment. The location of the acid plant is such, being readily accessible to the more important phosphate fields of the south, that the manufacture of superphosphates should prove a highly remunerative industry. The company was said, late 1908, to have contracted for the sale of its acid, for 40 years, at $3 per ton, to the Independent Fertilizer Co., on the basis of 100,000 tons yearly, and is said to have received a $250,000 bonus for this contract, with further bonuses of $2,250,000 due later.

Production has been as follows: 8,103,534 lbs. fine copper in 1902; 10,690,389 lbs. in 1903; 8,617,697 lbs. in 1904; 7,977,982 lbs. in 1905; 11,319,591 lbs. in 1906; 12,597,611 lbs. fine copper, secured from 383,631 tons ore smelted, in 1907, giving an average recovery of 23.32 lbs. per ton, for 1907, as against 34.82 lbs. per ton in 1905. The 1907 production also included 14,905 oz. silver and 85 oz. gold, part of which was secured from custom ores smelted, and, of the total production, 205,133 lbs. fine copper were secured from custom ore, and 2,230,136 lbs. of copper produced were refined electrolytically, balance being marketed as blister copper. Production was circa 14,000,000 lbs. fine copper in 1908, and should be considerably larger in 1909. At the end of 1908, production was about 1,100 tons of ore daily, from the Burra Burra mine, and 250 tons daily, each, from the London and Polk County mines.

Cost of finished copper was 8.08 cents per pound in 1905, and 10.436 cents in 1907, or, with addition of 0.68 cents per pound for freight, insurance and

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miscellaneous expenses, and 0.67 cents per pound for taxes, legal and administrative expenses, was 11.79 cents per pound. Costs were $2.81 per ton of ore treated in 1905, and $3.37 per ton for ore treated in 1907. Blast-furnace costs were only $1.25 per ton of ore in 1905, and $1.62 in 1907, while converter costs were 23.13 cents per pound in 1905, and 24.02 cents in 1907. The increased cost per ton of ore, in two years, is due almost entirely to increased wages, and increased cost of supplies, somewhat aggravated by a shortage of labor supply, during 1907. Low grade copper ores are treated profitably at other points, but, in such cases, there are appreciable gold and silver values, which are lacking at the Tennessee. The company is managed with the highest degree of technical skill and business ability, and its financial reports are unusually complete and satisfactory, giving detailed figures that not only are of vital importance to shareholders, but which are of deep interest to everyone interested in copper production.

COMPAÑIA MINERA TEODORA DE CHUQUICAMATA. **CHILE.**

Office: Valparaiso, Chile. Mine office: Chuquicamata, Antofagasta, Chile. Organized July 20, 1901, under laws of Chile, with capitalization 120,000 pesos, shares 100 pesos par.

TERANO MINE. **JAPAN.**

Mine office: Saretani-mura, Iyo-gori, Iyo, Japan. Ore is chalcopyrite, associated with iron pyrites, carrying 4 to 5% copper. Vein, traversing chloritic schist, ranges up to 7′ width, with an average of 12″ to 24″ only. Production, 1898, was 25,974 lbs. fine copper. Presumably idle.

MINA TERNERES. **MEXICO.**

Owned by Velardeña Mining & Smelting Co.

TERRY COPPER SYNDICATE, LTD. **TRANSVAAL.**

Office: Permanent Bldgs., Johannesburg, Transvaal. Mine office: Pietersburg, Zoutpansberg, Transvaal. Dampier Green, mine manager. Organized under laws of Transvaal, with capitalization £10,000; working capital, £4,500. Property is the Farm Waterplaats, also a year's option of purchase, at £6,000, of the farms Lucasrust and Kopermijn No. 3, adjacent, latter farms having an area of approximately 2,000 morgen. Development is by a 90′ shaft, with short drifts.

TESORA DE SONORA MINING CO. **MEXICO.**

Office: 405 Kemper Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. Geo. B. Hosier, president; Geo. E. Wittich, vice-president; Frank B. Foster, treasurer; Geo. B. Hosier, Jr., secretary; Thos. W. Foster, manager.

Lands, south of Nacozari and 1 mile from the Yaqui River, include the Todos Santos, an antigua once having a smelter, as evidenced by a large slag-dump. Old workings were shallow, only oxidized ores having been mined and smelted, but property is said to have been a considerable producer long ago, though records are lacking. Mine shows a 75′ silver-lead vein, claimed to show oxidized and sulphide ores carrying 10 to 50% lead and 15 to 500 oz. silver, which claims seems excessive. Has secured ore assaying 28.7% copper, 27.8% lead and 139 oz. silver per ton.

TESORA SILVER MINING CO. **UTAH.**

Office: 225 Dearborn St., Chicago, Ills. Mine office: Silver City, Juab Co., Utah. E. B. Chandler, secretary, at last accounts. Capitalization, $500,000. Was controlled, through ownership of 231,500 shares, by Bingham Consolidated Mining & Smelting Co.

TETER-STONE AZURITE MINING CO. **ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. Dr. D. W. Teter, president. Property is said to have a 4′ to 10′ contact vein, between limestone and granite, showing azurite and malachite in outcrops, and sulphide ore in a tunnel.

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TETON COPPER MINING & SMELTING CO. **WYOMING.**

Dead. Formerly at Jackson, Uinta Co., Wyo.

TEXADA CONSOLIDATED MINING CO. **BRITISH COLUMBIA.**

Office: Seattle, Wash. Mine office: Van Anda, Texada Island, B. C. G. L. Tanzer, president; D. Pabst, vice-president; M. Nally, secretary. Lands include the Cornell mine, and 8 adjacent claims, known as the Raven group. The Cornell mine was opened by a glory-hole, which has caved in, and a 560' main shaft, showing bornite and chalcopyrite carrying up to 8% copper, 2.5 oz. silver and $1 gold per ton. Has a steam plant with hoist and 5-drill Rand air-compressor.

TEXADA COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Van Anda, Texada Island, B. C. Fully described Vol. V.

TEXAS CONSOLIDATED MINES & POWER CO. **CALIFORNIA.**

Dead. Property sold, circa 1904, to W. H. Garlick. Formerly at Redding, Shasta Co., Cal.

TEXAS COPPER CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Chas. F. Hoff, president and manager. Capitalization $3,000,000, shares $1 par. Lands, 3 claims, unpatented, area 60 acres, one-half mile north of the Gould mine, in the Amole district, 20 miles northwest of Tucson. Mine has a 35' shaft and a 140' tunnel, showing a strong iron gossan with copper stains.

TEXAS COPPER CO. **TEXAS.**

Dead. Formerly had an office at Gowanda, N. Y.

TEZEPACO COPPER MINING CO. **MEXICO.**

Mine office: Rosario de Tesopaco, Alamos, Sonora, Mex. W. W. Harper, superintendent. Organized 1907, under laws of Colorado, with capitalization $1,000,000, by Ernest Pratt, Will E. Ewen and Luther A. Hyde. Was developing, 1907, and planned shipping ore to National Metal Co., Hermosillo.

TEZIUTLÁN COPPER CO. **MEXICO.**

Office: 82 Beaver St., New York, N. Y. Mine office: La Aurora, via Teziutlán, Puebla, Mex. Organized under laws of New Jersey, with capitalization $1,000,000, shares $100 par. Is controlled, through ownership of entire stock issue, by Teziutlán Copper Mining & Smelting Co.

TEZIUTLÁN COPPER MINING & SMELTING CO. **MEXICO.**

Office: 82 Beaver St., New York, N. Y. Mine offices, La Aurora, via Teziutlán, Puebla, Mex., and Ejutla, Oaxaca, Mex. Geo. D. Barron, president; Robt. S. Towne, vice-president and treasurer; S. W. Reynolds, second vice-president; preceding officers, A. Foster Higgins, W. J. Best, E. W. Gould, Jr., Henry L. Nelson, Henry Shepard and R. M. Carter, directors; Robt. L. Kayser, general manager; R. E. Safford, assistant treasurer and treasurer; A. Bianchi, superintendent; A. F. Schneider, mill superintendent; F. A. Barron, metallurgist; E. DuB. Lukis, engineer.

Organized April, 1905, under laws of New Jersey, with capitalization $10,000,000, shares $100 par. Controls, through entire stock ownership, the Teziutlán Copper Co., and has a close working arrangement with the Compañía Minera Mexicano. State Street Trust Co., Boston, transfer agent. Annual meeting, first Thursday in June.

Dividends are at the regular rate of 6% per annum, with extras, 1906-1907, making the rate 8% per annum. Dividends have been as follows: $100,000 in 1903; $350,000 in 1904; $495,216 in 1905; $800,000 in 1906; $800,000 in 1907. The company, having sufficient funds on hand, anticipated the regular and extra dividends for January, 1908, distributing the regular quarterly dividend of $1.50, and 50 cents extra, on Nov. 10, 1907, though crediting this to 1908 account, the disbursement being made at a time when dividends were

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at a premium, with practically every corporation in the United States. Net earnings were $914,013 in 1904, and are said to have exceeded $1,000,000 in 1906.

Lands include La Aurora mine, area circa 4,500 acres, 10 miles from Teziutlán, and about 130 miles east of the City of Mexico, with a 16-acre smeltersite, and about 2,500 acres miscellaneous lands, also Los Ocotes group, of 240 hectares. The climate is equable, and mines are surrounded by fine arable lands, with a labor supply that is adequate and of good character.

La Aurora mine, opened mainly by tunnels, has developed a considerable body of auriferous and argentiferous chalcopyrite, associated with sphalerite, giving average assays of circa 8% copper, up to 200 grams silver and 5 grams gold per metric ton, with circa 15% iron, 20% sulphur, 10% calcium carbonate and 30% silica.

Los Ocotes group, area 240 hectares, was bought October, 1905, of Compañía Minera de Cobre Los Ocotes, S. A. This property, 2½ miles north of San Martín, Ejutla, Oaxaca, Mex., is a group of mines, including the San Juan, which is one of the few copper properties that has paid for development, from production, since inception, and, in addition, has given a profit, the mine having been a steady producer since 1900. Lands show 4 fissure veins, of which one, on the San Juan mine, is of 2′ to 8′ width, in porphyry, developed to 200′ depth and 500′ length, with 3 shafts, 2 of 100′ each and one of 230′, with circa 4,000′ of workings, estimated to place 40,000 tons of ore in sight. The ore, which is sulphide, gives average assays of 6.5% copper and 15 oz. silver per metric ton, with a trace of gold, and ore, as produced, has averaged returns of circa 11% copper, with good silver values, and considerable ore has been produced averaging returns of 20% copper and 40 oz. silver per metric ton.

Equipment at Los Ocotes group includes a plant with steam, gas and electric power, steam hoists, steam pumps and power drills. In 1904 Los Ocotes produced 290 tons of concentrates, yielding 121,000 lbs. fine copper and 16,700 oz. silver.

The company has a 10-mile electric railroad, from the Aurora mine to Teziutlán, where connection is had with the Interoceanic Railway of Mexico. La Aurora mine is connected with the smelter by an aërial tram of 250 tons daily capacity.

The smelter, near the Aurora mine, includes an old plant, with 3 blast-furnaces, of about 300 tons daily capacity. There also is a new plant, with three 250-ton blast furnaces, and a converter department with 3 stands, making converter bars averaging 98.6% in copper tenor.

A 2,000-h. p. plant at the smelter includes a 1,000-h. p. hydro-electric installation, for which water is brought by a 3,600′ flume, under a 900′ head, from the Totoyic river, the company having a government concession for the use of 2,500 liters of water per second from that stream. Electric power is transmitted 6 kilometers to the mine, from the plant at the smelter.

Production, 1905, was 7,512,252 lbs. fine copper, 286,012 oz. silver and 3,057 oz. gold. The property was closed down, Nov. 23, 1907, but development work was continued, and the new smelter completed and production supposedly was resumed, late 1908. The Teziutlán is the most successful and promising copper mine in southern Mexico, and has a good management.

THARSIS CONSOLIDATED COPPER MINES, N. L. **TASMANIA.**

Dead. Formerly, circa 1893, at North Mt. Lyell, Montagu Co., Tasmania.

THARSIS SULPHUR & COPPER CO., LTD. **SPAIN.**

Office: 126 West George St., Glasgow, Scotland. Works offices: Oldbury, Worcestershire, Eng., Wellington Quay, Northumberland, Eng., Hebburn-on-Tyne, Durham, Eng., and Cardiff, Glamorganshire, Wales. Mine office: Alosno, Huelva, Spain. Jas. King, chairman; preceding officer, Jas. Cooper, Louis Oscar

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Schmidt, A. J. Messeán, H. Gaskell, E. M. Chelvet, R. Millet, T. Alexander, Hugh Brown and Sir Edw. P. Tennant, Bart., M. P., directors; Geo. Reid, secretary; Wm. P. Rutherford, general manager; Geo. Gray, superintendent.

Organized Oct. 27, 1886, under laws of Great Britain, with capitalization £1,250,000, shares £2 par. Dividends have been as follows: 17½% yearly in 1904 and 1905; 25% in 1906; 20% in 1907. To end of 1907 company's dividends aggregated 795⅜% on the share capital, amounting to the magnificent total of £8,852,182, in addition to which the company had written off the sum of £2,416,065, and held the large reserve of £1,138,244, in cash and unusually choice securities. The company's dividends have averaged nearly 20% per annum, since 1868, without the lapse of a year in disbursements, a dividend record comparable, among copper mines, only with that of the Quincy, of Michigan. Net profits, after all deductions, have been as follows: £218,866 in 1903; £215,593 in 1904; £225,135 in 1905; £315,147 in 1906; £216,023 in 1907.

Lands include the Tharsis group, area 1,143 hectares, and the Lagunazo group, area 271 hectares, at Alosno, about 30 miles west of the Rio Tinto, and the Calañas or Zarza group, area 618 hectares, at Calañas, midway between the Tharsis and Rio Tinto mines. The mines at Alosno, worked by the Romans, and probably by their predecessors as well, are identified, by some, with the Tarsish of the Bible. General geological conditions are much the same as at the Rio Tinto, the mines being in the southern zone of the Andevallo or Sierra Morena district of Huelva. The property shows 4 main lenses, these having their axes of length southeast by northwest. The largest lense is the Criadero del Sur, to the south. The Filon del Norte, to the northeast, is about 600 meters long and 140 meters in extreme width. The smaller lenses are the Criadero de la Sierra Buillones, and the Filon del Medio, to the northwest. The Tharsis and Lagunazo have been the principal producers in the past, but are nearing exhaustion. The Calañas is developing fairly, and has about 10 years ore reserves developed. The company also is developing the Almagrera, Triunfo and Vulcano mines, at Alosno.

The ores of the Tharsis average about 3% copper, 50% sulphur and 45% iron, with very small quantities of gold, silver, lead, zinc, nickel, bismuth, antimony and arsenic. Ore, after extraction, is piled in heaps and weathered, this process being assisted by occasional sprinkling. The leach-water goes into creosoted timber sluices, where the copper in solution is deposited on pig iron, and precipitate prepared for smelting in the usual manner.

The work of stripping the overburden from the eastern extension of the Sierra Buillones mine is progressing satisfactorily, stripping having amounted to 83,374 cubic meters in 1907. Removal of the overburden from the Calañas mines was 145,580 cubic meters in 1906, and 128,266 cubic meters in 1907. At the Lagunazo mine, operations have been confined, for several years, to leaching tereros.

The company owns a private railway, leading from the mines to Corrales, where there is a shipping pier. The line is well supplied with rolling stock, frequent renewals keeping the equipment modern and efficient.

Owing to the gradual exhaustion of its principal Spanish ore bodies, the company has been endeavoring, for some years past, to secure new mines, and, to that end, has investigated properties in Norway, Italy, Cyprus, Russia, Mexico, Canada, Tennessee and Arizona. Two contiguous properties, in Arizona, were under investigation during 1908, and the company is in the market for a mine of cupriferous pyrites, rich in sulphur, with large bodies of ore, and would give consideration to a promising copper property, regardless of sulphur values.

The company owns extensive works at various points, including a wet process plant at Hebburn-on-Tyne, and an electrolytic refinery at Oldbury, a

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suburb of Birmingham, with other works at Wellington-on-Tyne, Cardiff, Wales, and Garngad, a suburb of Glasgow, Scotland.

Production of fine copper was 11,147 long tons in 1898; 5,620 long tons in 1904; 12,590,226 lbs. in 1905; 10,617,600 lbs. in 1906 and 9,878,400 lbs. in 1907. Production for 1907 included 81,034 long tons of ore from the Sierra Buillones, and 376,658 tons from the Calañas, an increase of 34,310 tons for the year, with the total ore extraction of 457,692 tons, an increase of 19,935 long tons, the first increase in ore production for some years, with a decrease of 329 long tons in output of finished copper. Production, 1907, included 2,753 long tons of regulus, and ore shipments, including washed sulphur ore, of 406,015 long tons. The record of this property is one of the best ever made by any copper mine.

THOMPSON-LEHMER MINING CO. **MEXICO.**

Letter returned unclaimed from former office, Omaha, Neb. Mine office: Ocotlán, Oaxaca, Mex. Guillermo W. Thompson, general manager. The property at Ocotlán has auriferous and argentiferous copper and lead ores, with steam and electric power, employing circa 50 men, at one time. Company also is said to have lands in the Tlacolula, Villa Alta and Ixtlán districts of Oaxaca, with aggregate holdings of circa 1,000 hectares.

THOMPSON RIVER COPPER & PLATINUM SYNDICATE. **AUSTRALIA.**

Mine office: Walhalla, Gippsland, Victoria, Australia. Peter Finlayson, chairman. Organized circa 1907. The mine, having a 140′ shaft, is claimed to have produced 1,000 tons of copper ore in the past, being one of the very few copper mines of Victoria.

THOMPSON SIDING COPPER & GOLD MINES, LTD. **BRITISH COLUMBIA.**

Dead. Was dissolved August, 1904. Formerly in British Columbia.

THORNE COPPER MINING & REDUCTION CO. **NEVADA.**

Letter returned unclaimed from former office, 405 Empire Bldg., Denver, Colo. Mine office: Hawthorne, Esmeralda Co., Nev. B. E. Young, superintendent. Is a twin of the Walker Lake Copper Mining & Smelting Co. Lands, circa 8 claims, 4½ miles east of Walker Lake. Is not regarded favorably. Idle and apparently moribund.

THREE BEARS MINING CO. **NEW MEXICO.**

Dead. Lands sold, circa 1905, to Southwest Smelting & Refining Co. Formerly at Jarilla, Otero Co., N. M. Fully described Vol. V.

THREE CRIPPLES MINING CO. **WYOMING.**

Office and mine: Esterbrook, Albany Co., Wyo. Lands, immediately north of the Maggie Murphy, have an 85′ shaft, showing mainly gold values.

THREE JAYS COPPER CO. **BRITISH COLUMBIA.**

Dead. Formerly at Alberni, Vancouver Island, B. C.

THREE MAN MINING CO. **ALASKA.**

Mine office: Landlock, Prince William Sound, Alaska. W. A. Dickey, manager. Lands, near tidewater, are said to show an 8′ vein of massive chalcopyrite, which probably is an exaggeration.

THUMB BUTTE MINING & MILLING CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Lands, 8 miles west of Prescott, are opened by tunnel.

THUMB BUTTES MINING CO. **ARIZONA.**

Office: Yuma, Ariz. Mine office: Dome, Yuma Co., Ariz. Porter Moffett, president; preceding officer, Perry O. Spittler, A. B. Mink and J. L. Lee, directors. Organized circa July, 1907, with capitalization $1,500,000. Lands, circa 1,200 acres, showing ore, including some chalcocite, giving good assays in copper, silver and gold. Company was said, September, 1907, to have 20,000 tons of ore on the dump, which seems questionable.

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VEREINIGTE THÜRINGISCHE KUPFERBERGBAU GEWERKSCHAFT. **GERMANY.**

Mine office: Gotha, Saxe-Coburg-Gotha, Germany. Karl Gürtler, manager, at last accounts. Property is the Carl Alexander, Sophie, Carl August, Bernhard and Wilhelm Ernst mines.

ASOCIACIÓN DE PROPRIETARIOS DE LAS MINAS DEL TIBIDABO. **SPAIN.**

Office: Moncada 31, Barcelona, Spain. Mine office: Cassolas, Barcelona, Spain. Property is the San Gervasio de Cassolas mine, carrying chalcopyrite. Idle some years.

TICON MINE. **MONTANA.**

Office and mine: care of Jas. A. Murray, owner, Butte, Silver Bow Co., Mont. Property, lying between the Bell mine of the Anaconda and the Speculator mine of the North Butte, has a 500′ incline shaft on the vein, with one level opened, at depth of 300′, and is said to show 4′ of good ore in the bottom, which seems somewhat doubtful. Operations were resumed, circa Sept. 1, 1908.

TILT COVE COPPER CO., LTD. **NEWFOUNDLAND.**

Office: 9 Queen St. Place, London, E. C., Eng. Mine office: Tilt Cove, Newfoundland. Col. J. W. Young, chairman; E. C. Leaver, secretary; John Taylor & Sons, managers; F. J. Williams, superintendent. Organized Apr. 4, 1888, under laws of Great Britain, with capitalization £200,000, shares £2 par; issued, £178,000. Debentures, £80,000 first-mortgage 5½% bonds. For fiscal year 1907 the Tilt Cove mine earned profits of £57,534, divided equally between the Tilt Cove and Cape copper companies, comparing with profits, for 1906, of £99,340, similarly divided. Company ended 1907 with a cash balance of £25,587 13s. 9d. Dividends were 13¾% in 1905, 26¼% in 1906, and 18⅛% in 1907.

Lands, freehold, known as the Tilt Cove mine, on Notre Dame Bay, on the northern shore of Newfoundland, are leased for 99 years, expiring 1989, at an annual rental of £4,400, plus one-half the net profits, to the Cape Copper Co., Ltd., lease being terminable on one year's notice from the lessees. Property includes 3 mines, known as the West, Bluff and South mines. The mines have been worked since circa 1870.

The East mine produces sulphide ores averaging 3 to 3.5% copper, with small gold and silver values, the pyritic ore from the East mine averaging, 1896, about 3.7% copper. The West mine has smaller sulphide ore bodies, of high grade, averaging about 11% copper. Ore reserves in all mines are estimated at 125,000 long tons, and yearly production is 75,000 to 100,000 long tons of ore. For 1905 ore was mined at an average cost of only $1.72 per long ton, and mining costs, 1907, from the open pit of the East mine, were $1.21 per long ton. Production was 6,122,000 lbs. fine copper in 1904 and 5,104,960 lbs. in 1905.

TIMBER PEAK MINING CO. **NEW MEXICO.**

Mine office: Socorro, Socorro Co., N. M. Ores carry gold, silver and copper. Has a concentrator. Long idle and apparently moribund.

TINGHA MINE. **AUSTRALIA.**

Office: Mereweather, N. S. W., Australia. Mine office: Tingha, N. S. W., Australia. Jas. McAlister, secretary; Capt. W. Davey, manager. Lands, 2 miles east of Tingha, show a 3′ vein, originally opened for tin, succeeded at depth by copper, carrying a 3″ paystreak assaying 30 to 40% copper, with balance of ore body said to assay circa 15% copper.

TINTIC COMPANY. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Grant B. Schley, president; Kenneth B. Schley, vice-president; Michael Gavin, secretary and treasurer; preceding officers, Fredk. Strauss and

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N. Jaretski, directors. Organized, 1903, under laws of Maine, with capitalization $3,000,000, shares $5 par, increased, 1906, to $4,000,000. Is the parent company of the Tintic Mining & Development Co., Yampa Smelting Co., and West Mountain Tramway Co., and is a securities-holding corporation only.

TINTIC MINING & DEVELOPMENT CO. **UTAH.**

Office: 213 Dooley Blk., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capt. Henry Stern, president; Chas. W. Saxman, general manager; J. C. Dick, general superintendent; N. Treloar, mine superintendent; E. E. Price, mine foreman. Organized, 1896, with capitalization $3,000,000, and reorganized January, 1906, under laws of Maine, with capitalization $3,500,000, shares $5 par. Is controlled, through stock ownership, by the Tintic Co., and is operated as a close corporation, making no public reports.

Lands include claims in the Tintic district, now idle, on which heavy expenditures gave indifferent results, and the Yampa group, area circa 180 acres, on Carr Fork, Bingham Canyon, near the Utah Consolidated and Boston Consolidated, which shows a vein of 10′ to 200′ width, with average width of circa 37′, carrying disseminated chalcocite, covellite and chalcopyrite, formerly estimated to average 3.5% copper and $2 to $5 combined gold and silver values per ton, but now said to average 1 to 3% copper, 2 oz. silver and $1.50 gold per ton. Ores are highly ferruginous, rendering them valuable for fluxing the highly silicious ores of the Bingham district.

Development is almost exclusively on the Yampa mine, a fractional claim of less than 6 acres area, entirely surrounded by the Utah Consolidated. The mine has several miles of workings, and is developed by 2 tunnels and a 1,700′ shaft. The Craig haulage tunnel, on the 1,200′ level, is 3,248′ long, intercepting the main vein at about 2,200′ from the portal, and connecting with the shaft at 2,448′. There are 12 levels, of which 8 are producing ore, above the haulage tunnel, and the blind shaft on the 1,200′ level connects with the Craig tunnel. The Upper, or Yampa tunnel, intersects the shaft at 475′ and runs about 1,000′ on the vein, ore from the Yampa workings being sent down the shaft to the Craig tunnel for extraction. The management is said to plan sinking the shaft to 1,500′ depth. Ore is hauled, in the Craig tunnel, in trains of 6 three-ton cars, by 2 electric locomotives. As the ore is soft, heavy timbering is required, square sets being used.

Equipment includes an electric hoist, at the head of the blind shaft, on the 400′ level. There also is a hoist actuated by compressed air. The power plant, near the portal of the Craig tunnel, has steam and electric power, with a 35-drill Ingersoll-Rand air-compressor.

The mine has a 12,300′ aërial tram, the longest in the Bingham camp, with 600-ton ore-bins at the upper terminal. The tramline saves about 25 cents per ton on transportation and insures an adequate ore supply for the smelter, which is at the lower end of the tram. The smelter is described under title of its owner, the Yampa Smelting Co.

Production was 4,699,765 lbs. fine copper in 1906 and 5,001,255 lbs. in 1907. The Yampa mine, though small, is valuable, and the management is good.

TINTIC SILVER CROWN MINING CO. **UTAH.**

Office: 508 Auerbach Bldg., Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. Hon. John A. Edwards, president; Dr. L. W. Snow, vice-president; Mansfield L. Snow, secretary, treasurer and general manager; preceding officers, C. E. Cole and M. K. Green, directors. Organized Aug. 20, 1908, under laws of Utah, with capitalization $100,000, shares $10 par; issued, $61,250.

Lands, 25 claims, area circa 500 acres, well watered and fairly timbered, in the Blue Belle district of West Tintic, 8 miles from a railroad, showing

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fissure veins in porphyritic rocks and contact deposits in crushed zones in quartzite, there being 10 ore bodies, of which 3 are under development, one showing a 10" paystreak of massive galena, estimated to average 70% lead, 12 oz. silver and 75 cents gold per ton.

Development is by three 50' shafts, three 40' tunnels, a 100' tunnel and a 250' tunnel. Company plans continuous development.

TINTIC SMELTING CO. **UTAH.**

Office: Salt Lake City, Utah. Works office: Silver City, Juab Co., Utah. Chas. W. Nibley, president; Jesse Knight, vice-president and general manager; H. E. Rolapp, secretary; John Pingree, treasurer; Bela Kadish, superintendent; preceding officers, David Eccles and C. E. Loose, directors; Howard P. Saunders, mechanical engineer; Richard F. McCaffrey, metallurgical superintendent. Organized circa December, 1906, with capitalization $500,000, shares $1 par.

Property is a newly built reduction plant, of 350 tons daily capacity, planned as the first unit of a 700-ton smelter, works including a sampling mill. Smelter has two 14x60' hand-roasters, 4 Kelly cintering converters, and two 46x162" lead furnaces. The copper department is to include a 44x120' steel frame building, having a 125-ton blast-furnace. Plant is of modern design, and well equipped throughout, and works are well located for smelting lead ores, with considerable copper ore available, and should prove a great benefit to the Tintic district and adjoining fields. Planned beginning lead smelting July, 1908, and copper smelting circa September, 1908.

TINTIC STANDARD MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. E. J. Raddatz, general manager. Organized circa October, 1907, with capitalization $1,000,000. Lands, 14 claims, having a fissure vein of 30' to 80' estimated width and a 220' shaft, showing low grade lead ore, with gold and copper values.

SOCIEDAD DE LAS MINAS DE COBRE TINTO y SANTA ROSA. **SPAIN.**

Office: Rue Archimedes, 1, Brussels, Belgium. Mine office: Zalamea la Real, Huelva, Spain. Capitalization, 3,000,000 francs. Lands, 114 hectares, including El Tinto, Santa Rosa and 9 other old mines. Has a 7-kilometre aërial tram to Calañas. Property is leased to the United Alkali Co., Ltd.

TIPTON COPPER CO. **NEW MEXICO.**

Dead. Formerly at Tularosa, Otero Co., N. M.

TIP TOP COPPER CO. **ARIZONA.**

Office: Commonwealth Bldg., Philadelphia, Pa. Western office: 7 Coles Blk., El Paso, Tex. Mine office: Helvetia, Pima Co., Ariz. Geo. A. Aman, president; S. Charles Pratt, vice-president and general manager. Organized 1902, under laws of Arizona, with capitalization $1,150,000, shares $1 par.

Lands, 24 claims, area 400 acres, including the Tip Top and Copper Duke claims, also a 100-acre millsite, in the Helvetia district, showing 3 contact veins, averaging 14' width, carrying carbonate and sulphide ores, giving average assays of 5% copper and 1 oz. silver per ton, with a trace of gold, opened by 7 shafts, of 10' to 150' depth, and several tunnels, longest 958', with about 4,000' of workings. Has gasoline power and has developed considerable ore. Was bonded, 1907, to Guggenheim interest, for $250,000, with cash payment of $75,000, but both parties to bargain were dissatisfied, and property reverted to owners. Made considerable ore shipments, 1906-1907. Production, 1906, was 298,890 lbs. fine copper. Property considered promising.

TIP TOP COPPER CO. **NEW MEXICO.**

Dead. Lands sold, circa 1908, to Burro Mountain Copper Co., for $15,000. Was akin to a swindle; final dividend to shareholders was 1 mill on the dollar. Formerly at Silver City, Grant Co., N. M. Described Vol. VII.

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TIP TOP MINE. **ONTARIO.**

Office: Port Arthur, Ont. Mine office: Kashaboiwe, Rainy River district, Ont. Col. S. W. Ray, manager; Richard Sandoe, superintendent.

Lands, 4 claims, freehold, area 336 acres, known as locations K62, K63, K64 and K65, 6 miles from Kashaboiwe, on Round Lake in Moss township, showing schist and diorite, carrying 3 contact deposits, ranging up to 150′ in width, with 2 ore bodies, of 25′ estimated average width, carrying circa 18′ of ore giving average assays of 7% copper, 5 to 12 oz. silver and $1 to $2 gold per ton. Development is by shafts of 50′ and 208′, with 640′ of workings, estimated to show 45,000 tons of ore, which seems high. The mine is said to have blocked out a considerable amount of ore, of 4 to 6% in copper tenor, on a vein ranging up to 60′ width in the bottom workings.

Equipment includes a 100-h. p. steam plant, with 10-h. p. and 30-h. p. hoists, and a 5-drill Ingersoll-Sergeant air-compressor. Part of the material for a smelting plant was secured, 1907, but apparently erection of smelter not begun. Property considered promising.

COMPAÑIA MINERA DEL TIRO GENERAL, S. A. **MEXICO.**

Office: 2a Ojcaliente No. 8, Aguascalientes, Mex. Mine office: Charcas, San Luis Potosí, Mex. J. G. Creveling, Jr., president and general manager; W. F. Layer, vice-president; G. B. Wardman, secretary and treasurer; preceding officers, Thos. J. Ryder and O. F. Westlund, directors; DeWitt Creveling, superintendent; E. J. Cloyd, assistant superintendent; William Mueller, mine superintendent; Pablo Fuentes, engineer; W. O. Staples, auditor. Organized July 31, 1902, under laws of Mexico, with capitalization 375,000 pesos, shares 100 pesos par. Dividends, 1905, were 150,000 pesos.

Lands, 71 pertenencias, area 176 acres, also 25 acres of millsites and a 50-acre farm, in the Charcas district. The mine shows 2 main systems, carrying fissure veins in porphyry, not far from a limestone contact, the North vein averaging 3 to 8 meters width, with known length of circa 450 meters, developed for 350 meters length by shafts of 306m., 200m., 130m., 130m., 90m., 85m. and 55m., with upwards of 3,000 meters of workings on the North, or main vein, showing circa 200,000 metric tons of ore. The workings on the south zone are idle, awaiting the establishment of a concentrating plant adapted to this ore, which is of milling grade. The ore developed in the south zone is almost exclusively sulphide, and averages 2% copper, 5% lead, 12% zinc, 430 grams silver and 0.8 grams gold per ton.

The mines, discovered circa A. D. 1583, were worked on a small scale for nearly 3 centuries, and on a larger scale since 1859. The property has a 340-h. p. steam plant for hoisting and pumping, and in addition makes some use of malacates. Equipment includes 80-h. p. and 100-h. p. hoists, a Cameron station pump, and a 10-drill air-compressor. There is a combination machine and carpenter shop, of stone, with good equipments.

The 100-ton mill is planned to be increased to 250 tons capacity. The mine has a large number of structures, for various uses, all built of stone, including a general store, etc.

The stockholders of this company own the Potosí Central railroad, of 15.1 kilometers length, running from the mine to Las Charcas station, on the Mexican National railroad.

Fuel is Laredo coal, costing $6.85, gold, per ton, delivered, and eastern coal, costing $8.40, gold, per metric ton, delivered. Production, 1905, was 2,281,761 lbs. fine copper, made from 48,000 metric tons of ore carrying 2.16% copper. Production, 1907, estimated at 2,250,000 lbs. fine copper. Ore costs $4 gold per dry metric ton, f. o. b. cars of Mexican Central Railway. Forces, nominally, are about 750 men.

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Company is a close corporation, with only 35 shareholders. The management is good, and the property is one of proven merit.

TITANTIC COPPER CO. **ARIZONA.**

Office: 224 Milk St., Boston, Mass. Mine and works office: Williams, Coconino Co., Ariz. Organized June 3, 1907, under laws of Arizona, with capitalization $1,000,000, practically as successor of Anita Copper Co., which lost its lands through foreclosure.

Lands, 50 claims, area 1,000 acres, lying on both sides of the Bright Angel branch of the Santa Fé railway, also a 160-acre millsite and 60 acres miscellaneous lands, giving total holdings of 1,220 acres. Property shows Carboniferous limestone strata of circa 800′ thickness, carrying 3 irregular ore bodies, of which one, slightly developed, has oxide and carbonate ores assaying 8 to 15% copper, and 3 to 4 oz. silver per ton, opened by shafts of 40′, 35′ and 580′, with several short tunnels. Ore, as extracted, carries 4 to 8% copper.

Equipment includes a Fairbanks & Morse gasoline hoist, a 12-drill Rand air-compressor and 8 power drills.

The smelter, at Williams, 47 miles from the mine, with direct rail communication, has a 100-ton water-jacket blast-furnace, with other equipment for a 200-ton smelter.

The company had a contract with the Consolidated Arizona Smelting Co., to furnish fluxing ores, on a basis of 75 cents per ton and 40% of ore values extracted, the Consolidated Arizona doing the mining, but owing to bankruptcy of latter-named company, the contract was terminated, and property was idle at last accounts.

GUSTAVO TITUS. **CHILE.**

Mine and works office: Olmué, Limache, Valparaiso, Chile. Lands, 12 kilometers from the railway station of Limache, include the Felicidad, Abundancia and Veta Grande mines, showing large quantities of low grade auriferous and argentiferous copper ore. Smelter, having 1 reverberatory furnace, in 1903 treated 1,300 metric tons of ore averaging 3.5% copper, producing therefrom ejes of 46.89% average copper tenor, carrying 79,702 lbs. fine copper.

TOBACCO ROOT RANGE MINING CO. **MONTANA.**

Dead. Formerly at Mammoth, Madison Co., Mont.

SOCIEDAD BENEFICIADORA DE TOCOPILLA. **CHILE.**

Office: Valparaiso, Chile. Works office: Tocopilla, Antofagasta, Chile. Organized Sept. 7, 1906, under laws of Chile, with capitalization £200,000, shares £1 par.

COMPAÑIA THE TOCOPILLA SMELTING WORKS. **CHILE.**

Office: Valaparaiso, Chile. Works office: Tocopilla, Antofagasta, Chile. Organized Aug. 11, 1906, under laws of Chile, with capitalization 500,000 pesos, shares 50 pesos par. In liquidation, 1907.

TODD COPPER CO. **ARIZONA & CALIFORNIA.**

Office: Lankershim Bldg., Los Angeles, Cal. Mine office: Ehrenburg, Yuma Co., Ariz. U. S. G. Todd, president; E. Julian Solomon, vice-president; Wilbur H. Dran, secretary; preceding officers, Dr. H. Pittman and Henry R. Booker, directors. Organized Jan. 6, 1907, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Lands, 3 claims, area 60 acres, in the Weaver district, circa 12 miles east of Ehrenburg, also 4 claims in the Old Woman Mountains, San Bernardino county, California. Planned developing Ehrenburg claims by tunnel.

TOKAR (SUDAN) PROSPECTING SYNDICATE, LTD. **SUDAN.**

Office: 7 Devonshire Square, London, E. C., Eng. Sir F. Frankland, chairman; Felix F. Wilson, secretary. Organized Dec. 2, 1904, with capitalization £5,000, shares £1 par. Property is a license, from the Sudan government, to prospect for minerals. Location of prospecting rights is approxi-

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mately between 17° 30′ and 18° North Latitude, and between 37° 15′ and 38° 30′ East Longitude. Copper float is found over an area of circa 150 miles square, in a mountainous region near the Eyrthrean border, inhabited by the Hasas, a tribe of ebony Arabs. Country rocks are schist, having a strike of west of north, and a westerly dip, associated with eruptive crystalline rocks, showing numerous veins of low grade ore, averaging about 2% copper only. Apparently no work in progress.

TOLEDO MINING & POWER CO. **MONTANA.**

Office: 108 LaSalle St., Chicago, Ills. Mine office: Brandon, Madison Co., Mont. Louis D. McCall, president and general manager. Organized circa 1905, with capitalization $50,000, apparently as successor of Bismarck-Nugget Gulch Consolidated Mining Co. Lands, 17 copper claims and 18 gold claims, 3 groups of copper claims being on Stone Creek, in the Ruby Mountains. Property has a 60-ton concentrator and a 30-ton smelter. Idle and presumably dead.

SOCIÉTÉ ANONYME MINES METALIQUES DE TOLOSA. **SPAIN.**

Office: Monceau les Mines, France. Letter returned unclaimed from former mine office, Leiza, Navarra, Spain. Capitalization, 715,000 francs, 500 francs par. Property comprises iron mines in Guipúzcoa, and lead-copper mines at Navarra, latter including the Regina and other mines, partially prospected, and presumably idle.

TOLTEC METALLURGICAL CO. **MEXICO.**

Office: 743 Equitable Bldg., Denver, Colo. Mine office: Matehuala, Catorce, San Luis Potosí, Mex. Jas. A. Kilton, president and general manager; Edw. F. Welles, vice-president and treasurer; John S. Gibbons, secretary. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par, and protocolized under the laws of Mexico.

Lands, 798 acres of mineral lands, and a 200-hectare smeltersite. Property includes La Cobriza mine, idle; San Diego mine, having a 600′ shaft, showing ore assaying 49 to 93 oz. silver per metric ton, and the Candelaria mine, having an 877′ tunnel, carrying silver-lead ore of tenor up to 60% lead and 10 to 200 oz. silver per metric ton, also showing some auriferous copper ore carrying up to 6% copper. Planned, 1906, building a 150-ton smelter, with lead and copper stacks, at Estación Vanegas, on the main line of the Mexican National railroad, about midway between Monterey and San Luis Potosí. Company made extremely florid promises, and an explanation seems due to shareholders.

TOLTEC MINE. **MICHIGAN.**

Office: care of Alfred Meads & Sons, owners, Marquette, Mich. Mine office: Greenland, Ontonagon Co., Mich. Lands, 320 acres, carrying the underlay of the Evergreen belt and the Calico and adjacent beds of the Michigan. Production, 1851-1860, was 413,443 lbs. fine copper. Diamond drilling was begun, circa April, 1908.

TOLTEC MINING & SMELTING CO. **MEXICO.**

Office: care of A. W. Cunningham, president, Waco, Tex. Mine office: Ayutla, Oaxaca, Mex. A concentrator, planned 1906, seems lacking still. Idle and presumably moribund.

TOLWONG MINERAL CO., LTD. **AUSTRALIA.**

Mine office: Shoalhaven, N. S. W., Australia. Organized circa January, 1908, under laws of New South Wales. Lands show arsenical copper ores.

TOMAHAWK COPPER & ZINC MINING CO. **ARKANSAS.**

Dead. Formerly in Marion and Searcey counties, Arkansas.

TOMAHAWK JUNIOR MINING CO. **MICHIGAN.**

Office: care of H. F. Fay, 60 State St., Boston, Mass. Mine office: Calu-

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met, Houghton Co., Mich. Organized circa June, 1899, under laws of Michigan. Lands are in Keweenaw county. Idle since organization.

TOMBSTONE GOLD, SILVER & COPPER CO. **ARIZONA.**

Office: Bisbee, Ariz. Mine office: Tombstone, Cochise Co., Ariz. J. W. Shelor, president; R. C. Spink, vice-president; Dr. T. M. Smith, secretary; H. E. Haighton, treasurer; A. T. Schuster, superintendent; preceding officers, John Wahrenberger, S. C. Edmiston and M. W. Larsen, directors.

TOMBSTONE MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. O. A. Larson, John H. Foss, John Erickson and Hans J. Rice, directors. Capitalization $1,500,000, shares $1 par. Lands, 9 claims, on Stevens Peak, south of Mullan, showing a vein of circa 15′ width at surface, with good ore indications. Development is by a 500′ crosscut tunnel. Property has given ore assaying up to 15% copper and 2.5 oz. silver per ton.

TOM HAL MINING CO. **WASHINGTON.**

Mine office: Pateros, Okanogan Co., Wash. Thos. B. Warren, president and general manager, at last accounts. Company is a dead-beat. Lands, 5 claims, said to show a 4′ to 10′ vein, carrying auriferous and slightly argentiferous chalcopyrite, arsenopyrite and pyrite. Idle several years and presumably moribund.

TOM MOORE CONSOLIDATED MINING CO. **COLORADO.**

Dead. Succeeded by Tom Moore Gold Mining Co. Formerly at Eureka, San Juan Co., Colo.

TOM MOORE GOLD MINING CO. **COLORADO.**

Office: 1 Wall St., New York, N. Y. Mine office: Eureka, San Juan Co., Colo. Samuel G. Martin, superintendent. Organized, circa 1907, with capitalization $10,000,000, which is excessive, as successor of Tom Moore Consolidated Mining Co. At last accounts Dennis Ryan, of St. Paul, was suing S. G. Martin for an accounting. Has auriferous and argentiferous lead and copper ores.

TOMS MINING CO. **WYOMING.**

Letter returned unclaimed from former office, West Chester, Pa. Mine office: Encampment, Carbon Co., Wyo. W. H. Taylor, managing director. Lands, 9 miles east of Encampment, have a tunnel and an 85′ shaft, said to show good ore. Idle and presumably moribund.

TONGASS COPPER CO. **ALASKA.**

Office: Seattle, Wash. Letter returned unclaimed from former mine office, Ketchikan, Alaska. Is closely connected, in management and ownership, with the Hydah Copper Co. Lands, on Thorn Arm, are said to show copper ore carrying some gold and considerable silver.

TONOPAH-ALOHA MINING CO. **NEVADA.**

Dead. Formerly at Tonopah, Nye Co., Nev.

TONOPAH COPPER MINING & MILLING CO. **NEVADA.**

Office and mine: care of E. C. Day, vice-president, Tonopah, Nye Co., Nev. E. C. McDow, president; Herman Brunell, secretary and treasurer; preceding officers, Edw. Billings and Col. John W. Carney, directors. Organized October, 1905, under laws of Arizona, with capitalization $2,000,000, shares 50 cents par.

Lands, 5 claims, area 100 acres, in the Silver Star district of Esmeralda county, about 60 miles west of Tonopah, claimed to show ore assaying well in copper, lead, silver and gold. Company apparently was floated with the assistance of Letson Balliet, a well known promoter of crooked mining companies. Company sent out 200-share stock certificates, apparently at random, with request to recipients to pay $1 per month thereon. Is not favorably regarded, and apparently is moribund.

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TONOPAH GOLD & COPPER MINING CO. **NEVADA.**

Dead. Formerly at Tonopah, Nye Co., Nev. Fully described Vol. VI.

TONOPAH-GREENWATER COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Geo. H. Keyes, president and treasurer; H. D. Danforth, vice-president; Fredk. Tarbell, secretary. Capitalization, apparently $1,500,000, shares $1 par. Lands, 8 claims, area 160 acres, said to adjoin the Iron Mask group.

TONOPAH-NORTHERN MINING CO. **NEVADA.**

Office: 501 O. T. Johnson Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Manhattan, Nye Co., Nev. Capitalization $1,000,000, shares $1 par. Lands, claimed to be 130 acres, at South Manhattan, said to have a 100′ shaft on a 4′ 6″ "fissure vein" between porphyry and limestone, bottomed in sulphide ore, giving assays of 6.8 to 34.4% copper, 1.2 to 7 oz. silver and $2.06 to $13.22 gold per ton. Idle and apparently moribund.

TONOPAH-YERINGTON COPPER CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Organized 1907, under laws of Arizona, with capitalization $1,000,000. Presumably idle.

TONTO RIVER COPPER CO. **ARIZONA.**

Office: Pittsburg, Pa. Mine office: Roosevelt, Gila Co., Ariz. S. V. Thompson, manager. Lands, 79 claims, known as the Schell group, on Tonto Creek, circa 60 miles from Globe, showing well mineralized ledges carrying auriferous copper ores giving high assay values in copper, opened by shafts and tunnels, with circa 750′ of workings.

TOPEKA COPPER CO. OF ARIZONA. **WYOMING.**

Office: 817 Kansas Ave., Topeka, Kans. Mine office: Centennial, Albany Co., Wyo. Wm. Benton, president and general manager; Dr. N. A. Kramer, vice-president; M. F. Reed, secretary and treasurer; G. S. Simons, superintendent; preceding officers and John R. Bellinger, directors; Sydney Bartlett, engineer. Organized March 3, 1906, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $500,000.

Lands, 11 claims, partly patented, area 205 acres, known as the Maudem mine, in the Lake Creek district, showing fissure veins in granite and diorite, and contact deposits between syenite and limestone, ore bodies carrying a little oxidized ore near surface, with sulphides at depth. The property has 4 ore bodies under development, principal vein, the Maudem, of 7′ estimated average width, said to be traceable circa 2,100′, carrying oxidized ores near surface, with chalcocite, bornite, chalcopyrite and tetrahedrite at depth, estimated to average 12% copper, 1 to 8 oz. silver and $10 to $160 gold per ton. The Maudem mine has a 60′ shaft and an 820′ tunnel, and the Lake Creek mine has shafts of 40′ and 70′ and tunnels of 265′ and 365′, property as a whole having circa 1,500′ of workings. The Maudem or Joe Davis, and Lake Creek mines, are about one mile apart. Company plans continuing the Maudem tunnel to 1,200′ length and adding a light mining equipment.

TOPEKA MINING CO. **COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. Has gold, silver and copper ores.

TOQUIMA COPPER CO. **NEVADA.**

Office and mine: P. O. Box 9, Manhattan, Nye Co., Nev. W. J. Stock, president; Omer Maris, vice-president and manager; F. P. Jayne, secretary and treasurer; preceding officers, J. B. Giffen and L. W. Haworth, directors. Organized August, 1906, under laws of South Dakota, with capitalization $1,000,000, shares $1 par.

Lands, 7 claims, area 120 acres, east of Manhattan and 34 miles from a railway, showing a mineralized zone apparently of about 600′ width, traceable

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circa 2,000′. At surface the mineralized zone shows irregular mixtures of altered schists and coarsely crystalline limestone, with frequent irregular gossans and iron blowouts, with considerable decomposed ferruginous lime, highly friable, with quartz outcrops, all of the various rocks showing carbonate copper stains. Development is by a 180′ shaft, at an angle of 65°, on what apparently is the footwall of the mineralized zone, this shaft showing a little bornite, but mainly chalcopyrite below a depth of 20′. Equipment includes a small electric plant, Cornish pump and whim.

TORCH LAKE MINING CO. **MICHIGAN.**

Office: care of Thatcher Loring, president, 3-19 Central St., Boston, Mass. Mine office: Leopold Bldg., Houghton, Houghton Co., Mich. Capitalization $500,000, shares $25 par. Lands, 1,280 acres, being Sections 35 and 36, town 56 North, Range 33 East, lying east of the Tecumseh and midway between Calumet and Lake Linden. Was slightly prospected, 1899-1900, by diamond drill borings. Since idle.

TORPEDO MINE. **NEW MEXICO.**

Office: 135 Adams St., Chicago, Ills. Mine office: Organ, Donna Ana Co., N. M. Geo. E. Wood, president; Harvey E. Rich, secretary; Geo. E. Fitzgerald, general manager; R. E. Pringle, engineer; L. G. Tucker, auditor.

Lands, 16 miles west of Las Cruces, near the Copper Bar mine, carry lenticular ore bodies between limestone and granite, said to be increasing in size with depth. Mine, 500′ deep, opened circa 1876, is said to have produced upwards of 4,000 tons of ore averaging 14% copper, and some second class ore of 6% copper tenor was scrammed and shipped from waste dumps. Has steam power. Owing to water inflow of circa 800 gallons per minute, mine was idle from 1903 until summer of 1907, when shipments of one carload daily were made to El Paso smelter. Was said, August, 1907, to be building a 300-ton matting furnace. Property considered promising.

TORPEDO MINING CO. **NEW MEXICO.**

Dead. Property sold, Aug. 11, 1906, to Geo. E. Fitzgerald, et al. Formerly at Organ, Donna Ana Co., N. M. Described Vol. VI.

COMPAÑIA METALURGICA DE TORREÓN, S. A. **MEXICO.**

Office and works: Torreón, Viesca, Coahuila, Mex. Ernesto Madero, president and general manager; Col. Carlos Gonzalez, vice-president; Lic. Pragedis de la Peña, secretary; Lic. Pedro Torres Saldeña, treasurer; Joaquin Villegas, comisario; F. S. Villareal, assistant general manager; Donald R. Morgan, general mine superintendent; Ivan Ragaz, assistant mine superintendent; Ernest Harms, general smelter superintendent; C. A. Heberlein, assistant smelter superintendent; Chas. Moser, J. W. Pender and Pedro Vota, mine superintendents.

Organized June, 1901, under laws of Mexico, with capitalization 1,250,000 pesos, increased later to 2,500,000 pesos, and again increased, 1905, to 5,000,000 pesos, shares 100 pesos par, in 1,500,000 pesos 6% preferred redeemable stock, and 3,500,000 pesos common stock. Paid dividends, April, 1905, of 14 pesos on preferred and 12 pesos on common shares. Profits, 1904, were 629,279 pesos, and 1906 were 775,285 pesos. Is controlled by the Madero family.

Lands are extensive, including a number of developed and developing lead mines, and several partly developed copper mines, in northern Mexico. The San Diego and Buena Suerte mines, at Santa Barbara, Hidalgo, produce mainly galena and sphalerite, having a 200-ton concentrator, and employing about 500 men. Las Adargas mine, Jiménez, Chihuahua, has auriferous silver-lead ores, employing about 200 men. La Voladora and La Mitra mines, at Nuevo León, produce silver-lead ores, with a force of circa 100 men. Las Cabrillas and Las Higueras mines, at Los Muertos, Centro, Coahuila, produce

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silver-lead ores, and also have promising deposits of iron ore. Company also holds other silver-lead properties of lesser development.

The smelter, having connections with all railroad lines entering Torreón, is rated at 1,250 tons daily capacity, doing a general custom business on gold, silver, lead and copper ores, in addition to treating the large production of the company's own mines. Smelter has 10 blast-furnaces, including 8 lead stacks and 2 copper stacks, with 8 reverberatory roasters for lead matte, the first-fusion product carrying only 10 to 15% lead, which is calcined and re-smelted. A converter plant was added, 1907, to the copper plant. The works employ about 600 men.

In 1901 the smelter treated 71,294 metric tons of ore, in 1904 treated 201,612 metric tons, and in 1906 smelted 258,572 metric tons, showing a very gratifying growth. Production, 1907, is estimated at 1,250,000 lbs. fine copper. Company went through the 1907 panic in better shape than perhaps any other Mexican smelter, and is one of the most successful and well-managed metallurgical enterprises in the republic, its success being especially notable because the extensive works are owned and controlled by Mexicans, who have shown their ability to compete, on even terms, with the ablest American and European mining men and financiers.

TERREÓN SMELTER. **MEXICO.**

Owned by Compañía Metalurgica de Torreón.

TOSTON COPPER CO. **MONTANA.**

Letter returned unclaimed from former office, Pennsylvania Bldg., Butte, Mont. Mine office: Toston, Broadwater Co., Mont. David J. Charles, president; Emil H. Renisch, vice-president; John A. Shelton, secretary; W. K. Edwards, general manager. Organized Dec. 24, 1903, under laws of Arizona, with capitalization $1,250,000, shares $5 par. Lands, 6 claims, area 120 acres, showing 3 fissure veins in porphyry, with a 200′ shaft in a vein of about 15′ average width, carrying chalcopyrite with estimated average tenor of 6% copper, 1 oz. silver and $2 gold per ton. Idle.

TOTTENVILLE COPPER CO. **NEW YORK.**

Office: Foot West 29th St., New York, N. Y. Works office: Tottenville, Richmond Co., N. Y. W. M. David, superintendent. Property is a smelting plant and factory for working copper and brass into commercial forms.

TOWADA MINE. **JAPAN.**

Owned by Fujita-Kumi & Co.

TRAIL SMELTER. **BRITISH COLUMBIA.**

Owned by Canadian Smelting Works.

TRAM MINING CO. **WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. J. B. Barriani, president; J. H. Maclin, vice-president; W. G. McClintock, secretary and treasurer. Lands, 8 claims, near the Itmay. Presumably idle.

TRAMWAY MINE. **MONTANA.**

Owned two-thirds by Butte & Boston Consolidated Mining Co., and one-third by Butte Coalition Mining Co. Described under name of latter.

TRANSCONTINENTAL SILVER & COPPER MINING CO., LTD. **IDAHO.**

Office: 23 West Granite St., Butte, Mont. Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Hon. W. W. Woods, president; Geo. E. Marlowe, secretary and treasurer; A. J. Gillis, general manager; preceding officers, Col. Thos. Marshall and Thos. Marlowe, directors. Organized circa 1906, with capitalization $1,500,000, shares $1 par. Lands, 10 claims, near the Reindeer mine, south of Mullan, showing a vein of 100′ claimed width, producing surface ores assaying up to 14% copper and 3 oz. silver per ton. Has a 110′ tunnel.

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TRANSVAAL COPPER CO. **MEXICO.**

Office: 1408 Traction Bldg., Cincinnati, Ohio. Mine office: Cumpas, Moctezuma, Sonora, Mex. Louis J. Hauck, president; Louis Hehman, vice-president; J. M. Eilers, second vice-president; H. C. Beauchamp, secretary; Alfred Vogler, treasurer; preceding officers, Percy Andrae, Bernard Freiberg, F. H. Cloud, Theo. M. Foucar and O. C. Rasch, directors; Jas. T. McDonald, mine superintendent. Organized December, 1901, and reorganized July, 1903, under laws of West Virginia, with capitalization $6,200,000, shares $10 par; issued, $2,700,000.

Lands, 794 pertenencias, area 1,966 acres, also a 50-acre smelter site, and the Cloud ranch, of circa 15,000 acres area, with an interest in the San Nicolás-Tolentino ranch, of about 26,000 acres area. The ranches include timber and grazing lands, all property being in the Moctezuma district. The property shows 8 ore bodies, occurring as fissure veins and lenses, on which about 16,000′ of development work has been done, with deepest workings circa 600′.

The copper and silver-lead ore bodies occur as fissures, and also as wide mineralized dikes, in trachyte and rhyolite. Copper ores are mainly bornite and chalcopyrite, with occasional chalcocite, carrying the usual oxide and carbonate ores on the outcrops. The ore bodies of the Cobre Rico and Transvaal are mineralized dikes of apparently 200′ to 300′ width, carrying low grade copper sulphides, associated with iron pyrites and having a quartzose gangue, hence liable to prove silicious and require heavy fluxing. The Cobre Rico and Transvaal No. 1 are estimated by the management to show about 2,500,000 tons of low grade ore.

The Cobre Rico mine has 2 shafts and 2 tunnels, showing ore of concentrating grade, estimated to average about 3% copper, 3 to 4 oz. silver and $1.50 gold per metric ton. Shaft No. 1 is circa 100′ deep and shaft No. 2 is 140′ in depth, and the tunnels are of about 2,000′ aggregate length. The vein is wide, exposing a considerable amount of ore.

The Transvaal mine has shafts of 210′ and 318′, with about a mile of tunnels, blocking out considerable ore averaging circa 3% copper, 2 to 4 oz. silver and $1 to $1.50 gold per ton. Equipment at the Transvaal includes a steam hoist, 2 Cameron pumps, two 80-h. p. boilers and a Sullivan air-compressor.

The Buckeye mine, opened by tunnel, with about 4,000′ of workings, has a vein of 18″ to 50″ width, said to average circa 12% copper, 10 to 35 oz. silver and $1.50 gold per ton, with 2,500 tons of ore estimated to be blocked out.

The San Nicolás mine has a 250′ shaft and circa 3,000′ of tunnels, developing a 4′ vein carrying silver-lead values, said to average about 60 oz. silver per ton, with 6,000 tons of ore blocked out for stoping. Equipment includes a steam hoist, two 80-h. p. boilers and a Sullivan air-compressor.

The Ultima Chanza mine is opened by circa 500′ of tunnels, showing ore estimated to average about 10% copper, with gold and silver values.

The Virginia mine, having a vein estimated at 15′ average width, shows ore carrying gold values estimated as averaging $12 per ton, developed by circa 1,000′ of workings.

The Guadalupe mine carries cupriferous iron ore, used for fluxing the copper ores smelted by the company.

Buildings include an engine-house, boiler-house, shafthouse, machine-shop, office, laboratory, boarding-house, 6 dwellings and a 22x90′ general store, with a branch store at the smelter. The company has a hospital, and a $5,000 telephone system.

Nearest railroad is the Nacozari line, 26 miles distant, but a projected line has been surveyed into the district by the Cananea, Rio Yaqui y Pacifico. The company has laid out about 35 miles of wagon roads and 25 miles of trails, at

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a cost of about $50,000, maintenance of roads and trails requiring about $5,000 yearly. A small smelter, having a 35-ton reverberatory furnace, located at the Buckeye mine, was blown in, 1905, but closed down shortly, owing to unsatisfactory operation, and was again blown in, circa November, 1905, when it was said to be making a matte carrying up to 65% copper, 55 oz. silver and $7 gold per ton.

The main smelter, 15 to 20 miles from the mines, at Cumpas, where located because of ample water supply and a good site, has a 150-ton water-jacket blast-furnace, 42x120" at the tuyeres, and a 20-ton reverberatory furnace, with room and power for 2 additional 150-ton stacks. There also is a small sampling mill. The power plant includes three 80-h. p. boilers, a tandem-compound engine and a Connersville blower. This smelter was blown in May 1, 1906, doing a general custom business, producing mattè averaging 40% copper, 100 oz. silver and 0.5 oz. gold per ton, shipped to Nichols works for refining.

The smelter was blown out, October, 1907, and the mine closed a little later, remaining idle during 1908. The property is of considerable promise, but obviously cannot be operated at a profit without rail transportation. About 20 miles of narrow-gauge line will be required to connect the smelter with the various mines, and this will not be a cheap line to construct. The smelter also needs direct rail connection for receipt of fuel and shipment of its production. The company's management is composed of solid business men of good standing.

TRANSVAAL COPPER CO., LTD. **TRANSVAAL.**

Dead. Formerly in the Subeni River district, Transvaal. Described Vol. VII.

TRANSVAAL COPPER MINES, LTD. **TRANSVAAL.**

Dead. Was liquidated, December, 1907. Officers were A. H. Oppenheim, A. Dickson, W. E. Blelock and W. Ross, directors, and F. T. Pressland, secretary. Company was organized Oct. 18, 1905, under laws of Transvaal, with capitalization £70,000, shares £1 par; £55,000 issued. Lands were options on mineral rights to 16 farms, area 50,000 morgen, or circa 100,000 acres, east of Oliphant's River. Formerly in the Middelburg district of the Transvaal.

TRANSVAAL COPPER MINING CO., S. A. **MEXICO.**

In the Mexican incorporation of the Transvaal Copper Co.

COMPAGNIE DES MINES DE TRANSYLVANIE. **HUNGARY.**

Mine office: Brussels, Belgium. Organized 1903, with capitalization 2,000,000 francs, to develop mines of copper, lead, zinc, ochre, and coal, in Hungary. Presumably idle.

SOCIÉTÉ ANONYME DES CUIVRES DE TRANSYLVANIE. **HUNGARY.**

Mine office: Budapest, Hungary. Comte de Choulet, chairman. Organized Aug. 25, 1907, under laws of Hungary, with capitalization 5,000,000 crowns, shares 100 crowns par.

GEWERKSCHAFT TRAUTENSTEIN. **GERMANY.**

Mine office: Benneckenstein in Harz, Braunschweig, Germany. A. Polednick, manager, at last accounts. Has 2 shafts, the Gertrude, of 36 meters, and the Silber-Marie, of 162 meters, developing ores carrying zinc, lead and copper.

TRAVERS CONSOLIDATED MINING CO. **MEXICO.**

Dead. Title changed, 1905, to Travers-Durkee Coppers. Formerly at Moctezuma, Sonora, Mex.

TRAVERS-DURKEE COPPERS. **MEXICO.**

Office: 805 Rookery Bldg., Chicago, Ills. Mine office: Moctezuma, Sonora, Mex. Richard P. Travers, president; Henry R. Durkee, secretary and treasurer; preceding officers, Francis H. Leggett, W. C. Travers and F. S. Lewis, directors; Thos. Travers, superintendent.

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Organized June 14, 1905, under laws of Arizona, as Travers Consolidated Mining Co., with capitalization $6,000,000, increased October, 1905, to $15,000,000, shares $10 par, and name changed, December, 1905, to present title. Western Trust & Savings Bank, Chicago, registrar and transfer agent. Annual meeting, first Tuesday in June.

On Feb. 23, 1907, the company borrowed, of the Copper Queen Consolidated Mining Co., $300,000, at 6%, on notes payable one-half in 2 years and one-half in 3 years, secured by mortgage, the company giving the Copper Queen notes for $300,000 and a bonus of 100,000 shares of stock, for $225,000 cash. The company is said to have settled all deferred payments on the property from proceeds of money borrowed from the Copper Queen. Mr. Travers is said to have promised a dividend for January, 1909, but if so, the promise is not likely to be redeemed.

Lands, 11 groups, area, 1,410 acres, 3 miles from the forks of the Yaqui river, also a 12,000-acre ranch, surrounding the mineral lands, bought, 1906, for about $25,000, and the Marguerite and Inez claims, adjoining the mineral lands. Property includes the Promontorio mine, in the Promontorio Mountains, circa 35 miles southeast of Moctezuma, and about 80 miles from the nearest railway at Nacozari. The Promontorio is an antigua, said to have produced the copper from which were cast the bells on the old church at Moctezuma, built A. D. 1640. During the American Civil War some bornite from this mine was packed, on mules, 40 miles, to Guaymas, and shipped to Swansea, for smelting.

The Promontorio shows diorite, granite and limestone, carrying ore bodies in a shear zone between granite and diorite. The company reports one ore body, under development, as circa 300′ wide, carrying a 30′ paystreak estimated to average 20% copper, with circa 12.5% copper for an additional 60′ and 2.25% copper for balance of 210′, with 3 oz. silver and $4 gold per ton in high-grade ore and circa 2 oz. silver per ton in the low-grade ore, high-grade ore being chiefly bornite and low-grade ore disseminated chalcopyrite. Company also claims that 10′ of the ore in the 30′ paystreak will average above 40%, being massive bornite. Prof. W. A. Crosby states that the facts indicate an ore body of practically 50′ width, 1,000′ or more in length, and of indefinite depth, bordered by a broader zone of relatively low-grade ore, in diorite, grading insensibly into the rock walls. The low-grade zone is upward of 200′ in width, with a granite footwall, also carrying low-grade impregnations of copper. Dr. Franklin Carpenter states that the zone of secondary enrichment may be expected to continue to considerable depth. The claims put forth by the company are excessive, as, although there is considerable bornite shown in the mine, the average grade of ore is too low in copper tenor to stand shipment, and should be concentrated or smelted on the ground, if it is to be worked at a profit.

Development, 1906, consisted of a 125′ shaft and tunnels of 175′ and 520′ with total workings of 1,125′, estimated to show 360,000 tons of high-grade ore, and 1,440,000 tons of low-grade ore, which figures are excessive. The property is well situated for development by tunnel.

The Inez mine shows a large gossan, mined for flux, underneath which is cupriferous pyrrhotite, carrying small gold and silver values, and the Inez is also to have another ore body of promise, carrying auriferous and argentiferous copper ore.

The mine has been developed, without steam power, by tunnels, but the company has planned utilizing a large available water power on the Yaqui river.

The company has a 7-mile narrow gauge railway, laid with T-rails, leading from the mine to the smelter, and thence to the valley, connecting by wagon

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road with Nacozari. The projected Yaqui river branch of the Southern Pacific Railway is surveyed to pass a short distance from the Promontorio mine.

The smelter, planned to have a 75-ton water-jacket blast-furnace, was expected to be blown in November, 1907, but at last accounts was not completed, part of the material not being on the ground.

A little production has been secured, from high-grade ore, shipped to smelters at Douglas and El Paso. Apparently the company has failed to carry out its very liberal promises as to production and development, and presumably is idle, and in all likelihood is in poor shape financially.

TRAVERSELLA MINES, LTD. **ITALY.**

Dead. Voluntarily wound up, December, 1902. Formerly at Traversella, Torino, Piedmont, Italy. Described Vol. III.

TRAVONA MINE. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Hon. W. A. Clark, owner; Hon. Jerry Connolly, manager. Lands, 2 claims, 1 fractional, area 34 acres, said to have produced about $1,000,000 worth of silver ore. Is under bond, expiring Aug. 14, 1909, to Messrs. Connolly and associates, who must pay the usual royalty and deepen main shaft 100′, from present depth of 200′.

TREMONT-DEVON COPPER CO. **MICHIGAN.**

Office: First National Bank Bldg., Hancock, Mich. Mine office: Victoria, Ontonagon Co., Mich. Hon. Chas. Smith, president; Fred H. Begole, vice-president; preceding officers, Jos. Bosch, Jas. B. Cooper, Henry L. Baer, Robt. T. Dunstan, and Chas. D. Hanchette, directors. Organized December, 1908, under laws of Michigan, with capitalization $2,500,000, shares of $25 par. Lands, 680 acres, including the old Tremont and Devon mines, directly west of the Victoria. The company plans prospecting work, with a view to locating the probable western extension of the amygdaloidal bed now under development by the Lake Copper Co.

TRENTON MINING CO. **ARIZONA.**

Office: 1028 Tribune Bldg., New York, N. Y. Mine office: Patagonia, Santa Cruz Co., Ariz. Melvin Stephens, president; Jas. Vausiden, vice-president; G. Dillingham, treasurer; preceding officers, Abraham Vausiden, Peter Vausiden, C. W. Henderson and H. W. Mason, directors. Capitalization $500,000, shares $1 par, in $300,000 of 7% preferred and $200,000 of common stock. Was a reorganization of the Arizona Gold & Copper Co. Lands, 7 claims, area 140 acres, 8 miles west of Patagonia, in the Tyndall district, having about 1,200′ of workings, including several shafts and a tunnel, latter showing a 12′ vein carrying ore assaying 3% copper, 3 to 15% lead and up to 10 oz. gold per ton. Has a concentrator and is said to have an 80-ton smelter.

TRENTON MINING & DEVELOPMENT CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Employs circa 300 men. John D. Ryan, managing director; John Gillie, general superintendent; Geo. F. McGee, mine superintendent. Organized circa 1905, under laws of New Jersey, with capitalization $2,500,000, as Colorado Mining & Smelting Co. and name changed, circa 1905, to present title. Is controlled, through ownership of entire stock issue, by Amalgamated Copper Co. Net earnings were $481,826 for fiscal year 1907, and $67,259 for fiscal year 1908.

Lands, 35 quartz and placer claims, mainly fractional, area 220 acres, in the western limits of the Butte copper zone, including the Gagnon and Otisco mines, carrying argentiferous and highly zinciferous copper ores, averaging circa 2.75% copper and 3.5 oz. silver per ton.

The Gagnon mine has a 2,300′ three-compartment shaft, sunk at an angle of 74°, the shaft being only 150′ from the Original shaft, the Gagnon, which carries the continuation of the Original vein, showing good ore in the bottom workings. There also is an air-shaft of 1,800′, circa 700′ west of the Gagnon

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shaft. The mine is timbered with square sets, has electric call bells, and is connected underground with the Original mine. The Gagnon mine has 3 Aldrich electric quintuplex pumps, with capacity of 100, 200 and 425 gallons per minute, working against a 1,000′ head.

Equipment at the Gagnon includes a 22x48″ Dickson hoist, raising 2 double-deck cages for men, which are changed, for hoisting ore, to 2 single-deck cages, with two 3-ton skips swung under, hoisting with 1⅛″ round steel cable. There is a 20-drill Rand air-compressor.

The reduction plant, at Butte, includes a small concentrator and furnaces with 750 tons daily capacity, but lacks a converter plant. These works did a general custom business, in addition to treating the company's ores, until closed, 1905, since which time the company's ore has been sent mainly to the Washoe works, at Anaconda. The old reduction plant is held in reserve, for emergencies, but otherwise is unlikely to be used again.

Production of ore was 146,954 tons for fiscal year ending June 1, 1907, and 85,260 tons for fiscal year 1908, the 1907 production giving a gross yield of $9.96 per ton. Production, 1907, is estimated at 7,000,000 lbs. fine copper.

TRENTON-SONORA MINING CO. **MEXICO.**

Office: Trenton, N. J. Mine office: Tarachi, Sahuaripa, Sonora, Mex. F. C. Garretson, general manager. Property includes the San José, Santa Eduviges, El Porvenir and other mines, carrying copper, silver and gold ores, developed mainly by tunnel, the San José mine showing an 18″ paystreak of highly auriferous chalcopyrite.

TRES AMIGOS GOLD MINING CO. **MEXICO.**

Mine office: Temosáchic, Guerrero, Chihuahua, Mex. B. L. Croff, general manager. Is developing by tunnel, on a vein of 25′ to 40′ width, claimed to carry ore averaging 6% copper, 4 oz. silver and $10 gold per ton.

MINA TRES GRACIAS. **CHILE.**

Office and mine: Chañaral, Atacama, Chile. Basilio Caceres, owner; Roberto Caceres, manager. Has steam power, employing circa 100 men at last accounts.

TREVEDDOE MINING CO., LTD. **ENGLAND.**

Office: 13 Throgmorton Ave., London, E. C., Eng. Mine office: Bodmin, Cornwall, Eng. Col. Wm. F. Leese, chairman; R. Arthur Thomas, engineer; Wm. H. Adams, secretary. Organized Aug. 13, 1900, under laws of Great Britain, with capitalization £100,000, shares £5 par; issued, £95,000. Debentures, £17,500 authorized, £16,000 outstanding, at 5%. Lands, 500 acres, held on 100-year lease, subject to rental and royalty, bearing tin and copper ores. Production, 1902, was 60 tons of black tin and 175 tons of 7% copper ore. Operations, 1904, resulted in a net loss of £2,250, and for 1906 gave a profit of £158.

TRIANGLE MINES CO. **ARIZONA.**

Mine office: McCabe, Yavapai Co., Ariz. Organized 1905. Lands, 7 claims, at McCabe, having a 378′ shaft showing auriferous copper sulphides, of fair assay tenor. Idle at last accounts, because of legal troubles, which are said to have been straightened out.

TRI-BULLION SMELTING & DEVELOPMENT CO. **ARIZONA, MONTANA & NEW MEXICO.**

Office: 2 Rector St., New York, N. Y. Western office: 1305 Chamber of Commerce Bldg., Chicago, Ills. Mine offices: Kelly, Socorro Co., N. M., and San Carlos, Gila Co., Ariz. Hon. Howard Paschal, president; Louis O. Hedden, vice-president; Edgar Wiggins, secretary; John W. Dundee, treasurer; Louis J. Pierson, resident director; Samuel W. Traylor, general manager; preceding officers, Hon. J. B. Corliss, Dr. R. J. Marshall, Warren Curtis, Sr.,

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and Richard T. Green, directors; Woolsey McA. Johnson, consulting engineer; R. W. Bull, superintendent.

Organized 1903, under laws of Arizona, with capitalization $5,250,000, shares $1 par, and capitalization changed, 1906, to $5,250,000, in $250,000 preferred and $5,000,000 common stock, shares $5 par. The preferred cumulative stock has dividends in arrears since 1903. At end of fiscal year June 30, 1908, the company had in cash, notes and bills receivable, $32,000, with 3,000 tons of high-grade ore and 25,000 tons of milling ore extracted, estimated as worth $220,000.

Lands include a zinc property in New Mexico, copper lands in Arizona and the Tri-Bullion group of copper claims in Jefferson county, Montana.

The Tri-Bullion group, area 180 acres, in the Pipestone district of Jefferson county, Montana, was said, 1907, to have 800′ of shafts and opencuts. Apparently this has been idle for some time.

The Arizona claims include the Tri-Bullion group of 8 gold and silver claims, apparently idle, and the Starlight group of 14 copper and lead claims, latter located in Godless Gulch, in the Stanley Butte district, 8 miles south of San Carlos. The Starlight mine was discovered 1886, but was not opened until 1903, because a part of the San Carlos Indian Reservation, until lands were segregated, 1901. The Starlight group shows porphyry, quartz, granite and limestone, carrying 3 known ore bodies, of 3′ estimated average width, having oxidized ores estimated to average 8% copper, 10 oz. silver and $1 gold per ton, with more or less lead, zinc, antimony and bismuth, with some ore assaying up to 8% copper, 40% lead, 10 oz. silver and $3.50 gold per ton. The ore is low in silica and rich in lead and iron, rendering it self-fluxing, notwithstanding the existence of highly deleterious elements. The Starlight mine has shafts of 140′ and 200′, and a tunnel, planned to connect with the vein at 1,000′, giving a back of 500′. The Will Ryan group has a 1,200′ crosscut tunnel, said to show considerable quantities of low-grade ore. The Starlight group shows the wreck of an ancient adobe smelter, remaining from old operations by Mexicans or Spaniards.

The Kelly mine, which is the company's principal property, area 13 claims, near Magdalena, is primarily a zinc mine, with considerable lead values, but carries some copper, the upper working showing mainly zinc carbonates. First grade lead ore is said to run 20 to 25% zinc, and 8 to 12% lead, and zinc ore is said to average up to 2% copper, 32 to 35% zinc, 3% lead, circa 8 oz. silver and 75 cents gold per ton. There is evidence of increasing copper values with depth. Development is by the Kelly, Paschal and Traylor shafts, latter, of 3 compartments, with a steel gallows-frame, being said to show a 40′ ore body on the 300′ level. The Nit mine, adjoining the Graphic, is said to show a body of heavy sulphide ore. The company estimated, early 1907, that by the end of the year it would have enough ore blocked out for 10 years' production.

Equipment at the Kelly mine includes a power-house with three 150-h. p. boilers, an 18x36″ first-motion double-cylinder double-drum hoist, and a 15-drill Ingersoll-Rand air-compressor.

In 1907 the company planned building a 50-ton plant, at Cañon City, Frémont Co., Colo., to make zinc-lead pigment and zinc oxide, but apparently construction of this plant has been abandoned.

The mill, at the Kelly mine, built 1907, by the Traylor Engineering Co., apparently was not a success, and was remodeled and enlarged, 1908, and was planned to go into commission circa January, 1909.

The Kelly mine is leased, above the fourth level, to Coney T. Brown, but work was resumed by the company, November, 1908. The management gave consideration, 1908, to exchanging stock of the company for stock in the

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Kelly Smelting & Refining Co., owning property near the Kelly mines in New Mexico, and in Jefferson county, Montana, but this plan was unpopular with shareholders, and apparently was dropped. Many shareholders are dissatisfied with the management, and have proposed an investigation. Property considered promising.

TRIMETALLIC MINING, SMELTING & REFINING CO. **MEXICO.**

Office: care of P. Sandoval, treasurer, Nogales, Ariz. J. L. Shepard, president. Lands, 9 groups of claims, in the Ures and Hermosillo districts, Sonora, Mexico, with a government concession for the equivalent of about 100,000 miners' inches of water from the Yaqui river, which, under an effective head of 160′, could be made to develop a large water-power. Lands show auriferous and argentiferous copper ores. Property considered promising. Presumably idle.

TRIMOUNTAIN MINING CO. **MICHIGAN.**

Office: 82 Devonshire St., Boston, Mass. Mine office: Trimountain, Houghton Co., Mich. Employs circa 800 men. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; Frederick W. Denton, general manager; preceding officers, J. Henry Brooks, Chas. A. Snow, Chas. H. Paine and John R. Stanton, directors; John Jolly, superintendent; Edw. Koepel, mill superintendent; H. T. Mercer, engineer; Benj. D. Noetzel, clerk; Richard Bowden, mining captain; Jas. Vial, master mechanic at mine; Jas. Richards, master mechanic at mill; Will Harris, supply clerk.

Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par; paid in, $20. Is controlled, through ownership of 99,135 shares, by Copper Range Consolidated Co. Old Colony Trust Co., Boston, registrar. Annual meeting, second Wednesday in February.

The company paid $300,000 dividends, under a former management, and paid a $5 dividend, of $500,000, Apr. 22, 1908, this being the first under the present management. Mining profits, 1907, were $491,480.76, with a construction account of $66,084.29, and net earnings for year were $380,302.15, company ending 1907 with a surplus of $1,086,299.64. The final installment on the Trimountain debt was paid January, 1908, by A. C. Burrage, as per agreement.

Lands, 1,120 acres, being the E. ½ of Section 19, W. ½ of Section 20, N. ½ of Section 29, and NE. ¼ of Section 30, all in T. 54 N., R. 34 W. The Baltic mine is to the north, and the Champion to the south, with undeveloped lands to the east and west.

Owing to a very heavy sand overburden surmounting the ledge, the mine was opened by sinking drop-shafts through the alluvium, raising thence to surface on the angle of dip of the bed. The Baltic lode runs 15′ to 50′ wide on the Baltic tract, with an average width of about 25′, usually being well mineralized throughout, mass and barrel copper occurring near the walls. Masses upwards of a ton in weight have been found, but values occur mainly in stamp-rock. The two end shafts, toward the Champion and Baltic mines, are better than those in the middle, but there are prospects of better copper values with depth, and a slow but fairly steady improvement has been noted, for two years past. The mine has electric pumps, and, during 1907, made 7,528′ of new openings. The shafts are all of the same size and style, being 8x22′ outside of timbers, with 3 compartments, framed with 14x14″ sticks, exceptionally heavy timbering being required to withstand the pressure of shifting sand above the solid rock. Shafts 1 and 4 are the chief producers.

Lying parallel with and circa 65′ west from the Baltic lode is a very wide amygdaloidal bed, carrying some heavy copper and considerable stamp rock. This, opened by a crosscut from the 7th level of No. 1 shaft, has been explored to some extent, but nothing of great importance found. The great average width of the lode has led to successful experiments in dry-walling with waste-

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rock. Though at first ridiculed by some conservative mine managers, the use of culls for underground walls has proven its worth in the mines of the Baltic lode, and is being adopted quite generally in other Lake Superior mines. Waste-rock is used also for building underground chutes. These are roughly circular, with inner diameter of about 5′, and are built and filled about with waste, as stopes are carried upward, the chutes being built at a sharp pitch. It was feared that descending rock might catch upon projections of the inner wall, of rough mine-rock, but in practice no such trouble occurs, the wedging of surrounding waste-rock serving to hold the walls immovable. The saving in timbering resulting from the use of dry-walling and mine-rock chutes is very great.

No. 1 shaft, 1,675′ deep, Jan. 1, 1908, sunk at an angle of 68°, is 210′ north of the Champion boundary line. This shaft has a sand overburden of about 40′ depth, with first level opened 168′ below the collar, levels being 100′ apart from thence downward, No. 1 shaft developing a long stretch of exceptionally uniform stoping ground, of good average grade. Equipment at No. 1 includes a 2,500-h. p. Nordberg direct-acting duplex hoist, with 36x72″ cylinders and double-conical drum, of 18′ maximum diameter, with capacity for raising 6-ton skips from one mile depth. The shaft-rockhouse is of wood.

No. 2 shaft, 1,023′ northeast of No. 1, was 1,575′ deep, Jan. 1, 1908, sunk at an angle of 68°, with a steel and concrete collar, built 1907. This shaft shows improving ground below the 14th level. The shaft-rockhouse, 40x62′ on the ground, and 84′ high, of steel frame, iron sheathed, has 2,000-ton rock-bins, equipment including an engine, steam-hammer and two 18x24″ crushers. The hoist is a duplicate of that at No. 1.

No. 3 shaft, 1,027′ northeast of No. 2, sunk at an angle of 68°, was 1,425′ deep, Jan. 1, 1908. This shaft has a sand overburden of about 60′, and ground is much disturbed below the 2d level, but the formation becomes more settled at greater depth, where better stopes are shown, and there is a material improvement in values below the 14th level. Equipment includes a shaft-rockhouse and hoist that are duplicates of those at No. 2.

No. 4 shaft, 1,100′ deep, Jan. 1, 1908, shows some of the best stopes in the mine. The shaft-rockhouse is a duplicate of those at shafts 2 and 3, but the hoist is a temporary engine, good for a quarter-mile depth, which is to be replaced, eventually, by a hoist similar to those at the three other shafts.

No. 5 is merely the site for a shaft, there being an overburden of sand, mixed with boulders, 208′ in depth, which best could be penetrated by an upraise.

No. 6 also is merely a tentative site for a shaft, so located as to develop the Trimountain territory to the Baltic line.

The principal mine buildings and machinery, in the neighborhood of shafts 2 and 3, include a 32x45′ machine-shop, 40x60′ carpenter-shop, 25x45′ smithy and 30x60′ warehouse. There is a 35-drill cross-compound Rand air-compressor at No. 2 shaft, with a Deane condensing plant in a separate building adjoining. At No. 3 shaft the power plant, in a 68x180′ steel building, includes a battery of Stirling water-tube boilers and a 4,500′ Nordberg air-compressor, guaranteed to run 45 drills only, but actually running 65 drills, 10 pumps and sundry pneumatic machinery, giving a total duty equal to running 90 drills, or twice the rated capacity. At No. 3 there is a large coal trestle, supplying fuel to the boiler-room, and a cistern near No. 2 shaft stores water from a small brook for the boilers. A house over the cistern has a fire-pump, with hose, for defense of the mine buildings. The mine has a branch of the Copper Range telephone system.

The mine is served by the Painesdale branch of the Copper Range railway, which reaches all shafts and the principal shops.

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The mine location, which is well improved with macadamized roads, and is very neat in appearance, includes a large boarding-house, upwards of 100 dwellings and a general store and meat market having branches at the mill-site. The company maintains a hospital and nurses' home. There is a water system, with 10" mains, furnishing water for domestic use and fire protection.

The mill, 176x205' in size, of steel frame on stone foundations, occupies a 100-acre millsite at Beacon Hill, 2 miles west of Redridge, having about 2 miles frontage on Lake Superior. The mill has 4 steeple-compound Nordberg stamps, of which 2 are in use. Complementary machinery for each stamp includes crushing rolls, installed 1907, 36 improved Hodge jigs, 6 slime tables and 1 Wilfley table. No. 3 head was reset, 1908, on a solid concrete base, removing the old foundation, consisting of 3 tiers of 14x14" timber, the change entirely eliminating vibration, and under test this head has stamped 900 tons in 24 hours, heads having a normal capacity of about 800 tons daily each. Tailings losses, originally as high as 0.50 to 0.65%, were reduced later to 0.32%, and, 1908, were reduced to 0.26%, by the installation of regrinding rolls and settling tanks. The mill has a 300-h. p. engine, and a small but complete machine-shop on the second floor.

The mill boiler-house, of steel, has six 250-h. p. and two 200-h. p. Stirling boilers, latter maintaining a steam pressure of 180 to 200 lbs. per square inch, which is the highest carried at any mill in the district. The boiler plant has a brick-lined self-supporting steel smokestack, 165' high and 7' 6" in diameter. At the rear of the boiler-house are 3 coal trestles, under each being a 6x7' tunnel, 400' long, leading to the boiler-rooms, the floors of the sheds forming the roofs of the tunnels. Feed-water for boilers is piped from a small stream, dammed 1,000' distant.

The steel pump-house at the mill has a 20,000,000-gallon Nordberg pump, taking water from a well connected with a 40" riveted steel pipe, running 1,400' to an intake crib in Lake Superior. The crib, built of heavy timbers and braced by iron rods, is 42x56' on the bottom and 31' high, sunk in 21' of water, weighted with 1,800 tons of rock, and anchored into the sandstone bed of the lake by heavy iron rods. The 40" intake pipe is laid on the floor of the lake from the crib until shallow water is reached, and is anchored to the rock bed of the lake by eye-bolts. The 500' section of this line nearest shore was laid in a 14' trench, covered with cement, sunk in sacks, but this protection proved inadequate against heavy shore ice, and was replaced, 1908, by a reinforced concrete covering, for a distance of 250'.

The mill buildings include a smithy and carpenter-shop, each 18x30', and a 24x36' warehouse. The townsite of Beacon Hill, lying on the slope above the mill, has a number of dwellings, and mill buildings and townsite are lighted by electricity, supplied by a dynamo in the engine-room of the mill.

Production was begun Jan. 4, 1902, with one leased head, at the Arcadian mill, a second leased head being started in April. Two heads in the Trimountain mill were started in 1902, and the third and fourth heads were started in 1903. The Trimountain began production with returns of 37 lbs. fine copper per ton, but fell off, later, to 27 lbs. per ton, and, when the present management assumed control, the production fell sharply, from 27 lbs. to 18 lbs. fine copper per ton. The reason for this sudden decrease in returns is not far to seek, as Thos. W. Lawson, formerly the owner of a majority of the Trimountain stock, forced the old management to operate the mine on a radically wrong basis. The mine was gouged, rich rock removed and production maintained at a high level, through willfully robbing the mine, at the expense of its future, and, by these tactics, dividends aggregating $300,000 were squeezed out, in 1903, yet the mine was turned over to the Copper Range with a floating debt of upwards

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of $750,000, and it required five years to put the Trimountain back on a dividend basis.

Production has been as follows: 9,237,051 lbs. fine copper in 1903, 10,211,230 lbs. in 1904; 10,476,462 lbs. in 1905; 9,507,933 lbs. in 1906; 8,190,711 lbs. in 1907. In 1907 the mine hoisted 506,805 tons of rock, discarding 62,447 tons, or 12.3%, and stamped 444,358 tons, which yielded 12,729,445 lbs. mineral and 8,190,711 lbs. fine copper, an average return of 18.43 lbs. fine copper per ton. For 1907 working expenses were $1.96 per ton, or, including taxes, $2.06 per ton, and cost of finished copper, delivered, was 8.82 cents per pound, sold at an average price of 17.78 cents per pound. At end of 1908 production was circa 1,500 tons of stamp-rock daily. The Trimountain, while it has proven somewhat disappointing, has reached a point where its future may be considered assured, thanks to a highly efficient and capable management.

COMPAÑIA MINERA LA TRINIDAD. **MEXICO.**

Office: care of Sr. D. José Luis Requeña, presidente, Mexico, D. F. Mine office: Charcas, Moctezuma, San Luis Potosí, Mex. Luciano de la Rosa, manager. Capitalization 300,000 pesos, shares 1 peso par. Lands include the San Agustin mine, area 20 pertenencias, with an 80-meter shaft, also a mine with a 105-meter shaft, with steam hoist. At last accounts was producing daily about one carload of ore carrying 4 to 5% copper and 700 to 1,000 grams silver per metric ton. Employs about 40 men.

TRINIDAD MINING CO. **MEXICO.**

Office: 710 Lankershim Bldg., Los Angeles, Cal. Mine office: La Trinidad, Sahuaripa, Sonora, Mex. D. Richardson, manager. Has auriferous and argentiferous copper ore, with steam power and a 50-ton mill, and is said also to have a 10-ton smelter.

TRINIDAD MINING & SMELTING CO. **MEXICO.**

Mine office: Arcelia, Aldama, Guerrero, Mex. B. Davidson, mine manager. Has silver-lead ores carrying gold and copper values. Property includes the Luisa, Salvación, Sorpresa and Trinidad mines, carrying silver-lead ores, with gold and copper values. Has steam power and a 20-ton mill, employing about 50 men, at last accounts.

TRINITY COPPER CO. **CALIFORNIA.**

Office: 33 State St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Thos. W. Lawson, president; Arnold Lawson, vice-president; Homer Albers, secretary; Allen Arnold, treasurer; R. N. Bishop, general manager; preceding officers, Louis Auerbach, Arthur P. French, Henry H. Arnold, Frank E. Chase and Kenneth K. McLaren, directors.

Organized Oct. 18, 1900, under laws of New Jersey, with capitalization $6,000,000, shares $25 par. American Loan & Trust Co., Boston, transfer agent; International Trust Co., Boston, registrar.

Lands, 1,700 acres, also a patented townsite, near Kennett, with total holdings of 3,233 acres, a smelter site of 422 acres, formerly owned, having been sold to the Mammoth. Property includes the Shasta King, which is the principal mine, the Lost Desert group, and the King Copper group.

The Shasta King group, area 12 claims, is on the south fork of Squaw Creek, adjoining the Balaklala, 4 miles east of Iron Mountain. The mine is located in a deep gulch, topography being favorable for opening by tunnels, which are used exclusively for development. The main tunnel, 1,145′ long, is 7x8′ in size, with double tram-tracks, equipped with steel ore-cars, and a 7x8′ double-track tunnel has been driven 175′ vertically lower. The mine had, 1906, circa 7,500′ of workings, which have not been greatly increased since, and the property has been tested by 5,119′ of diamond-drill borings. The ore body is a lense, claimed to be approximately 150′ wide by 1,000′ long, and of unknown depth, but apparently the ore does not go to great depth, and it is possible

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that the bottom limits have been reached. The mine was claimed, by the management, to have circa 1,200,000 tons of ore in sight, with nearly 500,000 tons blocked out for stoping, but this statement was denounced, by Lewis E. Aubury, State Mineralogist of California, as a gross and willful prevarication. The management now claims that the Trinity has about 900,000 tons of ore in sight, but independent observers give very much lower estimates, and it seems probable that the property has ore reserves of at least 400,000 tons, with fair chances of 750,000 tons, and possibilities of a greater tonnage. The crosscut tunnels, driven in from the sides of the mountain, connect with drifts on the ore body, which is low grade disseminated chalcopyrite, variously estimated as from 1 to 4% in copper tenor, with combined gold and silver values of about $1 per ton. The ore carries small quantities of zinc and an excess of iron, and probably averages about 2.5 to 2.75% copper and 1 oz. silver per ton, with small gold values. The Trinity also has an ore body of undetermined size on the opposite side of the gulch from the Shasta King.

The Shasta King mine has an incline tramway of circa 2,000′ length, leading from the mine to the head-house of the Balaklala tramway, with ore-bins at the mine, the tram-line having about 500 tons daily capacity.

The King Copper group, of 22 claims, on Motion Creek, circa 2½ miles south of the Shasta King, had about 1,000′ of development work, at last accounts, but apparently no ore had been found in place.

The Statesman group has been partially explored, with a view to locating and developing silicious ores required for fluxing the heavy sulphide ores of the Shasta King mine.

The Uncle Sam group, held under bond and lease, also has been explored for fluxing ores, the Shasta King having large bodies of low grade copper pyrites, but lacking the silicious ores required to make free-smelting furnace mixtures. The Uncle Sam group shows some oxidized ore, at and near surface, of 3 to 8% copper tenor.

Equipment includes a steam plant, with a 6-drill air-compressor and power drills, and there also is a diamond drill. Buildings include a $20,000 office building, assay office, warehouse, shops, hospital, and about 25 dwellings for employes.

The company made a bluff at building a smelter, 1901, doing some grading at the time, but as the Trinity was worked mainly for the benefit of the stock market, grading was discontinued, and the site sold, now being occupied by the Mammoth smelter. At the company's annual meeting, February, 1905, the president was authorized to build a smelter, "according to specifications submitted by general manager Brown," but this smelter also vanished into thin air, like its predecessor. If printers' ink would build smelters, the Trinity would have them aplenty.

Ore production was begun, Sept. 25, 1907, apparently at the rate of 150 tons daily, but apparently none of this ore got to the smelter, and the mine begun production again, circa October, 1908, after nearly a year of practical idleness, with ore shipments of approximately 150 tons daily.

The Trinity was said to have had a contract with the Balaklala, calling for the treatment of 308,000 tons of ore for the first year, and 360,000 tons yearly for 9 succeeding years, but apparently this contract actually called for a minimum of 300 and a maximum of 1,000 tons daily, which, so far as can be learned, was to be matted for $3 per ton. Apparently it is undetermined what stand the First National Copper Co., successor of the Balaklala Copper Co., will take regarding the contract of the Trinity with the Balaklala, but Mr. Lawson is president of both corporations, so anything may be expected. Late 1908 the Trinity was said to be working about 75 men, at the Shasta King mine, and to be shipping considerable ore. It is not con-

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sidered likely that Trinity can produce copper for much if any less than 15 cents per pound, and the cost may be higher.

The management of the Trinity claimed, when the shares were listed on the Boston Stock Exchange, to have $745,047 cash in the treasury, and also claimed to have 80,000 shares of stock in the treasury, but the first balance sheet made public by the company, of date Feb. 19, 1907, showed that the treasury stock had disappeared mysteriously, this balance sheet giving assets of $5,221,000 in lands, which possibly is a trifle inflated, for the reason that the mine is said to have been bought by Lawson for $165,000 and a stock consideration, and was capitalized, with the innate modesty that so distinguishes this great reformer and philanthropist, at $6,000,000, this being Lawson's idea of the square deal to his followers. The company's balance sheet, of Sept. 30, 1907, showed accounts receivable of $895, and cash $40,705, while balance sheet for Sept. 30, 1908, gave cash resources of $282, with $895 in accounts receivable. This seems about the Trinity's measure. The company's annual statements are very unsatisfactory, and no adequate explanation has been given for the disapparence of the fund originally on hand for construction of a smelter. The Trinity has progressed backwards in a remarkable manner, its large cash surplus having sunk practically to the point of disappearance, while its 80,000 shares of treasury stock have disappeared completely, leaving no trace behind of the smelters promised at various times, these not only having failed to materialize, but even the hole where the first smelter was to be built having disappeared also. In this connection, the Copper Handbook repeats its criticism of the Boston Stock Exchange, which has lent itself to Lawson's crookedness by listing this utterly rotten stock. The Boston Stock Exchange generously permitted Lawson to list the balance of 80,000 shares of Trinity stock, early 1905.

In the prospectus of the Trinity Copper Co., issued Oct. 20, 1900, Lawson predicted that from August, 1901, the net earnings would be "at least" $2,000,000 or $3,000,000 yearly, and by that time "at least" $30,000,000 worth of ore would be blocked out. These predictions have proven as accurate and truthful as others from the same source. When Lawson put out this stock he gave a personal "guarantee" that the stock would not sell below $25, but it has declined repeatedly to a mere fraction of this figure. Lawson stated, in an advertisement, Jan. 17, 1907, that he had always kept the finances of the Trinity in the hands of others, and never, directly or indirectly, had the handling of them. This is important, if true.

Arnold Lawson was elected a director before he was a shareholder, and Thos. W. Lawson, philanthropical promoter-president, was on record, at the annual meeting, 1907, as the owner of only 200 shares, which shows the virtuous Lawson to be a very wise personage, as he unloaded, shortly before, on "investors," throughout the country, at prices as high as $44 per share.

To show what an utterly conscienceless scoundrel Lawson is, the following murderous suggestion is taken from one of his advertisement, of February, 1907, referring to Mr. C. W. Barron of the Boston News Bureau. "In such a cause the law can or will do nothing. If it were not for the law, this power would meet its death as does a skulking hyena. Some day following disaster caused by Boston News Bureau—disaster like that of Saturday, for instance—some victim less considerate perhaps than I, will kill this power as he would kill a mad cur." The offense of the Boston News Bureau and its publisher consisted of telling the truth about Trinity. Fortunately no crack-brained fool followed the hint, so murder was not done—no thanks to Lawson, the "reformer."

The Trinity is Lawson's scientific little game for parting fools from their money, and it has been worked, very cleverly, with the assistance of

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the Boston Stock Exchange, which is an accessory after the fact. The stock should be taken off the Boston exchange, and turned over to the Boston curb, which Lawson "reorganized" in 1908. Lawson saw fit to attack the Copper Handbook and its publisher in one of his advertisements, January, 1907, but was promptly called a liar and a bluffer, in a counter-advertisement, and notified to bring suit, if he dared, but, in preference, shut up, which is an evidence that Lawson, whatever he may be, is not a fool.

TRIUMPH GOLD-COPPER CONSOLIDATED SMELTING, LAND & IRRIGATION CO. **ARIZONA.**

Dead. Was a fraud, promoted by the notorious Wm. F. Wernse gang of swindlers. Formerly at Pima, Graham Co., Ariz.

TRIUMPH TUNNEL SITE CO. **ARIZONA.**

Office: El Paso, Tex. Mine office: Safford, Graham Co., Ariz. Thos. McEniry, president. Organized 1899, with capitalization $50,000. Lands are claimed to be 4,800 acres. Prospectus of this company is one of the worst ever issued, being full of deliberate lies, and the company cannot be regarded otherwise than as an intentional swindle.

TROUGH-GULLY COPPER SYNDICATE CO., LTD. **AUSTRALIA.**

Office: 46 Dame St., Dublin, Ireland. Mine office: Tamworth, N. S. W., Australia. Sir. E. Cochrane, Rev. J. Robinson, J. Mulligan and W. F. Cotton, directors. Organized Jan. 8, 1908, under laws of Ireland, with capitalization £17,000, shares £1 par.

TROUT CREEK COPPER MINING CO.

Dead. Formerly had an office at 317 Fidelity Bldg., Tacoma, Wash.

TROY CONSOLIDATED MINING CO. **ARIZONA.**

Office: 25 Broadway, New York, N. Y. Mine office: Troy, Pinal Co., Ariz. Works office: Florence, Frémont Co., Colo. Hon. A. B. Lewis, president. Capitalization $4,000,000, shares $10 par. Is practically a reorganization of the Troy-Manhattan Copper Co., though latter retains it corporate existence, and holds 160,000 shares of Troy Consolidated. Present company is said to have furnished a working capital of $750,000, which is doubted.

Lands, 50 claims, area circa 1,000 acres, 6 miles northeast of Kelvin and 7 miles from a railroad. Mine has about 6 miles of openings, including circa 7,000′ of tunnels, the Alice tunnel being circa 1,700′ long, with back of about 800′. Has 4 shafts, including a 500′ two-compartment main working shaft. Ores in upper workings are slightly auriferous and argentiferous oxides, succeeded by sulphide ores claimed to range 8 to 16% in copper tenor, with small gold and silver values. Vein is 3′ to 11′ in width, and widest in the bottom working, where it is very soft, requiring spilling. The 400′ Sisson shaft shows a 6′ body of sulphide ore, said to average about 5.5% copper. The 375′ two-compartment Buckeye shaft has a 5′ ore body, with a 2′ paystreak carrying 9% copper, and the Buckeye winze is claimed to show a 25′ vein of malachite, giving smelter returns of 6 to 10% copper, which estimates probably are excessive. The '91 claim has a 2′ to 8′ vein of wulfenite, for which a 40-ton concentrator was built, near the Davis shaft, but this ore body apparently did not prove of commercial value. About $750,000 has been expended on the property, by various managements and under various organizations, but it does not seem proven that large and permanent ore bodies have been developed. Mining equipment includes 2 gasoline hoists, a Leyner air-compressor and an electric plant, petroleum being used for fuel.

The old smelter, of 60 tons daily capacity, at Riverside, on the Gila River, was blown in 1901, and closed permanently, August, 1904, never running regularly, and experiencing much trouble from shortage of both coke and water. A new smelter, blown in January, 1905, ran 10 days, closing ostensibly on account of a washout, preventing the receipt of fuel, but in all likelihood

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the smelters did not run regularly because lacking an adequate ore supply. The Rocky Mountain smelter of the Colorado Smelting & Refining Co., at Florence, Colorado, bought late 1907, was rated at 500 tons daily capacity, but has been idle since circa 1902, and apparently never was a success. Smelter is said to have been bought for $400,000, and apparently management planned shipping ore from Arizona to Colorado, for reduction, which seems an idea of doubtful value. Suspended operations October, 1907. Results from mine, under various managements and ownerships, have been distinctly disappointing.

TROY COPPER CO. **ARIZONA.**

Dead. Merged, 1902, in Troy-Manhattan Copper Co. Formerly at Troy, Pinal Co., Ariz.

TROY GOLD MINING CO. **COLORADO.**

Dead. Formerly at Granite, Chaffee Co., Colo. Described Vol. VI.

TROY-MANHATTAN COPPER CO. **ARIZONA.**

Office: 25 Broadway, New York, N. Y. Is practically out of business, having transferred its property at Troy, Pinal county, Arizona, 1907, to the Troy Consolidated Mining Co., for a stock interest of 160,000 shares in the latter-named corporation. Fully described Vol. VI.

TRUE BLUE COPPER MINES, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Ainsworth, Slocan district, B. C.

TRUE BLUE MINE. **AUSTRALIA.**

Mine office: Stanthorpe, Queensland, Australia. Lenox & Rannie, owners. Mine has a vein of 8′ to 15′ width, carrying considerable ore assaying 17.12% copper and 33 oz. silver, which is shipped for smelting, low-grade ore being concentrated at an adjoining mill and shipped to London. Production, 1906, was 112,000 lbs. fine copper and 1,767 oz. silver.

TRURO MINING & REDUCTION CO. **MONTANA.**

Office: Cleveland, Ohio. Mine office: Basin, Jefferson Co., Mont. Lands, known as the Buckeye Mine, have a 170′ shaft, with about 600′ of workings, showing ore giving fair assay values in lead, copper, silver and gold. Has steam power, a small saw-mill and a 50-ton concentrator.

TSUBOI MINE. **JAPAN.**

Mine office: Tsuboi-mura, Kume-gori, Mimasaka, Japan. Ore is chalcopyrite, associated with iron pyrites, said to average 13% copper and 0.2% silver, occurring in three principal veins of 2′ to 4′ width, running parallel to plane of stratification of paleozoic clay-slate and schalkstein. Production was 218,808 lbs. fine copper in 1903, and 354,855 lbs. copper and 3,308,835 momme silver in 1907.

TSUNATORI MINE. **JAPAN.**

Mine office: Yokokawame-mura, Waka-gori, Rikuchu, Japan. Production was 309,063 lbs. fine copper in 1903, and 216,844 lbs. in 1906.

TUBAL-CAIN COPPER & MANGANESE MINING CO. **WASHINGTON.**

Office: 211 Coleman Blk., Seattle, Wash. Mine office: Port Townsend, Jefferson Co., Wash. Frank Hanford, president and treasurer; Victor E. Tull, general manager; I. A. Nadeau, secretary; S. Marpel, superintendent. Lands, 29 claims, 1 fractional, 18 miles from a railroad, in the Olympic Mountains, having a 1,800′ tunnel, planned to cut 5 veins of auriferous copper ore, said to carry fair values in both copper and gold.

AKTIEN-GESELLSCHAFT TUBALKAIN. **GERMANY.**

Mine office: Adenau, Rheinprovinz, Germany. Has ores of copper, lead and iron. Idle several years.

TUBUTAMA MINING & REDUCTION CO. **MEXICO.**

Mine office: Tubutama, Altar, Sonora, Mex. Lands, 300 pertenencias, including antiguas, adjoining the Sonora Mining & Milling Co. Idle several years.

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SOCIÉTÉ DES MINES DE TUCO-CHEIRA. **PERÚ.**

Office: 50, Blvd. Hausmann, Paris, France. Mine office: Casilla 10, Huaraz, Ancachs, Perú. Capitalization, 2,500,000 francs.

TUCSON CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 51 Chamber of Commerce, Milwaukee, Wis. Mine office: Tucson, Pima, Co., Ariz. J. H. Wussow, president; F. R. Morris, vice-president; F. J. Rodee, secretary and treasurer; Hon. F. W. Fickett, general manager; preceding officers, Dr. M. A. Barndt and C. F. Freeman, directors; E. W. Drew, superintendent. Organized Apr. 15, 1907, under laws of Arizona, with capitalization $3,000,000, shares $1 par; issued, $1,600,000.

Lands, 103 claims, area 2,060 acres, in 6 groups, known as the Old Pueblo, Masonic, Bolello, Gold Hill, Purcell and Black Dyke. The Old Pueblo is held from the Old Peublo Mining & Milling Co., under an option by which the Tucson Consolidated is to have 51% of stock of the Old Pueblo, on completion of $150,000 worth of work. The Old Pueblo is separately described, though included in present company's landed holdings. Property as a whole, including the Old Pueblo, shows 3 ore bodies under development, of 3′ to 60′ average width, giving ores assaying 6 to 30% copper, 12 to 80% lead, 3 to 125 oz. silver and 80 cents to $30 gold per ton, from azurite, malachite, chalcocite, chalcopyrite and galena, property as a whole having tunnels of 40′, 118′ and 287′, and 12 shafts of 45′ to 210′ depth, with a total of about 3,000′ of workings, estimated by company to show 2,000,000 tons of ore, with 500,000 tons blocked out for stoping, which estimate seems excessive. Principal development is on the Old Pueblo group, separately described. The Masonic group is near the Old Pueblo, circa 6 miles west of Tucson. The Purcell group, 17 claims, has a 100′ tunnel and several shafts of 25′ to 60′ depth, showing ore said to give average assays of about 25% copper, with about 1,000′ of workings, said to put in sight 500,000 tons of ore, which is an excessive estimate, that will assay 5% copper, 5 to 40 oz. silver and 8 cents to $5 gold per ton, with some silver-lead ores. The Black Dyke group, 48 claims, area 960 acres, has several shafts of circa 50′ depth, showing copper ore of 4 to 25% tenor, and lead ore assaying up to 69% lead and 139 oz. silver per ton. The Bolello group, 9 claims, shows 3 copper veins and has a 60′ shaft, carrying ore assaying up to 24% copper, with gold and silver values.

Equipment includes a 250-h. p. steam plant, with 2 hoists. Has 6 buildings, including 2 stores. Fuel is petroleum. Made an initial shipment, October, 1907, of ore carrying 10 to 12% copper and $5 to $10 combined gold and silver values per ton. Employs circa 20 men. Property considered promising, and management apparently business-like and vigorous, though inclined to make excessive claims.

TUCSON-GLOBE COPPER CO. **ARIZONA.**

Dead. Former office was at Tucson, Ariz. Property was the Robertson and Westbrook claims, near the Gibson mine, west of Globe. Formerly at Globe, Gila Co., Ariz.

TULAROSA COPPER CO. **NEW MEXICO.**

Office: Tularosa, N. M. Mine office: Bent, Otero Co., N. M. F. P. Kearns, president; H. A. Forrester, vice-president; G. P. Bent, secretary and general manager; W. F. Drake, treasurer; Sam Luschy, mine superintendent; R. G. Riley, mill superintendent. Organized March 5, 1905, under laws of New Mexico, with capitalization $5,000,000, shares $5 par, as successor of Tularosa Mining & Milling Co.

Lands, 15 claims, area 300 acres, and a 10-acre millsite, with 300 acres miscellaneous lands, in the Tularosa district, 15 miles from a railroad, showing a vein of apparently unknown width, dipping at 25°, carrying chalcocite, bornite and chalcopyrite with sandstone gangue, with a shallow oxidized zone

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carrying carbonates and a little native copper. Mine has shafts of 60', 50' and 45', with about 800' of workings, estimated to show 500,000 tons of ore. Has steam and water power, with 10 mine buildings.

Mill, 65x70', has an 8x14" Blake crusher, 1 Harz jig and 2 Wilfley tables. Ore is hand-sorted, selected smelter ore ranging up to 50% in copper tenor, balance of low-grade being milled, mill putting about 15 into 1 and producing a daily average of about 1 ton of concentrates carrying 42.4% copper and 30 to 45 oz. silver per ton. Average tenor of ore is reported by company to be 6%, but will perhaps show an average for concentrating ores of about 4% copper, 2 to 3 oz. silver and 0.02 to 0.03 oz. gold per ton. Company plans building a much larger mill, and opening mines more extensively, but is going carefully, in preference to going into debt, which is a wise course. Mine considered promising, and management regarded favorably.

TULAROSA MINING & MILLING CO. **NEW MEXICO.**

Dead. Succeeded March 5, 1905, by Tularosa Copper Co. Formerly at Bent, Otero Co., N. M.

MINA TULIPAN. **CHILE.**

Mine office: Chañaral, Atacama, Chile. Zoilo Rojas, owner; R. Olquin, superintendent. Has steam power.

TULLOCK GOLD & COPPER CO. **NEW MEXICO.**

Office and mine: Silver City, Grant Co., N. M. Organized 1907. Lands, 15 claims, area, 300 acres, on Edith Mountain, in the White Signal district, having a 50' shaft on the Dagger Point claim, showing ore said to average about 14% copper.

TULLY COPPER MINING CO. **COLORADO.**

Office: Encampment, Wyo. Mine office: Pearl, Larimer Co., Colo. F. J. Lordier, president; H. B. Lordier, president; H. B. Ashley, secretary; B. A. Mann, treasurer; J. D. Tully, superintendent. Organized 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 12 acres, unpatented, also a 6-acre millsite, showing 6 fissure veins, carrying oxidized ores, of which one, opened by a 175' shaft, is said to show a 25' vein, carrying average values of 6% copper and $4 gold per ton. Property, which is unpatented, is mortgaged for $1,500, raised to perform assessment work. Company apparently in a bad way.

TUM-TUM GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 1017 Scarritt Bldg., Kansas City, Mo. Jas. H. Clark, fiscal agent. Company claims to own 10 claims, area 200 acres, in the southwestern part of Washington, 60 miles in an air-line from Portland, Ore. Presumably idle.

TUMWATER COPPER MINING CO. **WASHINGTON.**

Office: Minneapolis, Minn. Mine office: Leavenworth, Chelan Co., Wash. Henry Jejeski, president; J. Cermak, vice-president; Francis Hrahovsky, treasurer; Andrew Jejeski, secretary; John Sadoske, superintendent. Organized 1907, under laws of Washington, with capitalization $500,000, shares $1 par.

COMPAÑIA MINERA DE TUNILLAS. **CHILE.**

Office: Santiago de Chile. Mine office: Tunillas, Coquimbo, Chile. Organized Apr. 18, 1906, under laws of Chile, with capitalization 600,000 pesos, shares 50 pesos par.

TUOLUMNE COPPER MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Edw. Hickey, president; N. J. Bielenberg, vice-president; J. J. Harrington, secretary; John W. Pratt, treasurer; Patrick Sheehan, general manager. Organized May 24, 1906, under laws of Arizona, with capitalization $800,000, shares $1 par. Shares are listed on the Butte Stock Exchange.

Lands, one fractional claim, area 6 acres, being small but well located, lying between the Speculator and Jessie claims, two of the best mines of the

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North Butte. Title is by deed, and property is not in litigation. Has a 1,050′ three-compartment shaft, planned to be deepened to 1,600′, with 1,500′ of drifts and crosscuts, latter showing 3 veins, on the 1,000′ level, one, of about 25′ width, carrying very low grade copper ore, the north vein showing circa 4′ of ore of 3 to 7% copper tenor. Company is preparing to install a new surface plant, with hoist good for 3,000′ depth, present hoist having reached the limit of its capacity. The Tuolumne is one of the few companies organized at Butte, during the 1906-1907 boom, to continue development steadily throughout the depression, employing about 35 men. No commercial ore of importance had been developed by the end of 1908, but work at the North Butte mine, adjoining, indicates that ores of good grade should be found at depth of 1,500′ or less. Property considered promising.

TURNBULL DEVELOPMENT CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Organized March 18, 1907, under laws of Arizona, with capitalization $500,000, shares $1 par, by Wm. Woolsey, H. N. Pascoe, G. W. Jones and Geo. R. Hill. Property is said to show a 10′ vein of slightly auriferous and argentiferous 10% copper ore, in an old shaft. Mine also has a 400′ tunnel.

TURGOVSKI WORKS. **RUSSIA.**

Mine and works office: Perm, Russia. D. T. Zaharovski, manager. Production, 1900, as per official Russian figures, was 111,686 lbs. fine copper, and unofficial returns of output for 1902 were 1,167,500 lbs. Presumably idle.

TURK MINING & MILLING CO. **WASHINGTON.**

Office: Davenport, Wash. Mine office: Turk, Stevens Co., Wash. A. H. Stiles, superintendent. Ores carry gold, copper and silver.

TURNER-ELY COPPER CO. **NEVADA.**

Office: 35 Wall St., New York, N. Y. Mine office: Ely, White Pine Co., Nev. S. Herbert Williams, manager. Capitalization $10,000,000, shares $10 par. Lands, 9 claims, area 116 acres, said to lie between the Nevada Consolidated and Cumberland-Ely.

TURNSTREAM COPPER MINING & DEVELOPING CO. **CAPE COLONY.**

Office: East London, Cape Colony. Mine office: Cathcart, Cape Colony. Organized circa June, 1907, under laws of Cape Colony, with capitalization £30,000, working capital £10,000, as successor of Turnstream Copper Syndicate. Lands, 16 miles from Cathcart, on the Zwart Kei river, show 4 veins, on one of which a 40′ shaft has ore giving a general average assay of 12.55% copper.

TURNSTREAM COPPER SYNDICATE. **CAPE COLONY.**

Dead. Succeeded, 1907, by Turnstream Copper Mining & Developing Co. Formerly at Cathcart, Cape Colony.

TURQUOISE COPPER CO. **NEW MEXICO.**

Mine office: Brice, Otero Co., N. M. Property includes an old turquoise mine, showing turquoise and copper ore, latter mainly melaconite and chalcocite. Shipments of hand-sorted and screened ore have returned 11 to 18% copper. Plans a concentrator.

TURQUOISE COPPER MINING CO. **ARIZONA.**

Mine office: Gleeson, Cochise Co., Ariz. Idle.

TUSAS PEAK GOLD & COPPER MINING CO. **NEW MEXICO.**

Office: 364 River St., Manistee, Mich. Mine office: Tusas, Rio Arriba Co., N. M. W. J. Sibben, president; Constantine Fleissner, vice-president; Otto Rosenfeld, treasurer and resident director; Jos. Baur, secretary; preceding officers, Max Bowman, Jas. W. Murray, A. Bohensted, Chas. Engler and L. B. Skyoch, directors; Frank Bolton, superintendent. Organized Apr. 28, 1902, under laws of New Mexico, with capitalization $2,000,000, shares $1 par. Bonds, $100,000 authorized, circa $40,000 issued.

Lands, 13 claims, area 230 acres, and a 5-acre millsite, in the Bromide

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district, circa 14 miles west of Tres Piedras, and 10 miles from a railroad. Principal development is on the Tampa mine, having a 13′ vein of auriferous and argentiferous copper ore, with a 5′ paystreak said to average 7.5% copper, balance of ore being of concentrating grade. The Tampa has shafts of 80′, 85′ and 425′, with about one-half mile of workings, showing ore reported by company to assay 5 to 44% copper, 1 to 4.5 oz. silver and $1.20 to $3.80 gold per ton, with some ores assaying up to 2.3 oz. platinum per ton, and with more or less molybdenum. Has a hydraulic ram on Tusas Creek, 3-drill air-compressor and a small sawmill. Has a 40-ton leaching plant, with Wild mills, completed 1907, planned to treat oxidized ores. Presumably idle.

TWENTIETH CENTURY ALASKA COPPER CO. — **ALASKA & WASHINGTON.**

Mine office: Valdez, Alaska. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. W. N. Robeson, business manager; Judson C. Hubbard, superintendent. Lands include claims in Alaska, and the Kitanning mine, 9 claims, 2 miles north of the Sunset, supposed to carry the extension of the Ethel vein, at Index, having a 400′ tunnel and a 650′ aerial tram. The Index property is idle, as presumably is the Valdez property also.

TWENTIETH CENTURY GOLD MINING CO., LTD. — **ARIZONA & ONTARIO.**

Dead. A swindle that paid dividends while selling stock. Formerly in the Rainy River district of Ontario and 60 claims in Cochise County, Arizona. Described Vol. XV.

TWENTIETH CENTURY KNIGHTS ISLAND COPPER CO. — **ALASKA.**

Mine office: Valdez, Alaska. Lands, 3 claims, on Dryer Bay, adjoining the Knights Island Copper Co.

TWIN BUTTES MINING & SMELTING CO. — **ARIZONA.**

Office: 121 Wisconsin St., Milwaukee, Wis. Operating office: Tucson, Ariz. Mine office: Twin Buttes, Pima Co., Ariz. Edw. P. Hayes, president; Samuel D. Adler, first vice-president; W. A. Barber, second vice-president; H. J. Blakeley, secretary; Edw. P. Hackett, treasurer; preceding officers, W. H. Earles, Felix Isman and J. G. Baxter, directors; Capt. Wm. McDermott, mine superintendent; David L. Stinson, railroad superintendent.

Organized Sept. 6, 1903, under laws of Arizona, with capitalization $1,000,000, increased, 1905, to $1,250,000, shares $1 par. Bonds outstanding, $100,000. Controls, through stock ownership, the Twin Buttes Railroad Co. Wisconsin Trust Co., transfer agent and registrar. Annual meeting, first Monday in January.

Lands, 61 claims, partly patented, [illegible] in the Oro Blanco district, in the foothills of the Sierrita Mountains. Property, opened 1860, was unsuccessful under former ownership, owing to lack of cash and management, though always considered promising. Lands are reported to carry fissure veins in limestone, and contact deposits between limestone and granite, with limestone foot and granite-porphyry hanging. The various properties of the Company had about a mile of workings, 1906, estimated to show 50,000 tons of ore blocked out for stoping, averaging circa 7% copper and 1.35 oz. silver, with traces of gold.

The Senator Morgan mine has a 7x10′ three-compartment shaft, of circa 500′ depth, said to show a vein of 25′ average width, carrying sulphide ore of circa 10% copper tenor in the bottom workings, but ore probably is not so rich as estimated. The Morgan shaft has railroad connections.

The Copper Glance mine has a 4x10′ shaft, sunk on an ore body having a 30′ gossan, succeeded by about 200′ of carbonate ore, and, on the 300′ level, a crosscut has passed through 35′ of marcasite carrying kidneys of chalcocite, and a crosscut on the 400′ level encountered a promising ledge of leached ore.

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The Copper King mine has a 200′ shaft, developing carbonate ores in the upper workings, and sulphides in the bottom, the showing being considered promising.

Equipment includes a 200-h. p. steam plant, burning wood and petroleum, at the Morgan mine, with a 125-h. p. Leyner double-drum hoist, raising 3-ton loads, and a 10-drill Leyner compound air-compressor. There is a gasoline plant at the Copper King mine.

Buildings, 14 in number, include a power-house, machine-shop, smithy and store.

The Twin Buttes railroad, 27 miles in length, running from Twin Buttes to Tucson, completed July, 1906, has one locomotive and [illegible] cars.

The matter of building a smelter was given tentative consideration in 1907. Water for a smelting plant can be secured from the Santa Cruz river, 5 miles distant.

Production was 709,329 lbs. fine copper and 11,294 oz. silver, in 1906, and was 94,056 lbs. copper and 242 oz. silver, in 1907. In August, 1907, the mine was shipping circa 50 tons daily, but suspended operations a few weeks later, resuming shipments, 1908, on the basis of 8 carloads weekly, to El Paso smelter. Property considered promising, but apparently is suffering from lack of adequate capital.

TWIN CITY DEVELOPMENT CO. — COLORADO.

Dead. Formerly at Turret, Chaffee Co., Colo. Described Vol. VI.

TWIN EDWARDS COPPER MINE CO. — NORTH CAROLINA.

Office and mine: Greensboro, Guilford Co., N. C. Organized September, 1902, with capitalization $100,000, shares $100 par. Lands are sundry old properties, including the Twin mine, with an 18′ vein, which was worked previous to the American Civil War. Idle several years.

TWIN KINGS MINING CO. — NEVADA.

Office: 396 Wells Bldg., Milwaukee, Wis. Mine office: Cuprite, Esmeralda Co., Nev. A. E. Heidkamp, president; Elbert Gidt, general manager. Capitalization $1,250,000, shares $1 par. Lands, 4 claims, 3 miles from Cuprite and 12 miles south of Goldfield, having a vein of 5′ to 10′ width, carrying mainly oxidized surface ores, with a little chalcopyrite, opened by several pits, cuts, and 2 shafts of circa 70′ each, said to give ore assaying 25 to 45% copper, 20 to 40 oz. silver and $20 to $40 gold per ton. Advertising of Koenig, Evans & Co., of Milwaukee, fiscal agents, was entirely too promissory. Presumably idle.

TWISP GOLD-COPPER MINING CO. — WASHINGTON.

Office: care of Frank R. Creighton, manager, Spokane, Wash. Letter returned unclaimed from former mine office, Twisp, Okanogan Co., Wash. Lands, known as the Badex group, circa 20 miles north of Twisp, are slightly developed by tunnel, showing a little low grade copper ore. Idle.

TWO LAKES COPPER MINING CO., LTD. — ONTARIO.

Office and mine: Sowerby, Algoma, Ont. Organized Oct. 18, 1906, under laws of Ontario, with capitalization $500,000.

TWO QUEENS MINE. — ARIZONA.

Owned by Central Mining & Development Co.

TWO REPUBLICS MINING CO. — ARIZONA.

Office and mine: Jerome, Yavapai Co., Ariz. R. A. Smith, president; John B. Lecorr, vice-president; Paul Smyly, secretary and treasurer; A. T. Dixon, manager. Organized 1908, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, circa 10 miles from Jerome, have a tunnel, planned to be driven 700′.

TYEE COPPER CO., LTD. — BRITISH COLUMBIA.

Office: 45 Leadenhall St., London, E. C., Eng. Operating office: Board

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of Trade Bldg., Victoria, B. C. Mine office: Duncans, Vancouver Island, B. C. Works office: Ladysmith, Vancouver Island, B. C. Thos. Headland Wilson, chairman; preceding officer, Nicol Brown, Harry von Berg, Albert Straube and C. Ludwig Loeffler, directors; Wm. Gardner, secretary; W. H. Trewartha-James, general manager; J. W. Bryant, superintendent; W. J. Watson, smelter superintendent; W. M. Brewer, ore purchaser.

Organized Apr. 4, 1900, under laws of Great Britain, with capitalization £180,000, shares £1 par. Dividends were 10% in 1904; 10% in 1905; 5% in 1906, and 7½% in 1907. At end of fiscal year, Apr. 30, 1908, the company had £80,595 19s. invested in selected bonds and stocks of exceptional solidity, and profits, for year ending Apr. 30, 1907, were £22,506.

Lands, 13 claims, crown-granted, area 342 acres, also a 45-acre smelter site, 60-acre tramway terminal and 800 acres timber lands, all in the Somenos district, on Mount Sicker, circa 11 miles northwest of Duncans, and about 80 miles from Vancouver.

The Tyee mine shows schists carrying up to 2% copper, with small gold and silver values, suitable for fluxing, and lenses, in banded schists, of chalcopyrite, with barite gangue, averaging 4% copper, 2.5 oz. silver and $3 gold per ton, with about 7% zinc and circa 38% barium sulphate, rendering the ore refractory in smelting. The main shaft, of circa 1,000′ depth, encountered no ore of importance below the 300′ level, though the mine was tested, systematically, to a depth of circa 1,200′, by drifts, crosscuts and borings by 2 diamond drills. The north lode of the Tyee, on the I. X. L. claim, adjoining the Tyee has a 500′ shaft. No. 2 shaft is circa 200′ in depth.

Mining equipment includes a 10x40″ link-motion hoist, with two 4′ drums, operating safety cages, with smaller hoists of 20 h. p. and 50 h. p., also 5-drill and 10-drill air-compressors and a pumping plant capable of raising 100,000 gallons daily, in a single lift of 1,000′. There also is a sawmill at the mine.

Buildings at the mines include an engine-house, boiler-house, smithy, carpenter-shop, store, boarding-house and bunkhouse.

The concentrator, at the main shaft, has a No. 4 Gates crusher, Blake crusher, grizzley, rolls, grinders, Snyder automatic samplers and an ore-sorting belt, ore being delivered from the sorting belt to 400-ton bunkers.

Ore is taken from the bunkers by a 3½-mile aërial tram, having half-ton buckets, operated by a 4-h. p. engine, for starting, gravity furnishing the motive power, there being a drop of 2,000′ between the mine and the 400-ton ore-bunkers at the lower terminus of the line, on the Esquimault & Nanaimo railway. From the lower bunkers, ore is carried 17 miles, by rail, to the smelter, in 30-ton bottom-dumping cars.

The smelter is well located, on a 45-acre site on Oyster Harbor, where there is a 40x210′ wharf, connected by an elevated incline trestle with the smelter-bins. Considerable improvements were made, 1907-1908, on these works, at a cost of circa £20,000. A notable feature of this plant is the roast-yard, which is fully described in the chapter on Pyrometallurgy of Copper, in this volume.

The smelting plant, terraced throughout, to permit handling of material by gravity, has a 56x81′ wooden furnace building, with a 200-ton Allis-Chalmers water-jacket blast-furnace, 42x120″ at the tuyeres, using a hot blast, with room for a second furnace of the same size. The furnace has a water-jacket forehearth for matte, slag skimming into a settler and thence into a launder, where granulated and washed away by running water. The dust-flue, 8x11x165′, arched over with corrugated iron, leads to a 90′ smokestack, of 7′ diameter. The furnace reduces 9.45 tons of ore and flux with one ton of coke. The reduction-plant also includes a complete sampling mill, briquetting plant for fines, electrolytic assay plant and an electric light plant. The plant does a general

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custom business, handling ores from British Columbian and Alaskan mines, and sells its product, as a 50% matte, to American smelters having bessemerizing works.

Production of the mine, 1906, was 23,823 tons of ore, yielding 2,115,617 lbs. fine copper, 77,085 oz. silver and 2,776 oz. gold. The mine was closed down, 1907, yielding in that year only 1,200 tons of ore. Smelter production, 1905, was 3,039,396 lbs. fine copper, 103,474 oz. silver and 5,952 oz. gold. The smelter treated circa 55,000 tons of ore in 1907, and for fiscal year ending Apr. 30, 1908, was in blast 187 days, treating 42,807 tons of ore, with 4,902 long tons of coke, one ton of coke smelting 8¾ tons of ore. Smelter production, for fiscal year 1908, was 3,975½ long tons matte, averaging 39.9% copper, 18.72 oz. silver and 18 dwts. gold per ton, equivalent to 3,558,486 lbs. fine copper.

The management of the Tyee is entitled to great credit for the masterly manner in which it has survived the exhaustion of its mine, and has changed position from a mining company to a custom smelting corporation, while continuing substantial dividend payments.

TYRONE DEVELOPMENT CO. **NEW MEXICO.**

Dead. Succeeded, circa May, 1907, by Chemung Copper Co. Formerly at Tyrone, Grant Co., N. M. Described Vol. VI.

TYRONE MINING CO. **NEW MEXICO.**

Office and mine: Tyrone, Grant Co., N. M. Lands, in the Burro Mountains, were being explored by churn drill, at last accounts.

TYWARNHAILE SYNDICATE, LTD. **ENGLAND.**

Office: 1 St. Helens Place, London, E. C., Eng. Mine office: Mt. Hawke, Scorrier, Cornwall, Eng. W. R. Thomas, mine manager; Chas. N. L. Shaw, secretary. Organized Sept. 19, 1907, under laws of Great Britain, as reconstruction of a company of similar name formed July 11, 1905, with capitalization £30,000, shares £1 par; issued, £23,683. Property is the Tywarnhaile mine, which carries copper ore only, without the tin found in other Cornish copper mines. Has a mill, using the Elmore vacuum process.

TZAREVO-ALEXANDROVSKI WORKS. **SIBERIA.**

Office, mine and works: Semipalatinsk, Siberia. Mines, said to be rather promising, though but slightly developed, yielded an average annual production of about 500,000 lbs. fine copper, at last accounts.

UBEHEBA COPPER CO. **CALIFORNIA.**

Office: 544 Equitable Bldg., Baltimore, Mr. Capitalization $1,000,000, shares $1 par. Lands, sundry claims, about 50 miles south of Goldfield, Nev., in the Ubehebe Mountains, near Death Valley, Inyo county, California, said to show veins of 8′ to 50′ width, carrying auriferous and argentiferous ores, up to 20% in copper tenor.

UBEHEBE COPPER MINES & SMELTER CO. **CALIFORNIA.**

Office: 701 Calvert Bldg., Baltimore, Md. Mine office: Lone Pine, Inyo Co., Cal. John Salisberry, president and general manager; Henry G. Merry, vice-president; J. J. Griffith, secretary and treasurer; Ray T. Baker, general manager. Lands, 50 claims, area 1,000 acres, in the Ubehebe district, circa 50 miles northwest of Rhyolite, Nevada, and about 50 miles from Bonnie Clair station, on the Bullfrog-Goldfield road. Property, said to give good surface showing of copper, has an 80′ shaft and a 145′ tunnel.

UGURCHAISKA MINE. **RUSSIA.**

Office: Batum, Russia. Kunderov Bros., owners; G. Chaimazadi, manager. Mine, in the government of Elizabethopol, was but a small producer, at last accounts.

UINTAH COPPER SUMMIT CO. **UTAH.**

Dead. Formerly at Vernal, Uintah Co., Utah.

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UINTAH MINING, MILLING & DEVELOPMENT CO. **UTAH.**

Letter returned from former mine office, Bingham Canyon, Salt Lake Co., Utah. L. C. Moore, general manager; F. D. McNeill, superintendent. Is said to have bought the Castro group, opened by a 700' tunnel, at Bingham Canyon, 1905. Apparently is some relation to the Castro-Grecian. Idle.

UINTAH TREASURE HILL COALITION MINES CO. **UTAH.**

Office: Provo, Utah. Mine office: Park City, Summit Co., Utah. Jesse Knight, president; T. W. Bell, vice-president; W. Lester Mangum, secretary and treasurer; preceding officers, J. William Knight and E. S. Fisher, directors; R. L. Andrews, superintendent. Organized 1907, under laws of Utah, with capitalization $500,000, shares 50 cents par. Lands, circa 20 claims, including the Creole mine, formerly held by the Uintah Treasure Mining Co.

UINTAH TREASURE HILL MINING CO. **UTAH.**

Dead. Was organized circa July, 1907, as successor of Treasure Hill Mining Co., and was succeeded, circa August, 1907, by Uintah Treasure Hill Coalition Mining Co. Formerly at Park City, Summit Co., Utah.

ULCAHOMO MINING & MILLING CO. **WYOMING.**

Office: Cheyenne, Wyo. Mine office: Leslie, Albany Co., Wyo. Lands, 11 claims, area 220 acres, 1¼ miles from the Strong Copper Mining Co., in Natrona county, Wyoming, having 2 shafts, deepest 150', on a vein carrying cupriferous pyrite with quartz gangue having small silver and nickel values, and occasional free gold assaying up to $1,000 per ton. Has steam power.

ULIDA CONSOLIDATED COPPER CO. **CALIFORNIA.**

Office: 37 Wall St., New York, N. Y. Mine office: Lone Pine, Inyo Co., Cal. Jos. H. Dalton, president; Henry D. Harris, secretary. Organized November, 1906, under laws of Maine.

ULIDA COPPER CO. **CALIFORNIA.**

Office: care of Hon. Wm. H. King, Salt Lake City, Utah. Mine office: Lone Pine, Inyo Co., Cal. Chas. McRoberts, superintendent. Organized circa January, 1907, under laws of Maine, with capitalization, $5,000,000. Lands, 23 claims, in the Ubehebe district, some distance from transportation, showing a 7' contact vein between limestone and granite, carrying argentiferous melaconite and occasional cuprite, giving assays of 14% copper and $3 to $10 gold per ton Development is by tunnel, and under former ownership mine made several small shipments of hand-selected ore of high copper tenor.

UNAWEEP COPPER MINING & MILLING CO. **COLORADO.**

Mine office: Grand Junction, Mesa Co., Colo. Jas. V. Howard, secretary. Organized under laws of Colorado, with capitalization $500,000, shares $1 par. Lands, 6 claims and a millsite, in the Unaweep district, slightly developed. Idle several years and presumably moribund.

UNCLE SAM CONSOLIDATED MINING CO. **UTAH.**

Office: 516 Dooly Blk., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John Dern, general manager; preceding officer, Jas. Chipman, Geo. Havercamp, B. S. Saunders and Jas. Nelson, directors; C. C. Griggs, superintendent. Organized June 29, 1901, under laws of Utah, with capitalization $500,000, shares $1 par. Owns 400,000 shares, being one-half of the capitalization, of May Day Mining & Milling Co. Report at annual meeting, June 1, 1908, for preceding fiscal year, showed gross earnings of $135,455. Was paying monthly dividends of 2 cents per share, to August 1907.

Lands include the Humbug mine and a four-fifths interest in the Richmond and Aanaconda claims, adjoining the Humbug. Mine produces mainly auriferous silver-lead ore, of both smelting and milling grades, but has some cuprite and copper carbonates ranging 12 to 33% in copper tenor. Has steam power and a concentrator. Production, 1907, was 185 carloads of ore.

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UNCLE SAM COPPER CO. ALASKA.

Office: 1237-25 Broad St., New York, N. Y. Mine office: Ketchikan, Alaska. Is said to be controlled by Alaska Mines Securities Co., through stock ownership, secured May, 1906. Lands, 3 miles from the Hadley, show a 40′ vein, traceable 1,200′, carrying auriferous and argentiferous copper ore, of fair average tenor. Property has necessary mining buildings, and a 1,150′ tramway leading from the mine to a wharf on tidewater.

UNCLE SAM COPPER CO. ARIZONA.

Dead. Formerly at Gilbert, Yavapai Co., Ariz. Fully described Vol. VI.

UNDERLAY MINE. AUSTRALIA.

Mine office: Dandaloo, New South Wales, Australia. Lands, circa 20 miles west of Dandaloo, adjoin the Mount Royal mine, showing a 5′ vein carrying high-grade oxide, carbonate and sulphide ores, ranging up to 40% in copper tenor. Presumably idle.

UNIDA GOLD & COPPER MINING CO. ARIZONA.

Mine office: Wickenburg, Maricopa Co., Ariz. Geo. Margenetic, president and general manager; Geo. Palda, secretary. Lands, in the Black Rock district, have a 300′ shaft and tunnels of 200′ and 300′, showing ore carrying good gold and copper values. Has steam power and shipped, 1907, several carloads of good ore.

COMPAÑIA MINERA LA UNIÓN. MEXICO.

Mine office: Viesca, Coahuila, Mex. Property is El Esfuerzo mine, carrying copper ores.

UNION CONSOLIDATED COPPER MINES, N. L. SOUTH AUSTRALIA.

Offices: Collins St., Melbourne, Australia, and 8 Broad Street Ave., London, E. C., Eng. Mine office: Umberatana, Lyndhurst, South Australia. E. Lowenstein, chairman; A. J. Miller, managing director; Arthur Hebden, London secretary; W. B. Greenwood, engineer; A. G. Sarjeant, mine manager. Organized Dec. 23, 1904, under laws of Victoria, with capitalization £150,000, shares £1 par. Owns a share interest in the Lyndhurst (South Australia) Copper Co., Ltd.

Lands, 440 acres, in the Yudnamutana district, circa 70 miles east of Lyndhurst, the nearest railroad point, and 400 miles north of Adelaide, including a number of old mines that have been failures in the past, on which a little mining was done and an old smelter built many years ago. Lands carrying what is known as No. 6 lode were set off as the Lyndhurst (South Australia) Copper Co., Ltd. Lands include the Daly mine, showing 5 veins, apparently opened to a depth of about 100′ only. No. 5 vein, which apparently is the only one of much importance, is claimed to average 400′ in width, traceable 1½ miles, and to carry ore averaging 4 to 5% copper. Apparently the width does not exceed 200′ and vein is traceable about one-half mile only, instead of 3 times that length. No. 5 lode is said to give oxide, carbonate and sulphide ores assaying 60% copper and 8 dwts. gold per long ton, these assays obviously being from carefully selected samples. No. 5 lode apparently is claimed by company to be a 4% proposition. Company claims the biggest surface showing in Australia, which claim seems utterly unwarranted, and claims to have upwards of 3,000,000 tons of ore in sight, in No. 5 vein, which is absolutely impossible, in view of the limited workings. Company's chairman stated his conviction that the lands were sufficient for at least 5 big copper mines, which was merely a wild guess. No. 6 lode was worked, circa 1890, and proved what the Australians call a duffer. Company made much of the fact that the Tasmanian Copper Co. was building a smelter in the district, and claimed to have a smelting contract therewith for the treatment of 1,000 tons of ore weekly, at 35s. per ton, price to be reduced to 32s. 6d. when production reached 3,000 tons weekly, but apparently the Tasmanian Copper Co. has practically aban-

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doned its mines in the Yudnamutana district, and its Blinman smelter as well. Bulk parcels of ore, sent to smelter for tests, are said to have given average returns of 27.7%, but such tests are important, or otherwise, according to whether ores are selected to give an average, or to furnish high returns. Company apparently is averse to examination of its workings by other than its own men, and is regarded with suspicion.

MINAS UNIÓN y CONSTANCIA. **MEXICO.**

Office and mines: Indé, Durango, Mex. Reinaldo E. Avila, general manager. Mines were opened in the Sixteenth Century. Country rock is andesite, showing 9 ore bodies, carrying chalcopyrite, galena and sphalerite, associated with pyrite. Ore body under development averages 2 meters width and is opened by a shaft of 18m. and by tunnels of 70m. and 100m., developing first-grade ore averaging 45% lead, 100 oz. silver and 54 oz. gold per metric ton, and second-grade ore averaging 4% copper and 20 oz. silver per ton, latter showing a little native copper. Smelter, 4 miles from the mine, has two 30-ton water-jacket blast-furnaces, shipping matte to the Aguascalientes works of the American Smelting & Refining Co., for conversion and refining.

UNION COPPER CO. **ARIZONA.**

Office: care of S. G. Reading, president, Williamsport, Pa. Mine office: Globe, Gila Co., Ariz. W. F. Anthony, vice-president; F. L. Toombs, secretary and treasurer. Organized Oct. 31, 1906, under laws of Arizona, with capitalization $1,000,000. Lands include the Chapparal, Sieboth and Halliday groups, the Chapparal group, 13 claims, being circa 2 miles northwest of the Gibson, and the Halliday group, 4 claims, lying between the Gibson and Central. Presumably idle.

UNION COPPER LAND & MINING CO. **MICHIGAN.**

Office: 825-60 State St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; preceding officers, John C. Watson, Stephen R. Dow, Walter L. Frost and Capt. Jas. Chynoweth, directors; J. Abner Sherman, land agent.

Organized 1863, and reincorporated 1893, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,000,000. Company begun 1908 with a balance of $88,368.98, paying therefrom, Feb. 10, 1908, a $40,000 dividend. Old Colony Trust Co., Boston, registrar. Annual meeting, fourth Thursday in March.

Lands, Jan. 1, 1908, were 5,323 acres, also 1,043 acres of mineral rights, in nearly 200 different parcels. Practically all of the company's holdings are on the Keweenawan copper belt, in Keweenaw, Houghton and Ontonagon counties, Michigan, much of the land being covered with valuable timber, including pine, hemlock and hardwood, mainly the latter.

UNION COPPER MINES CO. **NORTH CAROLINA.**

Office: 42 Broadway, New York, N. Y. Mine office: Gold Hill, Rowan Co., N. C. Thos. C Bunk, Jr., chairman; Capt. H. L. Griswold, superintendant. Organized 1907, under laws of Maine, with capitalization $2,500,000, shares $5 par, as successor of Union Copper Mining Co., bankrupt, one share of new stock being given for two of old.

Lands, circa 1,150 acres, about 15 miles from Salisbury, in Rowan and Cabarrus counties, well watered and timbered, showing 5 veins, 3 carrying copper and one each silver and gold, the gold and silver veins being but slightly developed. Principal development is on the Big Cut copper vein, opened for distance of about one mile, by 10 shafts, of 100' to 900' depth. Upper levels of old workings were claimed to show a vein of 20' to 40' width, which apparently should be 15' to 30', carrying oxidized ores and a little native copper. The lower levels open a vein of 8' to 16' width, with slate walls, carrying chalcopyrite with quartz gangue, claimed by former company to aver-

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age 10% copper, 3 to 30 oz. silver and $1.50 to $7.50 gold per ton, but a careful sampling, by Dr. A. R. LeDoux, gave averages of only 4.4% copper, 4 oz. silver and 40 cents to $1.20 gold per ton. Ore occurs in a mineralized zone as lenses and chutes, longest about 100' in length. No. 7 shaft, 200' deep, shows a vein 4" wide at surface, and 3' to 4' wide on the 200' level, averaging circa 4.5% copper.

The machinery plant is extensive, but badly planned, formerly including 27 boilers, 18 hoists, 3 air-compressors and an electric light plant. Old compressor has been sold and replaced by a new Ingersoll-Rand 10-drill air-compressor. Buildings include a 45x70' machine-shop, 40x60' smithy, a small iron and brass foundry, engine-house, boiler-houses, office building, 50-room hotel, 130 dwellings and a stable for 400 horses and mules.

The reduction plant includes a concentrator and smelter, latter having roasters and two 40-ton blast-furnaces, blown in September, 1901, and blown out June, 1902. Present company is said to plan a new mill. Affairs were badly muddled by management of former company, which conducted the property with a view mainly to the stock market. A little ore has been produced, and concentrates shipped, since 1902. Property considered promising, if worked in North Carolina instead of in the stock market. Idle.

UNION COPPER MINING CO. **CALIFORNIA.**

Office: care of Estate of Fredk. L. Ames, Boston, Mass. Mine office: Copperopolis, Calaveras Co., Cal. David Ross, superintendent. Stock control is owned by the Ames Estate.

Lands include the Union, Keystone and Empire mines, also 2 claims adjoining the Alto, in Del Norte county, California. Mines, opened 1861, were considerable producers, paying fair dividends, circa 1861-1868. Formation is a black pyritous slate, in amphibolite schists, this belt running from Tuolumne county, on the south, through Calaveras into Amador county, on the north. The slate is 33' to 40' wide, with strike of 30° East of South and dip of 30° East. Ore occurs as lenses of 15' average width, connected by stringers, main lense being 2' to 40' wide and 600' long. The alteration zone, circa 30' in depth only, carries rich oxides and carbonates, and some native copper, below which occurs chalcopyrite, carrying neither gold nor silver, and unusually free from arsenic, antimony, bismuth and other undesirable elements, blister copper therefrom making good wire-bars, without electrolytic refining. Product is classified as smelting ore of 10 to 11% copper tenor, and as leaching ore carrying 5 to 5.5% copper.

Main shaft, 60', is bottomed in a 15' lense of medium-grade ore, and the mine has a mile of openings in ore. Equipment includes a hoist and pumps, with necessary mine buildings. Has a 100-ton Orford smelter, installed 1889. Operations confined, for many years, to producing cement copper, by leaching old dumps, which are extensive. Old workings were cleaned and retimbered, 90' steel gallows frame built over main shaft, and smelter overhauled, 1905-1906. Has survey made for a 12-mile railway, to connect with Southern Pacific, at Milton. Mine closed down, June, 1907.

UNION COPPER MINING CO. **NORTH CAROLINA.**

Dead. Succeeded, 1907, by Union Copper Mines Co. Formerly at Gold Hill, Rowan Co., N. C. Fully described Vol. VI.

UNION COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

UNION COPPER SMELTER CO. **ARIZONA.**

Dead. Property was an imaginary smelter, devised to reduce ores from imaginary mines. Formerly at Pima, Graham Co., Ariz.

UNION COPPER SMELTING CO. **ARIZONA.**

Dead. Same as Union Copper Smelting Co. A fraud, put out by the

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notorious Wm. F. Wernse gang, of St. Louis. Formerly at Pima, Graham Co., Ariz.

UNION DEVELOPMENT CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Boston, Mass. Mine office: Johannesburg, Kern Co., Cal. Property was the Juanita claim, in the Monrow district, 26 miles east of Johannesburg, showing a contact vein, between granite and limestone, carrying auriferous chalcopyrite, with talcose gangue, opened by 4 shafts, deepest 212'. Idle some years and presumably moribund.

UNION MINE. **MICHIGAN.**

Office: care of Calumet & Hecla Mining Co., Calumet, Mich. Mine office: Ontonagon, Ontonagon Co., Mich. Jas. MacNaughton, general manager; Thos. H. Wilcox, superintendent. Property, first known as the Isle Royale & Lake Superior, was the first mine opened in the Porcupine Mountains. Old company was organized October, 1864, under laws of Michigan, with capitalisation $500,000, and presumably has been wound up. Mine has 4 shafts, of 85' to 400' depth, with 4 levels opened, on an amygdaloidal bed lying north of the Nonesuch lode, and once had a small stamp-mill with Frue vanners. Was unwatered February, 1908, by the Calumet & Hecla, which holds an option on the property.

UNION ORE EXTRACTION & REDUCTION CO. **COLORADO.**

Dead. Reorganized, circa 1905, as National Radium & Copper Co. Formerly at Denver, Denver Co., Colo.

UNION SMELTING CO. **ARIZONA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Chloride, Mohave Co., Ariz. Works office: Kingman, Mohave Co., Ariz. Lands include the Pinkham mine. Has a semi-pyritic smelter with a 60-ton matting furnace. Presumably idle.

UNITED ALKALI CO., LTD. **SPAIN.**

Office: 30 James St., Liverpool, Eng. Mine office: Valverde del Camino, Huelva, Spain. Works office: St. Helens, Lancashire, Eng. Employs 3,000 men. John Brock, chairman; E. K. Muspratt, vice-chairman; Eustace Carey, secretary; J. H. Cresswell, general manager; C. Kaesmacher, Hilstead manager; Alex. Hill & Stewart, consulting engineers. Organised under laws of Great Britain, with capitalization £8,750,000. Company is primarily a chemical and manufacturing corporation, with which copper mining is merely a small branch of the general business, and controls 46 subsidiary works and corporations, some of the plants being of very great size. The company has its principal works at St. Helens, Runcorn, Flint, Widnes and Glasgow, making extensive use of Spanish and Portuguese pyrites, which are burned for sulphur, after which the cinder remaining is leached for copper.

Copper properties in Spain include the Sotiel Coronada and Castillo del Buitron mines, which are separately described, also the Santa Rosa, Concepción, Poderosa and Monte Rubio groups, all in the province of Huelva. Properties show typical Huelvan slates, with lenticular contact deposits between slate and porphyry, these, with a generally NW. and SE. strike, and dip of 30° to vertical, carrying cupriferous pyrites.

The Santa Rosa group, including El Tinto mine, having a combined area of 141 hectares, at Zalamea la Real, Huelva, is leased from the Sociedad de las Minas de Cobre Tinto y Santa Rosa. The Tinto and Santa Rosa mines, with 9 openings, have a 9-kilometer Bleichert aerial tram to Calañas. Production, 1905, from the Tinto and Santa Rosa, was 38,605 long tons of pyrites, and 803 long tons cement copper.

The Monte Rubio group, held under lease from Sociedad Colectiva C. & J. Sundeim, includes the Monte Rubio, Gibraltar and Atbalcal Arbalcal mines, having a combined area of circa 100 hectares, at Palmogo, Huelva. These are

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ancient properties, worked only to the level of the nearest stream, in the Roman era, the old workings, though comparatively superficial, disclosing enormous masses of ore, occurring as oxides, sulphides and sulphate, with gangue of iron ore, indicating the existence of large bodies of unaltered iron-copper sulphides at greater depth. There is a 22-kilometer railway from Monte Rubio to Coiña Veral, on the river Guadiana, where the company also holds sundry undeveloped mineral leases.

The company controls the Ferocarril Buitron, of 79 kilometers length, with 42" gauge, equipped with 18 locomotives, transporting ore, merchandise and passengers.

UNITED ARIZONA COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office, Kansas City, Mo. Mine office: Prescott, Yavapai Co., Ariz. Lands, known as the Mohoney group, in the Black Rock district, are said to show a vein of 5' to 50' width, opened by a 100' shaft, and property has about 1,000' of workings, showing ore assaying well in copper, silver and gold. Idle and presumably moribund.

UNITED ARIZONA COPPER CO., LTD. **ARIZONA.**

Office: 1 Broad Street Ave., London, E. C., Eng. Mine office: Vekol, Pinal Co., Ariz. Rt. Hon. Earl of Orford, chairman; W. P. Guthridge, mine manager; C. Francis Shearer, secretary. Organized Oct. 15, 1902, under laws of Great Britain, with capitalization £200,000, shares £1 par; issued, £150,000.

Lands, 500 acres, known as the Reward mine, bought, Oct. 15, 1902, of Reward Consolidated Mining Co., circa 6 miles from Vekol. Company is said to have bought its lands for £160,000 cash, which statement is doubted. Property was bonded, 1907, for 30 months, to Casa Grande Development Co.

UNITED BINGHAM GOLD & COPPER MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Louis Moore, president; A. Hanauer, Jr., secretary; Edward Hoffman, superintendent, at last accounts. Lands, several patented claims, partly developed by the Snowstorm tunnel, which has opened a 4' vein, giving assays of 2% copper, 25% lead and up to $8 gold per ton. Idle.

UNITED COPPER CO **IDAHO, MONTANA & UTAH.**

Office: 42 Broadway, New York, N. Y. Operating offices: Butte, Mont., and Salt Lake City, Utah. F. August Heinze, president; Geo. Baglin, second vice-president; Stanley Gifford, secretary and treasurer; preceding officers, Wm. J. Curtis, Sanford Robinson, Chester Glass, John MacGinnis, Carlos Warfield and Horace G. Abel, directors.

Organized Apr. 28, 1902, under laws of New Jersey, with capitalization $80,000,000, shares $100 par, in $5,000,000 preferred 6% cumulative stock, and $75,000,000 common stock; issued, $50,000,000, in $5,000,000 preferred and $45,000,000 common shares. Stock is listed on the Boston and Pittsburg stock exchanges. Metropolitan Trust Co., New York, Old Colony Trust Co., Boston, and Fidelity Title & Trust Co., Pittsburg, registrars. American Trust Co., Boston, Union Trust Co., Pittsburg, and C. S. Buckingham, New York, transfer agents. Annual meeting, first Wednesday in June.

Preferred stock is redeemable, at $125 per share, in full or any portion thereof, upon any dividend date, on 3 months' notice. The board of directors has power to fix, determine and vary the disposition of any surplus, etc., from time to time, the powers of the board being practically absolute, and leaving shareholders without voice in the management, and apparently without recourse for mismanagement.

The company paid $7,462,500 dividends to end of 1907, of which $1,500,000 was paid on preferred and $5,962,500 was paid on common shares, preferred dividends being $150,000 in 1902, $300,000 each in 1903, 1904, 1905 and 1906, and $150,000 in 1907. First dividend on common shares was paid 1905.

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Dividends on common shares were $450,000 in 1905, $3,150,000 in 1906, and $2,362,500 in 1907. The common stock was placed, 1906, on a quarterly dividend basis, at rate of 7% per annum, but the company was unable to maintain this rate, after the depression in the metal market, followed by the panic of 1907.

For fiscal years ending June 1, the company's statements show income as follows: $1,045,475 in 1904; $1,513,850 in 1905; $3,011,620 in 1906; $961,023.97 in 1908, of which $841,662.50 was from dividends on securities held, and $19,361.47 from interest. President Heinze informed shareholders June, 1908, that the floating indebtedness of the company did not exceed $1,100,000.

The United Copper Co. is a securities holding corporation solely, and was organized, ostensibly, along much the same lines as its former great rival, the Amalgamated Copper Co., except that the Amalgamated buys control of subsidiary corporations to retain, while the United is operated as a blind pool, under the personal direction of the president, and shareholders are unable to obtain any satisfactory statement as to what their holdings represent.

By reason of the settlement of the protracted litigation between the Amalgamated Copper Co. and United Copper Co., February, 1906, through the sale of the Heinze holdings in Butte to the Butte Coalition Mining Co., the status of the United Copper Co. was changed materially, the company having begun business as the owner of sundry stocks and bonds of various subsidiary mining and holding corporations operating in Butte, as given in detail in Vol. V. The price paid by the Butte Coalition Mining Co., for the various Heinze holdings taken over, is said to have been $14,000,000, but apparently only part of this amount was in cash, the balance being in shares of the Butte Coalition Mining Co., which appreciated materially in market price, the consideration actually being rendered considerably greater than stated, in case the United Copper Co. sold its holdings in Butte Coalition at the high prices ruling in the copper share market during the latter half of 1906 and the first quarter of 1907. Apparently the United Copper Co. has disposed of the bulk of its Butte Coalition stock, which was its most valuable asset.

The shareholdings of the United Copper Co. are known only to the management, but are supposed to include, and doubtless do include, control of the Montana Ore Purchasing Co., Basin Reduction Co., La France Copper Co., Ohio Copper Co. and Stewart Mining Co., latter owning a lead mine in the Coeur d'Alene district of Idaho. Some of the holdings in subsidiary corporations are of doubtful worth, while others are valuable, but in nearly every case the subsidiary corporations are in need of cash, for further development.

In May, 1906, the stockholders of the United Copper Co. authorized the sale of $1,000,000 Montana Ore Purchasing bonds, and $2,500,000 Nipper Consolidated bonds, at par, to the Butte Coalition Mining Co. This presumably was to carry out a bargain previously made, and it is presumed that the consideration was in shares.

Thos. M. Hodgens, an owner of 1,390 shares of preferred stock in the United Copper Co., and formerly cashier of the Heinze bank, at Butte, secured an alternative writ of mandamus, July, 1907, requiring the company to show its books, and disclose whence earnings were secured, but apparently no such disclosure was made. Mr. Hodgens alleges that earnings of the company were not more than $1,000,000 in 1906, when an inspired article in the press said that the net profits, from various sources, were $12,000,000, the company claiming earnings of $3,011,620 in 1906. The United Copper Co. was unable, 1908, to borrow La France Copper Co., a subsidiary corporation, to the extent of paying its taxes in Butte, amounting to about $5,000 only.

The company's annual reports are not satisfactory, referring as they do, in the vaguest possible terms, to interests in subsidiary corporations, without

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giving definite information as to the extent of such interests. At present the United Copper Co. does not control any producing mines. The Stewart lead mine is a property generally considered valuable. The Ohio Copper Co. probably is the chief asset of the United Copper Co. at the present time, and is a property of much promise. La France Copper Co. has a zinc mine, of doubtful value.

The United Copper Co. being operated as a blind pool, shareholders have no protection whatever, and are at the mercy of the management, which has not shown itself overscrupulous. Shareholders were tremendous losers in the slump of 1907, when both preferred and common shares declined to merely nominal values. Nobody outside of the management has any exact idea of what the company owns, or does not own, but it is certain that the company does not own anything like the equivalent of its capitalization, though some of its properties, notably the Ohio, are of decided promise.

UNITED COPPER CO. **WASHINGTON.**

Office: 512-705 First Ave., Seattle, Wash. Mine office: Galena, Kittitas Co., Wash. Organized under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands, 310 acres, also a 60-acre millsite, well timbered, with available water power, on Camp Creek, a branch of the Cle Elum river, said to show 3 veins, carrying chalcocite and chalcopyrite, the main vein, of 50′ to 100′ claimed width, said to be traceable 4 miles, carrying chalcopyrite, with a parallel vein and a cross vein carrying chalcocite. Mine is claimed to have circa 1,800′ of tunnels, showing ore assaying up to 31% copper and $5 to $10 gold per ton. The Seattle Mining Exchange, having the same address as the company, claimed, 1906, in an advertisement, to have 1½ miles of chalcopyrite 50′ to 100′ wide, assaying $50 to $100 per ton, and copper glance 1½ miles in length assaying $200 to $300 per ton, with an 1,800′ bornite ledge of 55′ width adjoining the property on the same ledge, latter having a paystreak giving $1,400 per ton in gold, in addition to copper, which statements must have been made by a lunatic or a colossal liar. Property considered promising, but standing of company has been injured by the preposterous falsehoods told in its behalf.

UNITED COPPER EXPLOITATION & MINING CO. **NEVADA.**

Office: 511 Continental Bldg., Denver, Colo. Mine office: Ely, White Pine Co., Nev. A. L. Emberson, president; W. E. Flodin, vice-president; M. C. McKinnon, secretary and treasurer. Organized May, 1907, under laws of Arizona, with capitalization $10,000,000, shares $1 par. Lands are said to be 2 claims in the Ely district, and 12 claims in the Ward district, both in White Pine county. Promoters notified the public to come in as "ground floor organizers," on the basis of $250,000 cash for the lands, which seems a long way from the ground floor. Advertisements of company were highly untruthful and misleading. Cannot be learned that any development has been made, and company apparently is merely a bit of stock-jobbery.

UNITED COPPER-GOLD MINES CO. **OREGON.**

Office and mine: Grants Pass, Josephine Co., Ore. O. S. Blanchard, president; O. A. Thomas, secretary and manager. Lands, on Pickett Creek, an affluent of the Rogue River, 14 miles south of Grants Pass, are said to show veins of 5′ to 10′ width, carrying ore similar to that of the Waldo mine, giving assays of 6 to 8% copper and $30 to $100 gold per ton.

UNITED COPPER-GOLD MINING & EXTRACTION CO. **ARIZONA.**

Dead. Was still-born. Formerly at Morristown, Maricopa Co., Ariz.

UNITED COPPER MINING CO. **ARIZONA.**

Dead. Formerly at Tucson, Pima Co., Ariz.

UNITED COPPER MINING CO. **WASHINGTON.**

Office: 211 Jamison Blk., Spokane, Wash. Mine office: Chewelah, Stevens

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Co., Wash. Employs circa 30 men. Conrad Wolfle, president and general manager; J. W. Beckett, vice-president; Gale Smith, secretary and treasurer; Frank Vilwock, superintendent; Wm. H. Stowell, engineer. Organized July 16, 1906, under laws of Washington, with capitalization $1,000,000, shares $1 par; issued, $850,000. Bonds, $20,000 authorized. Annual meeting, fourth Thursday in January.

Lands, 8 claims, 2 fractional, unpatented, area 165 acres, also 200 acres miscellaneous lands, in the Chewelah district, 6 miles from a railroad, showing shale and schist, carrying an ore body of 6' average width, traceable 660', showing malachite, chalcopyrite and tetrahedrite, estimated to average 2.9% copper, 6 oz. silver and 40 cents gold per ton. Ore is mainly chalcopyrite, with occasional native silver.

Development is by shafts of 65', 175' and 270', and by an 1,100' tunnel on the Copper King property, of which 735' is crosscut and 365' in ore, mine having 1,610' of workings, estimated to show 100,000 tons of ore.

Equipment includes a 150-h. p. steam plant, with hoist, 2-drill and 4-drill Franklin air-compressors, and 7 power drills. There are 5 mine buildings, including a 16x24' wooden machine shop.

Production 1907 was 11,097 lbs. fine copper and for 1908 was circa 360,000 lbs. fine copper, and is estimated by company as likely to be about 1,000,000 lbs. in 1909. Ore was shipped to the Northport smelter. Company plans continuous development and building a 6-mile railway spur. Property considered promising.

UNITED ELY COPPER CO. **NEVADA.**

Office: Goldfield, Nev. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. G. L. Rickard, president and general manager; B. L. Colburn, vice-president; W. H. Waterman, secretary; H. Cook, treasurer; H. Chase, superintendent. Organized Oct. 22, 1906, under laws of Nevada, with capitalization $5,000,000, shares $5 par. Lands, 20 claims, area 400 acres, tested by two 250' churn drill holes, showing no copper.

UNITED ELY MINES CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev.

UNITED EMPIRE CO. **BRITISH COLUMBIA.**

Dead. Was succeeded, December, 1906, by United Empire Co., Ltd. Formerly at Princeton, Boundary district, B. C. Fully described Vol. VI.

UNITED EMPIRE CO., LTD. **BRITISH COLUMBIA.**

Office and mine: Princeton, Yale district, B. C. Wm. C. McDougall, president and general manager; John M. Smith, secretary; preceding officers, Mrs. M. L. McDougall, John M. Murray and R. L. Reid, K. C., directors. Organized December, 1906, under laws of British Columbia, as successor of United Empire Co., with capitalization $500,000, shares $1 par; issued, $300,000. Annual meeting, first Tuesday in November.

Lands, 9 claims, area 250 acres, also 692 acres of coal lands and 2,500 acres of miscellaneous lands, in the Similkameen district. The copper lands show limestone, diorite and sandstone, carrying 2 ore bodies, of which one, under development, is estimated at 100' width, and is said to be traceable 4,500', carrying malachite and occasional azurite, with chalcopyrite at depth, ore being estimated to average 2% copper, 2 to 4 oz. silver and $1 to $2 gold per ton. Development is by shafts of 30' and 50', and by tunnels of 125', 225' and 80'. There are about 2,000 tons of ore available for extraction, but no ore has been blocked out for stoping. Adjoining the copper ore, on the western boundary, is a series of coal measures, apparently of promise. Fuel is coal mined from the company's lands, costing circa $1.50 per ton. Management plans continuous development.

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UNITED EXPLORATION CO. **WYOMING.**

Office: 113 Devonshire St., Boston, Mass. Mine office: Battle, Carbon Co., Wyo. Succeded Beulah Copper Co. Lands, 13 claims, area circa 250 acres, developed by an 800′ tunnel. Idle several years and presumably moribund.

UNITED GERMAN COPPER MINES, LTD. **GERMANY.**

Dead. Dissolved, September, 1904. Formerly at Münster-am-Stein, Bavaria, Germany.

UNITED GLOBE MINES. **ARIZONA.**

Office: 29-99 John St., New York, N. Y. Mine office: Globe, Gila Co., Ariz. Jas. Douglas, president; Geo. Notman, secretary and treasurer; Niles S. Berry, superintendent; Robt. B. Riddell, chief clerk. Capitalization $2,300,000, shares $100 par. Is controlled, through ownership of majority of stock, by Old Dominion Co. Paid dividends of $6.50, Dec. 15, 1906; and $4, July, 1907.

Lands, 29 claims, lying west of the Old Dominion group, also 3 millsites. The mine is extensively developed, having a 765′ three-compartment shaft, showing a vein of circa 30′ width, carrying an ore chute of 700′ length, averaging 4% copper and upwards. Early 1908 the Maggie vein was cut, 85′ north of B shaft of the Old Dominion, on United Globe ground, this showing sulphide ore of excellent average tenor, including considerable massive chalcopyrite. The ore bodies of the United Globe are extensive, but erratic, and are highly silicious, requiring heavy fluxing, and the mine is wet. Leasers formerly working on the property produced ores averaging 20% copper and 1 to 15 oz. silver per ton, but the first grade ore mined by the company now averages circa 14% copper, or less.

A 200-ton smelter has been idle for some years, and is not likely to be blown in again, as the mine is operated under a close working agreement with the Old Dominion Copper Mining & Smelting Co., details of which are given in the description of the Old Dominion Co., and, to all practical intents and purposes, the United Globe is now a portion of the Old Dominion mine.

Production was 4,607,537 lbs. fine copper and 5,277 oz. silver in 1906, and 3,399,084 lbs. fine copper and 12,382 oz. silver in 1907.

UNITED GOLD & COPPER CO. **ARIZONA.**

Office: Columbian Bank Bldg., Pittsburg, Pa. Mine office: Hereford, Cochise Co., Ariz. J. L. Currier, president; S. B. Manning, secretary and treasurer. Capitalization, $1,000,000. Lands, 11 claims, area 220 acres, 7 miles from Hereford, said to give fair surface indications of copper, with a 137′ tunnel. Idle.

UNITED GOLD & COPPER CO. **NEW MEXICO & CALIFORNIA.**

Dead. A swindle that sold stock and paid dividends simultaneously. Formerly at Lordsburg, Grant Co., N. M. Fully described Vol. V.

UNITED GOLD & COPPER MINING CO. **COLORADO & NEW MEXICO.**

Dead. A swindle. Formerly at Turret, Chaffee Co., Colo. Described Vol. V.

UNITED GREENWATER COPPER MINING CO. **CALIFORNIA.**

Dead. Merged Dec. 12, 1906, in the Greenwater & Death Valley Mining & Smelting Co. Formerly at Greenwater, Inyo Co., Cal.

UNITED METALS CO. **ALASKA.**

Mine office: Coppermount, Prince of Wales Island, Alaska. Harry Corbin, superintendent, at last accounts. Lands, about midway between Coppermount and Sulzer, giving a promising showing of high grade ore, and a little ore was shipped, 1905, to the Coppermount smelter. Presumably idle.

UNITED METALS SELLING CO. **NEW YORK.**

Office: 42 Broadway, New York, N. Y. Works office: Perth Amboy, Middlesex Co., N. J. Adolph Lewisohn, president; Henry H. Rogers, vice-president; A. W. Evarts, secretary; Urban H. Broughton, general manager;

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R. W. Stuart-Wortley, treasurer; preceding officers, Wm. Rockefeller, Jesse Lewisohn and Frederick P. Olcott, directors. Organized Jan. 29, 1900, under laws of New Jersey, with capitalization $5,000,000, shares $100 par. Regular dividend is 7½%, quarterly. Dividends have been 15% in 1900; 5% in 1901; 10% in 1902, 1903 and 1904; 20% in 1905 and 1906, and 30% in 1907, with total dividend disbursements of $6,250,000 to Dec. 31, 1907.

The company does a general commission business in metals, and is the largest copper broker in the world, being sales agent for the Amalgamated Copper Co. and producers affiliated with the Amalgamated, and a considerable number of independent producers. This company "held the umbrella" over the copper market in 1901, and again in 1907, enabling independent companies to market their copper, while the production of the Amalgamated and its affiliated companies was held back. Company sells yearly, 200,000,000 to 250,000,000 pounds of Amalgamated copper, and 250,000,000 to 300,000,000 pounds of other copper, on a commission, formerly 1½%, which was cut, 1906, to 1%, when copper passed 18 cents per pound in price. The commission is by no means excessive, in view of the facilities offered, these including the guarantee of all sales accounts, and, when desired, advances of 75 to 90% of the invoice value of copper. A considerable part of the company's profits are derived from its extensive refining operations.

The Raritan Copper Works, on New York Harbor, completed 1899, and since enlarged, is one of the largest and most modern copper refining plants in the world, the works including a smelter and mammoth electrolytic refinery. The smelter, having 2 furnace buildings, has two 100-ton furnaces casting anodes in iron moulds on a mechanical conveyor, and two 150-ton casting furnaces for wire-bars and anodes.

The electrolytic refinery includes two tankhouses and a power-house, connected by 3' concrete tunnels, power consumption being about 3,600 kilowatts, the works having a capacity of nearly 1,000,000 lbs. finished copper daily. No. 1 is the old and No. 2 the new tankhouse, latter completed circa 1907. No. 1 tankhouse has 1,600 tanks, each holding 21 anodes and 21 cathodes, of size 24x36", using a current of 5,000 amperes, with a cross-sectional area of only 5 square inches in the busbars.

No. 2 tankhouse is 150x184' in size, having concrete foundations, with steel frame and brick walls, special Berlin brick being used for the basement floor, these being considered acid-proof. Permanent equipment includes 1,370,000 pounds of lead, of which 1,500,000 pounds are in tank linings, and 581,000 pounds of copper, divided as follows: copper cathode rods, 186,000 pounds; stripping plates, 122,000 pounds; busbars and connections, 170,000 pounds; leads, etc., 100,000 pounds; lead anode rods, 300,000 pounds. No. 2 tankhouse has 3 bays, running lengthwise, with two 10-ton 3-motor Whiting cranes in each bay, equipped with special devices for handling an entire tankful of anodes or cathodes at one load. No. 2 tankhouse has 3 electric circuits, running lengthwise, one in each bay, each circuit of 396 tanks being handled from the power-house by one electric generator. Current is 7,500 amperes, giving a current density of 20 amperes per square foot. Main conductor has a cross-sectional area of 12¾". There are 1,188 depositing tanks, arranged in 108 nests of 11 cells each, electrode arrangement being on the Walker system, tanks being lined with 6-pound lead containing 4% antimony. There also are special tanks for rinsing the cathodes, after removal from depositing tanks, and tanks for scrubbing slimes from scrap anodes, latter amounting to about 13% by weight. Works have special shears for trimming cathode loops, and a Morrow loop machine for attaching copper lugs to the cathode starting sheets. Anodes are 28x36" and cathodes are 30x37", each tank having 24 anodes and 25 cathodes, spaced on 4⅝" centers, cathodes remaining in tanks

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14 days and anodes 28 days. In No. 1 tankhouse the anodes require 35 days for corrosion.

The general direction of the electrolytic circuit is lengthwise, but circulation of the electrolyte is crosswise, and, for circulation purposes, No. 2 tankhouse is divided into 6 units, of 198 tanks each, the circulation rate being about 4 gallons of electrolyte per tank per minute, solution entering bottoms of tanks and overflowing from tops. Adjoining the tankhouse is the pump-house, having hard-lead centrifugal pumps for circulation of the electrolyte, pumps having no stuffing-boxes or wearing parts coming in contact with the electrolyte, the shaft-bearings being placed above the level of the inflowing solution. These pumps are giving excellent service. Slimes are screened and washed through launders to a sump, and are pumped thence to receiving tanks in the silver refinery. The works employ about 1,000 men, when operated to their full capacity.

UNITED MINES CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Organized 1904, with capitalization $5,000,000. No trace of operations and presumably moribund.

UNITED MINING CO. **UNITED STATES, CANADA & MEXICO.**

Office: 66 Broadway, New York, N. Y. John Thompson, president; Albert Freeman, vice-president; John R. Stanton, treasurer; John McKinnon, secretary; preceding officers and Josiah Quincy, directors; E. A. Tays, managing engineer. Organized Jan. 17, 1905, under laws of Maine, with capitalization $6,000,000, shares $10 par, in $1,000,000 cumulative 6% preferred stock and $5,000,000 common stock, as successor of United Mining & Development Company of America. Is a promotion and development company, planned to develop and finance mines along much the same lines as the Venture Corporation of London.

The King Solomon mine, area 40 acres, in Calaveras County, California, is a gold property which has not proven satisfactory, and is idle.

The Century mine, at Brownell, Pima County, Arizona, formerly held by the Producer Mining Co., Frank Brownell, superintendent, has a 100′ shaft, showing a 2′ vein carrying auriferous and argentiferous copper ore of medium grade.

The lands at Leadville, Lake County, Colorado, were 320 acres, of which apparently 40 acres have been leased to the John Thompson Mining Co.

The Monitor mine, at Saltese, Missoula County, Montana, formerly held under bond, has been surrendered. Company is said to hold the Greene-Campbell mines, near Silver Star, Madison County, Montana, and the Buckeye mine, in Flathead County, Montana.

Company is said to have mining interests in the Black Hills of South Dakota.

The Navajo group, apparently 6 claims, held on royalty of 12½%, showing mainly gold ores, is near Bland, Sandoval County, New Mexico. Company is said also to have lands in the Cochiti district of New Mexico.

The Nevada de los Miches mine, area 107 hectares, near Fuerte, Sinaloa, Mexico, has auriferous copper ores, but apparently property has been surrendered. The Aztec copper mines are 12 miles from Alamos, Sonora. Three groups, including the Maconi mines, at Cadereyta de Montes, Queretaro, Mexico, apparently are tied up by litigation over titles with O. y T. Braniff.

The Oldham-Stirling gold mine is circa 20 miles from Halifax, Nova Scotia, and the Cariboo Consolidated copper mine is in the same neighborhood.

UNITED MINING & DEVELOPMENT CO. OF AMERICA. **U. S. A. & MEXICO.**

Dead. Succeeded Jan. 17, 1905, by United Mining Co. Described Vol. VI.

UNITED PEAK DOWNS COPPER & COAL CO., LTD. **AUSTRALIA.**

Office: Brisbane, Queensland, Australia. Mine office: Copperfield, Cler-

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mont Co., Queensland, Australia. John Currie, chairman; Currie, Buchanan & Co., secretaries; J. T. Coates, mine manager; W. H. Rands, consulting engineer. Organized circa April, 1908, under laws of Queensland, with capitalization £75,000, shares 7s. 6d. par; issued, 130,000 shares, 3s. 6d. paid up. Company was a reconstruction of the Peak Downs Freehold Copper & Coal Co., Ltd., which was a reconstruction of the Peak Downs Copper Co.

Lands, circa 1,200 acres, freehold, exempt from labor conditions. Property is the old Peak Downs mine, which, in early days carted ore circa 300 miles, securing profits therefrom of £278,250 in 15 years' operation. The mine, reopened 1906, by predecessors of present company, has a vein of 2′ to 3′ average width carrying chutes of high-grade ore, and 3 narrow parallel veins of 6″ to 20″ width. Ore, as a whole, averages circa 4.5% copper. The mine, opened to depth of 270′, has been thoroughly retimbered, and, when reopened, old pumps and pipes were found converted into copper precipitate, by the action of the acid mine waters.

The smelter, built some years ago, has reverberatory furnaces, and a new 100-ton water-jacket-blast furnace was blown in, July 24, 1907, working intermittently until October, 1907, when smelting was suspended, on account of the low price of copper. Production, when the smelter was in blast, was said to be circa 7 tons of matte daily, and a small amount of regulus was secured also. Production, 1907, is estimated at 500,000 lbs. fine copper. Mine is considered decidedly promising, but will require extensive development, its eyes having been picked out by the old management.

UNITED REEFS, N. L. **AUSTRALIA.**

Office: 378 Queen St., Brisbane, Queensland, Australia. Mine office: Black Snake, Kilkivan, Queensland, Australia. C. C. Moulton, secretary; Cecil Rae, general manager. Lands, known as the Shamrock mine, are 16 miles south of Kilkivan. Smelter has a 50-ton blast furnace and 2 reverberatories, difficulty being experienced in securing adequate supplies of fuel and flux. Ore smelted 1906 averaged 1% copper, 1 oz. silver and 9 dwts. gold per long ton. Employed circa 60 men at last accounts.

UNITED STATES & BRITISH COLUMBIA CO. **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Lands, known as the Burton group, have 2 shallow shafts and a tunnel.

UNITED STATES COPPER CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Lands, 5 claims, known as the McGowan group, on Snowstorm Hill, east of the Missoula Copper Mining Co.

UNITED STATES COPPER MINES, INC. **ARIZONA.**

Office: Louisville, Ky. Mine office: Wickenburg, Yavapai Co., Ariz. Geo. A. Newman, Sr., president; J. C. Parker, vice-president; Geo. A. Newman, Jr., secretary and treasurer; Hector McRae, general superintendent; preceding officers, Bernard Flexner, J. C. Parker, Samuel Taylor and W. D. Mahaney, directors. Organized under laws of Kentucky, with capitalization $2,000,000.

Lands, 900 acres, said to have a 9′ vein, with a 15″ paystreak assaying 25% copper, 3 oz. silver and $2.50 gold per ton, opened by 25 pits and shafts of 14′ to 500′ depth. Company is backed by Louisville businessmen of good standing, but in advertisements, January, 1907, claimed to have a copper mine and not a prospect, which is not the truth, and to have 30,000,000 tons of high grade copper ore blocked out, which is absolutely untrue. Company claimed that it could produce copper at 6 cents per pound, which remains to be proven. One enthusiastic shareholder feels certain that the mines are superior to any in Arizona for several reasons, one of which is that a smooth wagon road stretches 12 miles from the end of the railroad to the mine, and this unprecedentedly

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satisfactory transportation means facilities "untouched by any other great property." Is not regarded favorably.

UNITED STATES GOLD & COPPER CO. **WASHINGTON.**

Dead. Formerly at Chewelah, Stevens Co., Wash.

UNITED STATES GOLD & COPPER CORPORATION. **NEVADA.**

Office 1410 Real Estate Trust Bldg., Philadelphia, Pa. Mine office: Humboldt House, Humboldt Co., Nev. John McKinley, chairman; Jos. H. Reall, president; J. Uhle Bethell, vice-president; Wm. Steele, treasurer; J. R. Humphrey, secretary; preceding officers, N. L. Gartner, B. Howard Coffin, A. E. Wager and Wm. Bromer, directors; Jas. McKinley, manager; W. E. Adamsen, consulting engineer. Organized under laws of Nevada, with capitalization $2,500,000, shares $1 par. Lands, 12 claims, area 240 acres, showing about 1,000' of old workings, including a 370' tunnel, property also having a 170' new tunnel, driven by present management. President states that no mine in the world offers a better showing than this, which, of course, is not true. Is not regarded favorably.

UNITED STATES GOLD CORPORATION. **COLORADO.**

Office: 67 Fonda Blk., Boulder, Colo. Mine office: Eldora, Boulder Co., Colo. Edward Monroe, president and general manager; M. T. Garretson, vice-president; John R. Wolff, secretary; W. L. Dayton, treasurer; John F. Rowell, superintendent. Lands, 500 acres, in the Arapahoe copper-gold belt. Presumably idle.

UNITED STATES & GUERRERO EXPLORATION CO. **MEXICO.**

Office: Ashland, Ky. Dr. J. Letton Martin, president. Capitalization, $1,000,000. Lands, claimed to be 146 acres, in the states of Guerrero and Michoacán, latter near the Inguarán mine. No trace of operations and presumably moribund.

UNITED STATES METALS REFINING CO. **NEW JERSEY.**

Office: 100 Broadway, New York, N. Y. Works offices: Chrome, Middlesex Co., N. J., and Grasselli, Lake Co., Ind. Employs about 750 men at the Chrome works, and 125 at the Grasselli works. W. G. Sharp, president; L. Vogelstein, vice-president; E. J. Huthorn, secretary; F. W. Batchelder, treasurer; preceding officers, W. H. Coolidge, Edw. A. Clark and Ambrose B. Todd, directors; H. A. Prosser, general manager; Lawrence Addicks, superintendent Chrome works; Wm. Thum, superintendent Grasselli works.

Organized November, 1903, under laws of New Jersey, and reorganized Oct. 15, 1906, with capitalization $4,000,000, shares $100 par, half in 7% cumulative preferred and half in common shares; issued, $3,100,000, half preferred and half common stock. Is controlled, jointly, through stock ownership, by United States Smelting, Refining & Mining Co., and Aron Hirsch & Sohn, of Halberstadt, Germany. Annual meeting, second Tuesday in May.

The Chrome works, of 12,000,000 lbs. monthly capacity, include a complete smelting and converting plant for the treatment of ores, concentrates, mattes and bullion, copper supplies being received mainly from Utah, Montana, Arizona, California and British Columbia, with odd lots picked up from other fields. The smelting department includes two 75-ton reverberatory furnaces, for remelting blister copper, and 2 furnaces for remelting cathode copper. There also is a circular blast furnace, 42" at the tuyeres and 13' high, using an 11-oz. blast-pressure. Waste gases from the reverberatories are burned under a Babcock & Wilcox boiler. The power plant includes steam-driven dynamos of 1,000 and 1,200 h. p., giving, respectively, 5,500 amperes at 115 volts, and 6,500 amperes at 130 volts. The converter department has a monthly capacity of 3,000,000 lbs. finished copper.

Metal is received in slabs and cakes, and cast into anodes weighing 350 to 400 lbs., by a Walker casting machine having 22 moulds, and anodes are

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transferred, in sets of 15, from the casting machine to the electrolyic tanks, by electric traveling cranes.

The electrolytic plant has 810 cells, forming two systems of 12 compartments with 34 baths each, 408 cells in a system. Tanks are lead-lined, 3' 6" broad, 3' deep and 10' long, each bath containing 15 anodes and 16 cathodes, the extra cathode providing terminal plates. Cells are arranged in steps, in two rows, with a 12" drop between tanks. Current is conveyed to the cells by copper leads of 1½x4¾". Current density is 15 to 17 amperes per square foot, and the difference of potential of bath is 0.3 volts. The cell bath temperature is 52° to 57° C. Electrolyte contains 40 grams copper and 140 cc. sulphuric acid per liter. The blister copper treated contains antimony, arsenic, selenium and tellurium, as well as copper, nickel, gold and silver, and the sludge from the tanks is treated by filter presses and refined in a cupel furnace for gold and silver values. As much silver is volatilized in refining, the gases from the furnace are drawn off by a fan, then cooled and filtered through flannel sacks, before entering the stacks. From the waste electrolyte liquor, crude nickel sulphate and copper sulphate are made, there being, in connection with the refinery, a sulphate plant where bluestone is produced for the requirements of the works.

The Grasselli plant, consisting of a 75-ton electrolytic lead refinery, at Grasselli, a suburb of Chicago, was the first electrolytic lead refinery in the United States.

The plants of the United States Metals Refining Co. are strictly modern in design and equipment, and are noted for the technical and commercial excellence of their practice.

UNITED STATES & MEXICAN MINING CO. **MEXICO.**

Office: 42 Murray St., New York, N. Y. Mine office: Hostotipaquillo, Ahualulco, Jalisco, Mex. Isaac P. Martin, manager. Lands include the Trinidad and Guadalupe mines, carrying auriferous and argentiferous copper and lead sulphides. Has water power, employing circa 75 men, at last accounts.

UNITED STATES & MEXICO CONSOLIDATED MINING CO. **MEXICO.**

Office: 110 State St., Boston, Mass. Letter returned unclaimed from former mine office, La Cananea, Arizpe, Sonora, Mex. W. C. Humphrey, president; E. Allen, secretary; Geo. W. Farrington, superintendent. Organized January, 1906, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands, 30 pertenencias, area 74 acres, on the western slope of the Sierra Madres, circa 30 miles east of Cananea, said to have a shaft. Company claimed to plan shipping 300 tons weekly, by wagon, and also claimed to plan building a 300-ton smelter, but apparently neither shipped ore nor built a reduction plant. Regarded with suspicion.

UNITED STATES MINING CO. **UTAH.**

Office: 400-55 Congress St., Boston, Mass. Operating office: 508 Dooly Blk., Salt Lake City, Utah. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Eureka, Juab Co., Utah. Wm. G. Sharp, president; Wm. F. Coolidge, vice-president; F. Winthrop Batchelder, secretary and treasurer; Albert F. Holden, managing director; Frederick Lyon, assistant managing director; preceding officers, R. D. Evans, Eugene N. Foss, N. W. Rice, E. C. Swift, J. J. Storrow and Sidney W. Winslow, directors; Hon. C. E. Allen, general manager; A. P. Maybury, mine superintendent at Bingham; R. A. Brown, mine superintendent at Tintic; Richard E. Parker, consulting engineer; Percy Williams, engineer; Aron Hirsch & Sohn, sales agents.

Organized 1899, and reorganized, 1901, under laws of Maine, with capitalization $15,000,000, shares $25 par. Debentures $500,000 due May, 1909. Is controlled, through ownership of 98% of stock issue, by United States Smelting, Refining & Mining Co., stock control having been obtained through exchange

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of shares, with a cash bonus paid to the United States Mining Co. Controls, through ownership of entire capital stock, the United States Smelting Co.; controls, through ownership of practically entire stock issue, the Centennial-Eureka Mining Co.; controls, through ownership of majority of stock and bonds, Niagara Mining & Smelting Co.; owns a half interest in the International Metals Selling Co. National Shawmut Bank, Boston, registrar. Annual meeting, in October.

The properties at Bingham include the Old Jordan, Telegraph, Commercial, Galena and adjoining claims. The Niagara mine also is held, through a controlling stock interest. The United States Supreme Court decided, October, 1907, in favor of the company in the litigation with Col. E. A. Wall over the Kempton lode. The mines are timbered with 8x8" Oregon pine, and were said, 1906, to have about 2,000,000 tons blocked out for stoping, of which about 90% was low grade ore. The Bingham mines have an aërial tramway, of 25 tons hourly capacity, taking ore to the railway.

The Old Jordan and Telegraph properties were silver mines originally, opened on a fissure vein of silver-lead ore crossing the big sulphide copper dyke from which production has been secured latterly. The Old Jordan group has about 5 miles of workings, developing a large amount of ore. Copper ores are silicious and deficient in iron, requiring heavy fluxing, ranging in tenor from 1.5% to 2% copper, 2 to 5 oz. silver and $1 to $2.50 gold per ton, and are said to give smelter returns of 26 to 28 lbs. copper, and $2 to $2.50 combined gold and silver values per ton. Litigation over the Old Jordan was settled, 1905, in company's favor.

The Galena mine, reopened circa 1905, is said to have produced upwards of $1,000,000 worth of ore, under previous ownership, with average smelter returns of 20% lead, 25 oz. silver and up to $10 gold per ton. The Galena carries low grade copper values, in addition to auriferous silver-lead ores, and was shipping circa 400 tons daily, 1907, until suspension of work, in September.

The Centennial-Eureka mine, of the Tintic district, is described elsewhere, under the title of its owner, the Centennial-Eureka Mining Co.

In addition to its metalliferous mines, the United States Mining Co. owns a large limestone quarry and iron mines, supplying flux, and has coal mines, the colliery having a coking plant in connection. The advantages pertaining to control and ownership of ores, fluxes, fuel and smelter, under a single management, are very great.

Smelting is done by the United States Smelting Co., a subsidiary corporation, and the smelter is described under title of its owner.

Production was 15,841,667 lbs. fine copper for 1905, and for fiscal year ending Oct. 1, 1905, the smelter produced, from Utah ores, 14,965,438 lbs. fine copper, 10,208,226 lbs. lead, 2,107,956 oz. silver and 71,445 oz. gold. For later years' production is included in figures of United States Smelting, Refining & Mining Co., which also include California copper production, from the Mammoth mine. Smelting was suspended, at the end of 1907, but lead smelting was resumed, 1908, and copper smelting is to be resumed, early 1909. Further details regarding closely related interests will be found in the descriptions of the United States Smelting Co. and United States Smelting, Refining & Mining Co.

UNITED STATES MINING CO. **WYOMING.**

Office: 1204-37 Wall St., New York, N. Y. Henry T. Clarke, Jr., president; John T. Clarke, vice-president and treasurer. Capitalization $1,500,000. shares $10 par, in $500,000 preferred and $1,000,000 common shares. Is a securities holding corporation only, controlling a majority of the outstanding stock issue of the Doane Verde Mining Co., and share interests in the Battle Lake Tunnel Site Mining Co., Penn-Wyoming Copper Co., and Newsboy Mining & Milling Co., latter of Ouray, Colorado. Company also has an interest in a

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tract of mineral land near the Reindeer, Bessie Wilgus and Coon Valley mines, at Leadville, Lake Co., Colorado.

UNITED STATES MINING & SMELTING CO. **MEXICO.**

Dead. Formerly at Hermosillo, Sonora, Mex. Described Vol. V.

UNITED STATES & NICARAGUA CO. **NICARAGUA.**

Office: 345 Fourth Ave., Pittsburg, Pa. R. A. Smith, president; M. K. Salsbury, vice-president; Wm. Rees, secretary and treasurer. Organized Apr. 20, 1903, under laws of Maine, with capitalization $1,000,000, shares $100 par. Property is an exclusive government concession for mining, covering the two northern states of Chinandega and Segvoia, in the republic of Nicaragua. Idle.

UNITED STATES SMELTING CO. **COLORADO.**

Office: Colorado Springs, Colo. Mine office: Cañon City, Frémont Co., Colo. J. D. Hawkins, president; Chas. J. Bocking, manager; R. H. Hawley, superintendent. Property is a 100-ton custom smelter, treating mainly zinc ores, but handling also some copper and lead ores.

UNITED STATES SMELTING CO. **UTAH.**

Office: 400-55 Congress St., Boston, Mass. Operating office: 508 Dooly Blk., Salt Lake City, Utah. Works office: West Jordan, Salt Lake Co., Utah. A. F. Holden, managing director; Hon. C. E. Allen, general manager; H. A. Prosser, metallurgical director; Geo. W. Heintz, superintendent; H. C. Bellinger, consulting metallurgist; T. R. Jones, manager custom ore department. Is controlled, through ownership of entire capital stock, by United States Mining Co., which, in turn, is controlled by United States Smelting, Refining & Mining Co.

Lands, 150 acres, near the Utah Consolidated and Bingham smelters, 12 miles from Bingham and 80 miles from Tintic. The reduction works, which do a general custom business, include a 100-ton concentrator, on the bank of the Jordan river, southwest of the smelter, and 2 sampling mills.

The smelter, of circa 2,500 tons daily capacity, includes lead and copper departments. The lead smelter, built 1904, has three 100-ton water-jacket blast-furnaces, and six 70′ hand-roasters. In 1908 these were installed 26 converter-roasters, for lead ores, which, in effect, are sintering furnaces, adapted to raw ores. Each converter-roaster consists of a brick-lined square shell, 6x6x3′, with a 3′ hood, and a bottom of grate-bars, through which comes a 9-oz. blast. Charges require about 12 hours treatment, sintering to a solid cake, which is discharged by ram, like coke from a by-product oven, after which the sintered cakes are broken in a Blake crusher, and crushed material conveyed automatically to steel-cars, going thence to bins in the furnace-house, where mixed with charges for the blast-furnaces.

The copper department has six 200-ton water-jacket blast-furnaces, and a 125-ton reverberatory furnace. Pyritic smelting, employed originally in the copper stacks, was abandoned. The converter department has 2 stands, with an electric traveling crane, briquetting plant for fines and flue-dust, and a silica mill. The smelter has a 300′ steel stack, connected with the furnaces by a flue, and separate brick flues lead to a baghouse.

The baghouse is perhaps the best planned and constructed, and certainly is one of the most successful, in existence. The building is 58x192′ in size, with an addition of one-half the size under construction, late 1908. The baghouse is in 5 compartments, with steel floor, underneath which is a 12′ basement, with 5 cellars, each divided into 3 sections. There are 2 fans, driven by a 100-h. p. electric motor, drawing smoke and fumes from all parts of the smelter. The gases, having an initial temperature of 300° C., are cooled, by passing through 3 series of steel tubes, from one brick chamber to another, 10 tubes, each 2′ in diameter and 20′ long, connecting each chamber, the gases going finally through a steel tube 30′ long and 6′ in diameter, into the baghouse,

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which has 2,200 bags, each 32' 6" long and 18" in diameter, canvas bags being used for blast-furnace gases and woolen bags for gases from the roasting plant. The bags are hung vertically, with metal thimbles at top and bottom, the upper ends being closed, and lower ends opening into the dust-cellars, the floor of the baghouse above the basement having 18" circular holes, with thimbles 6" high and 18" in diameter extending upward from each hole, over which the feet of the bags are slipped. Apparently the bags wear for a long time. The bags are shaken every 12 hours, the workman who does this wearing a rubber suit and metal helmet, with a supply of compressed air for breathing, but an apparatus has been devised for shaking the bags simultaneously, from a point outside the chambers. The dust from the bags, amounting to about 5 tons daily, is wetted down and taken to the briquetting plant, where it is converted into briquettes, and charged into the furnaces. Gases, after leaving the baghouse, contain less than 0.75%, by volume, of sulphurous fumes, this amount being the maximum permitted by the courts.

The baghouse saves considerable zinc, lead and silver, previously lost through volatilization, and the management plans utilizing some of the zinc heretofore lost. The dust from the bags returns about 30% lead, with a heavy proportion of arsenic. Patents have been applied for in connection with a new process, providing for the neutralization of sulphurous gases with zinc oxide, to form zinc sulphate, which will be retained in the baghouse, the reaction taking place in the flues, while the fumes pass to the baghouse at a temperature a little higher than 100° C. The baghouse produces zinc oxide, from crude zinc sulphide and other materials not yet disclosed, which is mixed with 50%, by weight, of crushed coke, dampened, and fed upon the grates of a battery of 5 small furnaces, each about 15' long and 3' wide, with party walls, the mixture being maintained at a thickness of about 12" upon the grates, each furnace having a capacity of 6 tons daily.

Late 1908 the management was installing an arsenic plant, with Brunton furnace and a series of brick condensing chambers for crude arsenic, and a refining-furnace having brick condensing chambers for white arsenic, similar to the plant at the Washoe works.

The power-house at the smelter has a 750-h. p. General Electric steam turbine, with blowers, air-compressor and an electric light plant.

The smelter was closed down, circa October, 1907, owing to an unfavorable court decision, restraining the company from polluting the atmosphere in the Salt Lake Valley, to the detriment of agricultural interests. The court permitted resumption of lead smelting, early 1908, and at the end of the year the company planned resuming copper smelting shortly, with the aid of a baghouse to care for deleterious sulphurous and arsenical fumes.

Further particulars in connection with this company will be found in the description of the United States Smelting, Refining & Mining Co.

UNITED STATES SMELTING, REFINING & MINING CO.

UNITED STATES & MEXICO.

Office: 400-55 Congress St., Boston, Mass. Operating office: 508 Dooly Bldg., Salt Lake City, Utah. Wm. G. Sharp, president; Chas. G. Rice, vice-president; A. F. Holden, managing director; preceding officers, B. Preston Clark, Robt. D. Evans, J. J. Storrow and Sidney W. Winslow, executive committee; F. Winthrop Batchelder, secretary and treasurer; Frederick Lyon, assistant managing director; preceding officers, Frederick Ayer, Wm. Barbour, Chas. F. Brooker, Wm. H. Coolidge, Eugene S. Foss, C. A. Hight, N. W. Rice, Galen L. Stone, H. H. Wehrane, Capt. John W. Weeks, Robt. S. Bradley and David A. Ritchie, directors; H. A. Prosser, metallurgical director.

Organized Jan. 10, 1906, under laws of Maine, with capitalization $75,000,000, shares $50 par, in $37,500,000 preferred 7% cumulative shares, and

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$37,500,000 common shares. Has circa 6,000 shareholders. City Trust Co., Boston, transfer agent. National Shawmut Bank, Boston, registrar. Annual meeting, in May.

The company is a securities holding corporation only, controlling, through practically entire stock ownership, the United States Mining Co., United States Smelting Co. and Mammoth Copper Mining Co. The company also controls, through ownership of a large majority of stock, the Centennial-Eureka Mining Co., United States Stores Co. and United States Lime Co., and owns a majority of both preferred and common stock issue of the American Exploration Co. The company secured, latter half of 1908, a controlling interest in the Bullion-Beck & Champion Mining Co., and controls, through practically entire stock ownership, the Compañía Minera Real del Monte y Pachucha, of Mexico, which property was bought for 3,800,000 pesos. Controls, through ownership of 100,000 shares, the Peruvian Mining, Smelting & Refining Co. Owns a half interest in the United States Metals Refining Co., other half being owned by Aron Hirsch & Sohn, of Halberstadt, Germany. The company also owns slightly less than a majority interest in the shares of the Richmond-Eureka Mining Co. The various subsidiary corporations are described separately, under their respective titles. Control of the United States Mining Co. was secured by exchanging stock, three-fourths in preferred and one-fourth in common shares of the United States Smelting, Refining & Mining Co. having been given, share for share, plus $1 per share cash bonus, for each share of United States Mining Co.

Company pays 7% on preferred stock, in quarterly dividends of 1¾%, payable January, April, July and October, first dividend having been paid Apr. 15, 1906. Dividends were begun, 1907, on common stock, and in 1908 the company paid 4 quarterly dividends, of 1% each, on common shares. The company's dividend requirements, for both common and preferred shares, are $2,400,000 yearly.

The company ended 1907 with an available surplus of $4,067,087; which was cut down, by adding $733,255 to reserve, and other dispositions, to a net surplus of $557,003. The floating debt, estimated at $3,000,000 during the panic period, late 1907, was considerably reduced, early 1908. Net earnings were $3,504,522 in 1906, and $2,386,539 in 1907. Net earnings were said to have been circa $300,000 in September, and $335,000 in October, 1908, showing a substantial recovery in business and profits.

Production, 1906, including outputs of all subsidiary corporations, was 33,856,287 lbs. fine copper, 27,828,644 lbs. lead, 4,852,292 oz. silver and 162,537 oz. gold, with a gross value of $14,747,746. Production for 1907, including outputs of all subsidiary companies, was 88,518,378 lbs. fine copper, 53,617,224 lbs. lead, 6,739,269 oz. silver and 265,822 oz. gold, with a gross value of $18,408,655, giving net earnings of $2,386,539, for an exceedingly bad year.

The United States Smelting, Refining & Mining Co. is an ambitious undertaking, and must be considered a serious competitor of the Amalgamated Copper Co., Federal Lead Co. and American Smelting & Refining Co., commonly termed the copper, lead and smelter trusts. The company has properties of great present value, and much greater potential worth. While the company has made mistakes, it invariably has profited by them, and in 10 years has worked from a position decidedly dubious to one where its present is assured, and its future most promising.

UNITED VERDE COPPER CO. **ARIZONA.**

Office: 901-49 Wall St., New York, N. Y. Mine and works office: Jerome, Yavapai Co., Ariz. Employs circa 900 men. Hon. Wm. A. Clark, president; Jas. A. Macdonald, vice-president; H. H. St. Clair, secretary and treasurer; Chas. W. Clark, general manager; Will L. Clark, assistant general

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manager; Thos. Tayler, smelter superintendent; C. B. Hopkins, engineer; Otto Strodhoff, chief clerk; Geo. Bosch, master mechanic.

Organized Sept. 2, 1899, under laws of West Virginia, as a reconstruction of a company of same title organized under laws of New York, with capitalization $3,000,000, shares $10 par; issued $2,999,270. Is controlled, through ownership of about 90% of total stock issue, by Senator Clark, and is operated practically as a close corporation, having about a dozen shareholders only. Annual meeting, third Monday in February.

Gross earnings, 1907, were $6,557,918, with operating expenses of $3,479,072, leaving net earnings of $3,078,846, company ending year with a surplus of $5,131,608, including bills and accounts receivable of $1,508,401, investments in choice bonds and stocks of $1,314,239, and cash of $155,309.

Dividend payments were begun, 1892, by old company, on the basis of 25 cents per share monthly, increased, 1896, to 50 cents per share monthly, and again increased, 1898, to $1 per share monthly, maximum dividends being $4,498,680 in 1899, in which year the net earnings were $5,435,970. Recent dividends have been as follows: $2,025,000 in 1905; $2,700,000 in 1906; $2,700,000 in 1907, with total dividend disbursements, to end of 1907, of $24,405,680.

Lands, 18 claims, patented, area 230 acres, with sundry adjoining property, including the North Venture and South Venture claims, which have produced a little high-grade ore, in the Verde district of the Black Hills range, at an average elevation of 5,600′ above sea-level, and about 1,800′ above the valley of the Verde river. Property shows porphyritic rocks, slate and schist, the mine, being in a zone of slates and intrusive dioritic rocks, the neighboring limestone being superimposed unconformably, and apparently having no connection with the ore deposits. The United Verde was a small gold and silver mine, discovered 1880, opened 1883, and closed 1885, because unprofitable, until bought, 1888, by Senator Clark, who has developed it into one of the great mines of the world.

The mine is opened on a single monstrous lense of sulphide ore, in slate, of circa 600′ extreme width and about 1,900′ length, proven to depth of 1,000′, the ore body consisting of more or less irregular masses, in a much broken and disturbed area, the lense having a dip of 72° and being intruded by a 70′ quartzite dyke that carries about 1% copper, and from 1 to 13 oz. gold per ton, which is used for converter linings. The gossan outcrop, carrying auriferous and argentiferous oxidized ores to depth of circa 160′, has been worked out. The zone of secondary enrichment carries mainly chalcocite, with some covellite and other alteration minerals of copper, all highly argentiferous. The base zone carries mainly chalcopyrite, with a little bornite, both auriferous and argentiferous. No ore assortment is attempted, and no concentration is made, everything from the mine going to the furnaces, the average of ore from all openings formerly being circa 6.5% copper and 15 to 32% sulphur, with considerable gold and silver values. The ore, as a whole, is not so rich as formerly.

Underground openings are very extensive, with enormous ore reserves, estimated as high as 20,000,000 tons, which is much too high. The mine is developed to a depth of 1,000′, and diamond drill borings show ore to a depth of 2,000′, with decreasing values. Production is mainly from the 5th to 8th levels, inclusive. The mine is worked pillar-and-stall, and timbered with square sets, filled with waste, worked-out stopes being filled with culls, and occasionally with barren rock, blasted from the mountainside above the mine, and milled into abandoned stopes, a practice considered somewhat dangerous.

The ore is very heating, owing to its richness in sulphur, and is liable to spontaneous combustion, and, owing to the more or less shattered condition of the lense, it is difficult entirely to prevent the access of air, very little

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of which will keep a sulphur fire burning incessantly. The most serious fire, in August, 1902, caused a total suspension of mining, but finally was gotten under control by pumping the mine full of carbonic acid gas, this being made by treating crushed limestone with dilute sulphuric acid, in iron tanks, the gas being forced, by natural pressure, into the top of the shaft, whence it fell, by gravity, to the bottom of the mine, displacing the lighter atmospheric air. In April, 1905, a serious explosion killed 5 men, and for a time threatened the entire mine. The fire had eaten its way to a point below the 700′ level, and a cave on this level, caused by the fire, fissured the superincumbent rock-mass so that surface water from the heavy spring rains seeped down into the fire zone, generating steam that blew out the solid masonry bulkheads and endangered the lives of the miners by steam and sulphur fumes—a truly diabolical combination. In fact, the explosion at the United Verde might be termed an artificial volcano, just as the "air-blasts," at the Quincy and other Lake Superior mines, are called artificial earthquakes. The fire on the 400′ level has been burning since 1897, and the mine is on fire in various places, from the 7th level to surface, fire in stopes not worked being walled off by cement bulkheads having steel gates. Mining is in progress in the fire zone, on the 300′ level, under the Plenum system, introduced by J. J. Shaw. By this method, air under pressure is blown against the face of the stopes, by electric fans. The air feeds the fire, which is a smouldering one, but drives back the deadly fumes into the shattered rock-mass, and permits the extraction of ore. The fire, while dangerous and annoying, cannot destroy the copper, all of which will be recovered, eventually, by mining or leaching.

The mine is subject to bad caves, one of which carried down the office building and killed a number of employes, some years ago. Owing to fires and caves, the shafts sunk in ore were subject to drawing, causing their ultimate abandonment, new shafts being sunk in the country rock. From a miner's standpoint, the United Verde is not an especially desirable working-place, as the openings are very hot, and the acid waters cause blisters and sores upon the unprotected skin, while the mine fires and caving ground render underground work more or less hazardous. Strenuous efforts have been made to render the mine safer, but, owing to its having been opened wrongly at the start, such efforts are made at a disadvantage, but the mining system has been much improved latterly, and the United Verde, while by no means an ideal place for the employment of persons with weak nerves, is much safer than formerly.

Development is by shafts of 500′ and 1,000′, and by tunnels of 800′, 2,640′ and 6,593′, tunnels having electric haulage. The old main shaft, 6x18′ in size and 800′ deep, is no longer in use. The new main shaft, with 5 compartments, and 1,000′ deep, was located 900′ from the old main shaft, to sink continuously in country rock, but cut ore at 600′ depth, and has held it to the bottom, considerably extending the known ore limits of the mine. Equipment of the new main shaft includes 4 cages, worked in counterbalance.

The new drainage tunnel, of 6,593′ length, was begun Dec. 23, 1906, and completed Sept. 10, 1908, being driven from both ends, in less than 21 months. This tunnel, running from the Verde valley, connects with the workings on the bottom level, at depth of 1,000′, and drains the entire mine. The tunnel is 7x9′ in the clear, and at the bottom is a 2x2′ water conduit. The tunnel has one track, with room for a second, to be added later.

The surface plant and smelter are located on top of the mine, the precipitous walls of the cañon rendering such a location obligatory, when the mine was opened. Equipment includes a steam plant, of about 2,600 h. p., with 2 powerful hoists, and a compound air-compressor of 6,000 cubic feet capacity per minute, having steam cylinders of 28″ and 52″, with 48″ stroke, and air

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cylinders of 24" and 44". Electric light and power are furnished by a generator direct-connected to a 350-h. p. engine. Fuel is coke, costing $12.75 per ton, for the smelter, inferior wood, costing $8 per cord, for the roast-heaps, and coal and petroleum for steaming purposes. There is a 175,000-gallon tank at the mine and a 500,000-gallon tank at Jerome Junction, for oil storage.

Water is received through 2 miles of 10" pipe, from the Walnut Springs dam, which was rebuilt, 1907. The supply being somewhat scanty, water is husbanded with care.

The precipitation plant, formerly near the smelter, has been removed to the mouth of the drainage tunnel, the new plant consisting of a flume one-half mile long, 5' wide and 10" deep, with a grade of 0.8%, with settling tanks 120' apart, copper being precipitated from the mine water on scrap-iron.

All ore above 12% in copper tenor is sent direct to the smelter, balance being trammed through the tunnel on the 500' level to the roast-yard, where the ore is heap-roasted, with cordwood, on contract, each 500-ton heap requiring 5 to 9 weeks for roasting. After roasting the ore is trammed back into the mine, through the tunnel, and hoisted through the shafts to the smelter, the exceedingly precipitous nature of the ground rendering it impracticable to secure direct connection between the smelter and roast-yard, except through the mine.

The smelter is built on the hanging wall side of the mine, too close to the ore body, and there has been considerable trouble from caving ground. The smelter was practically rebuilt, 1903, while in blast, and another large new furnace was installed, 1907. Equipment includes 5 rectangular water-jacket blast-furnaces, 4 of circa 500 tons daily capacity each, and a fifth furnace, 48x240", of 750 tons capacity, giving the works a nominal capacity of about 2,750 tons daily, but, in practice, one blast-furnace is held in reserve, as a spare. The reverberatory furnace, formerly used for smelting flue-dust and ores exceptionally rich in gold and silver, has been dispensed with, as has a small tilting furnace for casting anodes. The smelter stack has a screen-top, to catch flue-dust, which carries high values in gold and silver. The converter department has 6 stands, 15 shells and two 50-ton traveling cranes. Anodes are shipped for refining mainly to the Waclark Wire Works, at Elizabeth, New Jersey, controlled by Senator Clark, where the gold and silver are parted electrolytically, copper being used mainly for drawing into wire. There have been rumors at intervals that the smelter would be removed, one of these detailing, very circumstantially, the alleged plans of the management to build a new smelter at Farmington, New Mexico, near coal, but, while the smelter may be removed later, it will not go to the fuel, but will remain near the ore, and possibly new works may be built near the mouth of the drainage tunnel, which would seem about the best site available in the near vicinity of the mine.

The United Verde & Pacific Railroad, controlled by the company, is a 28-mile narrow-gauge line connecting the mine with the Santa Fé, Phœnix & Prescott railroad, at Jerome Junction, this line traversing a very difficult country. Consideration has been given, tentatively, to the construction of a railroad from Flagstaff to Jerome.

Underground employes work 8-hour shifts, and such as wish it are furnished rooms for $5 per week, and table board for $7 per week, in a fine hotel built by Senator Clark.

Production has been as follows: 43,995,932 lbs. fine copper, which was the largest recorded production, in 1899; 29,275,503 lbs. copper, 668,842 oz. silver and 23,754 oz. gold in 1904; 32,683,951 lbs. copper, 486,041 oz. silver and 15,915 oz. gold in 1905; 38,822,265 lbs. copper, 428,317 oz. silver and 12,913 oz. gold, with a gross value of $8,038,126, in 1906; 33,015,457 lbs. copper, 356,638

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oz. silver and 11,733 oz. gold, valued at $6,557,918, in 1907; circa 34,000,000 lbs. copper, with corresponding gold and silver values, in 1908.

In earlier years the United Verde made copper for 5 cents per pound, and even a trifle less, after deducting gold and silver values contained, but present costs are much higher. Cost per pound of finished copper, after deducting gold and silver values, has been as follows in recent years: 9.17 cents per pound in 1904; 9.27 cents per pound in 1905; 8.69 cents in 1906; 10.54 cents in 1907, the costs for 1907 having been abnormal. Under average circumstances, the copper of the United Verde may be figured as costing 9 to 10 cents per pound, with a marked tendency toward increasing costs.

The United Verde, owing to the former policy of the management, now practically abandoned, of withholding all information, has been lied about more industriously than almost any other mine in the world, and it has been stated, repeatedly, that the mine made copper for nothing, the gold and silver values covering all expenses, but this statement never was true, though likely to do service in the press, and in the prospectii of new mining corporations, more anxious for cash than for truth, for many years to come. The United Verde also has been pointed out, repeatedly, as a perfect example of blind luck, but this story is no nearer truth than the others. The United Verde was taken by Senator Clark when it was a thoroughly discredited gold-silver mine, and, by liberal applications of cash and brains, was developed into a magnificent copper mine, consequently, the credit therefor is due to Senator Clark, and not to the goddess of chance. The mine, while it has seen its best days, as a low cost property, is one of the best copper mines of the world, and will be a large and profitable producer for many years to come.

UNITED VERDE COPPER EXTENSION CO. ARIZONA.

Mine office: Jerome, Yavapai Co., Ariz. J. J. Fisher, manager. Was a reorganization of the United Verde Extension Mining Co., which came to grief. Lands, 5 claims, adjoining the United Verde, having a 581' shaft, said to show promising ore in bottom. Has steam power.

UNITED VERDE EXTENSION MINING CO. ARIZONA.

Dead. N. L. Amster denies ever having been consulting engineer for this company. Formerly at Jerome, Yavapai Co., Ariz. Described Vol. VI.

UNITED VERDE JUNIOR COPPER CO. ARIZONA.

Dead. Lost charter 1902; lands 1903. Was a stock-jobbing scheme, promoted by Benj. F. Peach and Edwin Wallace. Formerly at Jerome, Yavapai Co., Ariz.

UNITED VERDE JUNIOR COPPER MINING CO. ARIZONA.

Dead. Formerly at Jerome, Yavapai Co., Ariz.

UNITED VERDE SYNDICATE, LTD. BRITISH COLUMBIA.

Office: care of S. E. Ceperly, Vancouver, B. C. Mine office: Howe Sound, New Westminster district, B. C. Lands, 6 claims, area 240 acres, 40 miles from Howe Sound, on Fitzsimmons Creek, showing large bodies of heavily mineralized schist, carrying 1.5 to 9% copper and $2.84 gold per ton, with a little silver. Property idle and cannot be operated to advantage until rail connections are secured.

UNITY COPPER & GOLD MINING CO. NEW MEXICO.

Dead. Charter forfeited 1902. Formerly at Tres Piedras, Taos Co., N. M.

UNITY COPPER MINING CO. WYOMING.

Office: Chicago, Ills. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Property is the Haskins group, near the Doane mine. Was developing by tunnel, at last accounts.

UNITY MINES CORPORATION. UTAH.

Office: 52 Broadway, New York, N. Y. Mine office: Alta, Salt Lake Co., Utah. W. J. Robinson, president; Harry A. Lee, vice-president; D. L. Schwartz,

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secretary; E. W. Penfield, treasurer; preceding officers, Theo. Cook and Chas. F. Quincy, directors. Organized 1906, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Controls, through stock ownership, the Continental Mines & Smelting Corporation and the Continental Transportation Co.

UNIVERSAL COPPER MINING CORPORATION, LTD. MEXICO.

Office: 31 Lombard St., London, E. C., Eng. F. Richards, secretary. Organized Dec. 21, 1896, under laws of Great Britain, with capitalization £40,000, shares £1 par; issued, £9,476. Property is merely a share interest in the New Ario Copper & Exploration Co., Ltd.

UNUK RIVER MINING & SMELTING CO. ALASKA.

Mine office: Ketchikan, Alaska. J. W. Daly, manager. Has gold and copper ores.

UPINGTON COPPER SYNDICATE. CAPE COLONY.

Office: Brown's Bldgs., Johannesburg, Transvaal. Mine office: Reimoes, Cape Colony. A. Dickson, J. Dale Lace, E. Brayshaw, J. J. Hoffman, N. Tenhoff and C. E. Campbell, directors; J. G. Davis, secretary. Organized circa June, 1906, under laws of Transvaal, with capitalization £10,000. Lands are an option of the Farm Aoovoorby, on the Orange river, near Reimoes, circa 30 miles southwest of Upington. The option is for £5,000 cash and 16,000 shares, giving a purchase price of 15s. per morgen. The property shows cuprite and malachite, associated with iron, in quartz gangue, ore assaying 20 to 40% copper from a number of shallow test pits.

SOCIEDAD MINERA UPOLONGOS. ARGENTINA.

Dead. Lands sold to Famatina Development Corporation, Ltd. Formerly at Chilecito, Rioja, Argentina. Described Vol. V.

URÉA MINING CO. MEXICO.

Dead. Formerly at Velardeña, Cuencamé, Durango, Mex.

URIQUE DEVELOPMENT CO. MEXICO.

Letter returned unclaimed from former mine office, Urique, Arteaga, Chihuahua, Mex. Lands include the Barranca de Gloriapán mine, said to give good smelter assays, and the Santos Reyes mines, said to have a vein of about 18" average width, carrying circa 100 oz. silver per metric ton, with some bonanza ore carrying circa 1,000 oz. silver per metric ton, opened by 2 tunnels, blocking out considerable ore of good copper and silver tenor.

URUÁCHIC MINING & SMELTING CO. MEXICO.

Mine office: Uruáchic, Rayón, Chihuahua, Mex. H. T. Beddington, superintendent. Has auriferous and argentiferous copper ore, with steam power.

UTAH AMALGAMATED COPPER CO. UTAH.

Dead. Was reorganized, 1908, as Utah Gold & Copper Mines Co. Former officers were Dr. C. E. Watkins, president; F. L. Burt, secretary and treasurer; L. G. Grew, superintendent. Capitalization was $1,000,000, shares $1 par. Former landed holdings are described under title of Utah Gold & Copper Mines Co. Formerly at Newhouse, Beaver Co., Utah.

UTAH APEX & HIGHLAND BOY CONSOLIDATED MINING CO. UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized Feb. 8, 1904, under laws of Maine. No trace of operations secured, and company almost certainly abortive.

UTAH-APEX MINING CO. UTAH.

Office: 53 Tremont St., Boston, Mass. Operating office: 306 Auerbach Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 60 men. E. R. Hastings, president; John W. Horne, treasurer; preceding officers, Henry R. Bradley, Jas. D. Casey, Wm. F. Fitzgerald, John P. Gorman, R. F. Haffenreffer, Jr., Cowley Lambert and Chas. A. Morse, directors; Robt. S. Oliver, general manager; H. L. Parker, superintendent; E. D. Gardner, engineer; Arthur L. Pearse, consulting engineer.

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Organized May, 1902, under laws of Maine, as a merger of Copperfield Mining Co. and York Mining Co., with capitalization $2,500,000, increased, 1906, to $3,000,000, shares $5 par. Issued 26,000 shares of new stock, to shareholders, early 1907, and stock outstanding, April, 1907, was $2,641,000. Has authorized the issue of $500,000 convertible bonds, at 6%; outstanding, $189,000, September, 1908. Owns a 50% interest in the Markham Gulch Mining & Milling Co., which has a 150-ton mill. Has absorbed, since organization, the Highland Boy Mining Co., Petro Mining Co. and Minnie Mining Co., and December, 1908, secured, for circa $100,000, a controlling share interest in the Phœnix Mining Co., property of which adjoins the Utah-Apex. Federal Trust Co., Boston, registrar. Annual meeting, second Tuesday in September.

Lands, 24 claims, area 162 acres, on York Hill, in Carr Fork Cañon, adjoining the Utah Consolidated on the south and west, location being considered good. Property originally was the York and Copperfield groups, to which the Dana, Petro and Highland Boy Consolidated groups were added. The properties, before absorption by the present company, produced circa 300,000 tons of ore, including chalcopyrite and lead carbonates and sulphides. Lands show limestone and quartzite, carrying the Parnell, Petro, York and Andy bedded deposits, 3 of which are more or less developed, these being traversed by 6 fissure veins, of which the Leonard, Louisa, York and Petro have been opened, and proven to carry ore, the Dana fissure, which is the widest, being undeveloped. The property carries ore values mainly in copper, though with good values in lead, silver and gold, ores carrying an excess of iron, giving low smelting charges, because of the premium paid for each excess unit of iron by Utah smelters. First class copper ores carry only about 2% copper and circa $6 to $8 per ton combined gold and silver values, while second class copper ores carry about $8 per ton in combined gold and silver values. First class lead ores carry 35 to 50% lead, with gold and silver values, and second class lead ores range 7 to 14% in lead tenor, with small gold and silver values. In October, 1908, sixteen shipments returned an average of 1.67% copper, 35.69% lead, 8.44 oz. silver and 50 cents gold per ton. The mine shows considerable first class ore, and large quantities of second class ore, and ore reserved were increased largely, during 1908, being estimated, at end of year, at 154,000 tons of silver-lead ore, of $17 average value per ton.

Development is by 3 shafts and 6 tunnels, with circa 5 miles of workings. The 6 tunnels are known as the Parnell, Minnie, Smilax, Andy, Andy No. 2 and Parvenu, each circa 200′ apart vertically, and connected by incline shafts, all on the Parnell vein, which is estimated, by the company, to average 5′ in width, and to be mineralized for about 1,000′ on its strike and 2,000′ on its dip. The tunnels are connected by incline blind shafts, of 200′ and 300′, equipped with electric hoists. The Andy tunnel opens 3 ore chutes on the Parnell vein. The Parvenu tunnel, which is the principal opening, is circa 3,000′ in length, planned to be extended to length of nearly one mile, cutting the Parnell vein with a back of circa 2,200′. The company planned, late 1908, reducing extraction costs by connecting the Parvenu tunnel, on the 700′ level, with other workings, by a 3-compartment blind shaft, to be raised 350′.

A 3,000′ Bleichert aërial tram runs from the portal of the Andy tunnel to a loading station, whence ore is hauled by team to the Markham mill, circa 1¼ miles distant. The company also has planned the construction of a 2,300′ railway spur, from the mouth of the Parvenu tunnel to the Copper Belt railroad.

Equipment includes a 15-drill air-compressor and 2 electric hoists, machinery plant not being extensive, owing to extraction of ore mainly through tunnels.

Production, of circa 100 tons of ore daily, during 1907, was discontinued,

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Oct. 1, 1907, returns to that date being $229,419.13, the last 18 shipments of 1907, of circa 25 tons each, giving average returns of about $18 per ton. Production was resumed, Aug. 15, 1908, with shipments of about 30 tons daily, increased later to 40 or 50 tons daily. Property considered decidedly promising.

UTAH-ARIZONA GOLD & COPPER MINING CO. **ARIZONA.**

Office: Salt Lake City, Utah. Mine office: Chloride, Mohave Co., Ariz. Lafayette G. Burton, general manager; W. O. Young, superintendent. Lands include the old Hall mine, 20 miles from Chloride, in the Weaver district. Company is said to have bought machinery for a 10-stamp mill, June, 1908.

UTAH-BINGHAM MINING CO. **UTAH.**

Office: 547 Tremont Bldg., Boston, Mass. English office: 6 Moorgate St., London, E. C., Eng. Operating office: D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 25 men. Clarence S. Ward, president; Warren N. Akers, vice-president; Alfred R. Shrigley, secretary; J. E. Meadowcroft, London secretary; preceding officers, Robt. F. Miller and F. J. Minton, directors; M. F. Rowe, assistant treasurer; W. W. Bellows, general manager; P. M. McCrea, superintendent. Organized Feb. 3, 1906, under laws of Maine, with capitalization $2,000,000, shares $5 par, increased, Apr. 18, 1908, to $2,750,000, shares $5 par; issued, $2,313,595. Owns 532 shares in the Ilion Mining Co. Federal Trust Co., Boston, registrar.

Lands, 17 claims, patented, area circa 115 acres, near the Telegraph and Old Jordan mines, showing limestone, quartzite and porphyry, carrying fissure veins and irregular ore bodies in limestone, latter striking northeast with average dip of 30°. The property shows 5 known ore bodies, 4 of which are said to carry ore of fair assay tenor, mainly silver-lead, with a little auriferous copper ore, latter expected to occur in considerable quantities at greater depth. The limestone ore body, of irregular outline, circa 200′ in extreme width and traceable about 3,000′, carries melaconite, chalcocite, chalcopyrite and galena, estimated by company to average 2 to 5% copper, 10 to 40% lead, 5 to 16 oz. silver and 80 cents gold per ton.

Development is by a 200′ shaft and by tunnels of 250′, 360′, 420′, 600′ and 900′, with a total workings of about 2 miles, of which about 3,000′ are now in use.

Equipment includes a 100-h. p. electric plant, with a 100-h. p. General Electric motor, taking current from the Telluride Power Co. Has a hoist, good for 500′ depth, and a 5-drill Ingersoll-Sergeant air-compressor. Buildings, 10 in number, include a 20x40′ wooden machine shop, 20x30′ smithy, 24x26′ office and 16x80′ boarding house.

Production, last quarter of 1908, was 100 to 150 tons of ore weekly, sold direct to smelter, secured at estimated average mining cost of $1 per ton. The property has developed considerable ore bodies, estimated, apparently conservatively, at 100,000 tons, with prospects of much greater tonnage to be opened at depth. Property considered promising.

UTAH BUCKHORN MINING CO. **UTAH.**

Dead. Was succeeded, circa January, 1908, by Del Verde Tunnel Co. Formerly at Ogden, Weber Co., Utah.

UTAH CONSOLIDATED GOLD MINES, LTD. **UTAH.**

Dead. Reorganized, 1903, as Utah Consolidated Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

UTAH CONSOLIDATED MINING CO. **UTAH.**

Office: 949-42 Broadway, New York, N. Y. Mine office: Bingham Canyon, Salt Lake Co., Utah. Works office: Murray, Salt Lake Co., Utah. Has circa 4,900 shareholders. Urban H. Broughton, president; Adolph Lewisohn, vice-president; T. L. Hermann, second vice-president; preceding officers, James Phillips, Jr., and C. N. King, directors; F. P. Addicks, secretary and treasurer;

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Joseph R. Risque, general manager; W. B. Smith, general superintendent; W. M. Johnson, assistant superintendent; C. L. Morris, smelter superintendent; S. Severin Sörenson, mechanical engineer; E. P. Mathewson, consulting metallurgical engineer.

Organized 1903, under laws of New Jersey, with capitalization $1,500,000, shares $5 par, as a reconstruction of Utah Consolidated Gold Mines, Ltd., a British corporation that, in turn, succeeded the Xavier Gold Mines, Ltd., October, 1896. Property of the Utah Consolidated Mining Co. is 2,490 shares of the 2,500 shares of the capital stock of the Highland Boy Gold Mining Co., of New Jersey, latter corporation holding direct title to the Utah properties. Shares are listed on the Boston Stock Exchange.

Dividends of the present company, and its predecessor, have been as follows: $732,000 in 1901; nothing in 1902; $900,000 in 1903; $900,000 in 1904; $1,050,000 in 1905; $1,500,000 in 1906; $2,100,000 in 1907; $600,000 in 1908. Net earnings have been as follows: $1,088,637 in 1903; $1,164,348 in 1904; $1,887,385 in 1905; $2,835,002 in 1906; $1,179,413 in 1907.

Lands, 31 claims, patented, area 229 acres, known as the Highland Boy group, in Carr Fork Cañon, circa 2½ miles from Bingham Canyon. Company also owned a smelter site, in Pine Cañon, Tooele Co., Utah, circa 4 miles across the divide from the mine, but this was sold, late 1908, to International Smelting Co. The company has about 150 acres of mineral land, unexplored previous to 1907, which is to be thoroughly tested, and considerable diamond drilling was done, 1907-1908.

The property has 6 distinct ore bodies, with 3 main ore chutes developed, largest being approximately 320′ in extreme width, by 340′ in length, and of unknown depth. It was claimed in the press, 1907, that the Highland Boy ore body had faulted into the Yampa, but this does not seem proven, though lower ore values are encountered at depth. The ore shutes apparently are longer in the bottom levels, though carrying good values, and likely to continue workable to great depth. Ores are sulphide, carrying 2 to 13% copper and $2.50 combined gold and silver values per ton, average ores carrying about 30% each of iron, silica and sulphur, rendering them self-fluxing. Extensive underground development was done, 1907-1908, proving much new ore of promise, though the average of ore is lower in grade, since 1906. Some good new ore bodies have been opened toward the west, and considerable lead ore of promise has been developed. During 1907 the mine made nearly 2 miles of new openings, and raised stopes were reopened, 1908. Ore reserves, 1907, were estimated at 1,302,930 tons.

The Highland Boy mine is opened by a 900′ shaft and 7 tunnels, of 1,000′ to 2,500′ length, extraction being almost entirely through No. 7, the lowest tunnel, which is 700′ below the crest of the mountain. All tunnels are connected, and ore is milled down to the bottom tunnel for removal. There are 2 large electric hoists on the 700′ level, ore from the bottom workings being raised through blind shafts to the level of the lowest tunnel. The ore breaks easily, and in good sized bodies, extraction being by the top slice caving system, with square-set timbering, expense for latter being heavy, with culls used for underground filling, and ore is broken mainly by contract. The mine has upwards of 15 miles of workings, with electric traction in No. 7, the lowest and main working tunnel.

A 12,700′ aërial tram leads from the portal of No. 7 tunnel to ore bins on the Rio Grande Western railway. There is a subsidiary aërial tram, crossing Carr Fork Cañon, used for handling lumber and mining supplies.

The smelter, at Murray, 17 miles north of the mine, and 10 miles south of Salt Lake City, is of circa 600 tons daily capacity, equipment including 30 McDougall calciners, 3 Wethey calciners and 9 reverberatory furnaces, 2 of the

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latter being 17x48' 6" in size. A 27x56x18' dust-chamber has a steel hopper-bottom, and the works have a 190' stack, 5' 6" in diameter. The smelter includes a converter department. The smelter power plant has a 450-h. p. Nordberg tandem-compound steam engine, and a 250-kw. Westinghouse electric generator. The smelter did good service, giving very clean slags, and produced blister copper of 99% copper tener, with very low smelting costs, but was blown out, January, 1908, owing to trouble with the agricultural interests in the Salt Lake Valley, a court decree enjoining the company from smelting ores carrying in excess of 10% sulphur, and from sending out arsenical fumes. The farmers of the valley demanded $300,000 for permission to allow the smelter to run, but finally came down to a demand for $125,000, providing the company would restrict production to 700 tons daily, which offer was refused peremptorily, and the smelter was blown out, January, 1908.

On suspension of smelting at the company's own plant, a 12-month contract was made with the Garfield smelter, February, 1908, which contract was extended, for 18 months, from Sept. 24, 1908. Smelting at the Garfield plant has been marked by much friction between the Utah Consolidated and the American Smelting & Refining Co., the contention of the former being that costs are greater by about 2 to 2½ cents per pound of finished copper, at Garfield, than they were at the company's own smelter.

The company planned, tentatively, a $1,250,000 smelter in the Pine Cañon district of Tooele county, Utah, 4 miles from the mine, which would have necessitated a tunnel through or a costly aërial tram over the mountain between, or very possibly a combination of tunnel and aërial trams. In November, 1908, the company made a smelting contract with W. D. Thornton, of Butte, Montana, which was assigned by him to the newly-organized International Smelting Co. This contract, for 10 years, provides for treating up to 1,200 tons daily of Utah Consolidated ores, on terms materially more favorable than were given by the Garfield Smelting Co., the contract also providing for the sale, by the Utah Consolidated to the new smelting company, of the smelter site in Pine Cañon, and extensive smoke easements secured in connection therewith. The contract calls for beginning of smelting April, 1910. It will be necessary for the Utah Consolidated to construct, meantime, a transportation system between its mines and the smelter, unless the International company should see fit to provide such a system, with a view to securing other business also from the Bingham camp.

Production has been as follows: 298,700 tons ore, yielding 13,553,483 lbs. fine copper, in 1904; 287,148 tons ore, yielding 17,264,474 lbs. copper, 374,685 oz. silver and 28,290 oz. gold, giving an average extraction of 3% copper, 1.3 oz. silver and 0.1 oz. gold per ton; in 1905; 18,533,974 lbs. copper, 457,812 oz. silver and 42,001 oz. gold in 1906; 279,642 tons ore, yielding 13,987,557 lbs. copper, 390,296 oz. silver and 34,554 oz. gold, giving average returns of 50.87 lbs. copper and 1.4 oz. silver per ton, in 1907. At end of 1908 mine was shipping circa 800 tons of ore daily, to the Garfield smelter, said to average 2.65% copper, with reduced gold and silver values.

Ores smelted averaged returns of 57.9 lbs. copper, 1.1 oz. silver and $2 gold per ton, with a copper cost of circa 5 cents per lb., in 1904; 60.3 lbs. copper, 1.3 oz. silver and $1.98 gold per ton, with net costs of copper 7.6 cents per lb., in 1905; 62.4 lbs. copper, 1.6 oz. silver and $2.87 gold per ton, with net costs for copper of 4.2 cents per lb., in 1906, this being the lowest priced copper made by any large mine in the world, but apparently this low cost was made by drawing unduly on rich reserves; 50.87 lbs. copper per ton, with net costs of 7.45 cents per lb., in 1907. In 1908 costs for smelting are said to have been about 2 cents per lb. above former figures, due partly to increased cost of transportation, but largely to increased smelting charges at the Garfield

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smelter. The Utah Consolidated is a very fine mine, with a good management, and should be capable of increased production, though it is probable that the low costs of 1906 never will be repeated.

UTAH CONSOLIDATED MINING & MILLING CO. **UTAH.**

Office: care of John Y. Smith, secretary and treasurer, Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Thos. R. Cutler, president; Hon. Reed Smoot, vice-president; preceding officers, A. N. Holdaway and Hugh J. Cannon, directors. Organized under laws of Utah, with capitalization $250,000, shares 25 cents par. Lands, 4 claims, near the Sioux Consolidated, with development planned by tunnel.

UTAH COPPER CO. **CALIFORNIA**

Mine office: Lone Pine, Inyo Co., Cal. Samuel McRoberts, superintendent. Organized 1907, under laws of Maine.

UTAH COPPER CO. **UTAH.**

Office: 604 McCornick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Works office: Garfield, Salt Lake Co., Utah. Employs circa 900 men. Chas. M. MacNeill, president; Daniel C. Jackling, vice-president, general manager and chairman executive committee; Spencer Penrose, secretary and treasurer; John Hays Hammond, managing director; Pope Yeatman, associate managing director; A. Chester Beatty, consulting engineer; F. A. Gillespie, assistant secretary and treasurer; preceding officers, Wm. B. Thompson, Col. Chas. Hayden, J. D. Hawkins, Silas W. Eccles and Kenneth K. McLaren, directors; Robert C. Gemmell, general superintendent; J. D. Shilling, mine superintendent; John McDonald, assistant mine superintendent; Frank G. Janney, mill superintendent; Geo. F. Waddell, assistant mill superintendent; William Spencer, mining engineer; G. O. Bradley, mechanical engineer; John M. Hayes, cashier.

Organized June, 1903, and reorganized Apr. 30, 1904, under laws of New Jersey, with capitalization $4,500,000, shares $10 par, increased, October, 1905, to $6,000,000, and again increased, January, 1908, to $7,500,000, shares $10 par; issued, $7,347,500. Retired, 1906, outstanding balance of original bond issue of $750,000, at 7%, paying a premium of 5% therefor. Bonds, authorized, $3,000,000, in denominations of $1,000, at 6%, convertible into stock at $20 per share, at option of holder, prior to Jan. 11, 1911; outstanding, Dec. 31, 1907, $2,964,000. Dividends, quarterly, of 50 cents each, were paid Sept. 30 and Dec. 30, 1908, amounting to $666,824. Controls, through stock ownership, the Bingham & Garfield Railway Co., organized July, 1908, under laws of Utah, with capitalization $1,000,000, shares $100 par. A large share interest in the Utah Copper Co. is held by American Smelters Securities Co. Shares are listed on the Boston and Paris Stock Exchanges. Morton Trust Co., New York, registrar. Annual meeting, fourth Friday in January.

Lands, 18 claims, area 200 acres, with circa 3,000 acres in mill and smelter sites, also sundry surface rights, for dumping waste. In 1908 the company bought surface rights to 29 acres, for $17,500, from the Little Eddy and Puritan companies, and surface rights to 80 acres, for $15,000, from Bingham Amalgamated company, for railroad right of way, waste tracks and dumping room. Mineral lands, bought of De Lamar-Wall Mining & Milling Co., lie on both sides of Bingham cañon, permitting ore extraction by tunnel, to great depth.

Lands show porphyry and quartzite, country rock being monzonite, an altered, decomposed, friable porphyry, that breaks easily, yet stands well, ore being mainly chalcocite, with some chalcopyrite, quite evenly disseminated throughout the porphyry, with occasional veinlets carrying high-grade chalcocite and bornite. The porphyry ore runs 0.75 to 2.75% in copper tenor, and the average of assays of 6,000 samples, 1906, was 1.98% copper; 0.15 oz. silver and

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0.16 oz gold per ton, which was practically identical with the average assays of ore milled to that date. The monzonite ore body has been proven by extensive diamond drill borings, conducted on surface and from the main tunnel to depth of 500', proving a continuous [illegible] ore body for a thickness of 800' to 900' with an estimated average depth of 310' of workable ore. The capping, of leached country rock, carrying unworkable copper values, ranges 50' to 65' in depth, with ore of workable tenor underneath for 300' to 800' depth, succeeded by monzonite too low in copper tenor to be workable.

The mine, while having a single ore-body, is being developed both underground and open-cast, but is essentially a quarrying proposition, like the Rio Tinto and Granby. The underground mine, operated by the top slice caving system, eventually will be broken into open pits, and the entire mine worked open-cast. The mine openings are rectangular, laid out like the streets of a city, with blocks above blocks, like the successive floors of a building. There are 13 tunnels, entering the hills at approximately right angles to the gulch. These tunnels are avenues, and, crossing the avenues, at right angles, parallel with the gulch, are streets, these being opened 150' apart. Paralleling the tunnels, or avenues, are drifts, corresponding to city alleys, these being 75' on either side of the avenues. The tunnels are 10x10', or larger, and all openings are of exceptionally large dimensions, connections between the various floors being secured by upraises from alley to alley. Stope levels are opened at intervals of 17' and 25'. The avenues, streets and alleys are named on the same system as is used in the street nomenclature of Salt Lake City, and the underground mine, as a whole, has nearly 20 miles of openings, under about 40 acres of ground. Timbering costs are said to be less than 2 cents per ton of ore mined, and the mine has, blocked out, above the main tunnel level, about 25,000,000 tons of ore. The main working tunnel has a double tram-track, laid with 30-lb. rails, with an electric haulage system.

The open-cast workings are planned on a truly colossal scale, in magnitude comparable only with the greatest iron mines on the Mesaba Range of Lake Superior. Removal of both overburden and ore is by steam-shovels, and stripping was begun with steam-shovels, August, 1906, the capping ranging 50' to 65' in depth. For the third quarter of 1908, stripping averaged 87,000 cu. yds. of capping monthly, or at the rate of about 10 acres yearly, each acre being estimated to carry about 1,000,000 tons of payable ore. The ground must be blasted before removal by steam-shovel, and the method of mining followed provides for removal of ore in 60' benches, in sections 40' thick and 1,000' long, each section carrying circa 180,000 tons of ore, requiring, for blasting, about 25 tons of dynamite, ground being broken at a cost of about 1½ cents per ton. A single blast has torn down 15,000 tons of ore. Mining equipment, for open-cast operations, includes 7 Vulcan and Marion steam-shovels, of 70 to 90 tons weight each, 3 being employed in stripping and 4 for removal of ore.

For removal of ore and deposition of overburden, the company has 10 miles of standard gauge tracks, laid with 65-lb. steel rails, equipment including 5 locomotives, and 125 dump-cars of 6 cu. yds. capacity each. The waste-rock from the capping is loaded on cars, and dumped down the cañon, on lands bought for the purpose.

At the end of 1908 the company estimated that there had been developed, on a 72-acre tract, an average of 1,000,000 tons of ore per acre, at an average depth of 310', giving 72,000,000 tons of ore proven, sufficient for nearly 30 years production, on the basis of 2,500,000 tons of ore extraction yearly. The principal disadvantage of steam-shovel work lies in the mine being on both sides of a precipitous gulch, which causes the steam-shovel employed on stripping to run speedily into ore, the cuts being unpleasantly short, owing to the sharp pitch. This disadvantage is overcome, partially, by switchbacks, and in case

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of serious trouble there are alternative methods available for the removal of overburden and ore, these including the construction of a cog-line railway, to the top of the ore body, to give access to the upper portion.

Mining equipment includes a steam plant, with air-compressors and power drills, but, owing to ore extraction being mainly open-cast, and underground ore being secured through tunnels, the mining plant is smaller than may be found at many properties having a tithe of the productive capacity of the Utah Copper Co.

The company has had very poor service from the Rio Grande Western railroad, which, holding the entire Bingham camp at its mercy, is inclined to be somewhat dictatorial and dilatory. For this reason the Utah Copper Co. secured a charter, 1908, for the Bingham & Garfield Railway Co., and plans the construction of a 20-mile railway line, from Bingham Canyon to Garfield, at an estimated cost of about $1,000,000.

The company has 2 mills, the first being near the mine, and the second, which is one of the greatest in the world, at Garfield Beach, 19 miles distant.

The old mill, remodeled 1908, of circa 900 tons daily capacity, was so planned that it could be increased, by units, to circa 6,000 tons ultimate capacity, but the development at the mine rendering it probable that this capacity would be insufficient, a more extensive millsite was secured, on Great Salt Lake. The old concentratory, at Copperton, 1½ miles below Bingham, receives ore over a spur of the Bingham branch of the Rio Grande Western railway, the railroad track entering the mill over a trestle, ore being dumped into bins beneath the track. The building is 192x327' in size, of wood, sheathed with iron. Equipment includes 2 Gates centrifugal crushers, 4 sets of rolls, 6 Hartz jigs, 4 Wilfley tables, 2 Overstrom tables, 2 Card tables, 52 slime tables, 24 Chilean mills, 18 six-foot Frue vanners, 6 hydraulic classifiers, and 6 revolving screens. The crushing department, 26x44' in size, has two 1,200-ton Gates crushers, and 2 sets of 36" and 30" Gates rolls. Ore is drawn from the bins, through chutes, to a 200' belt-conveyor that carries ore to the crushers. The boiler-house, 36x100', has eight 75-h. p. boilers, with automatic stokers, and 125-h. p.; 150-h. p., and 350-h. p. engines.

The new mill is located on a 3,000-acre site, 4 miles east of the Garfield smelter and one mile east of the works of the Boston Consolidated, reached by an 8-mile branch of the Rio Grande Western railway. The mill is of steel frame, on concrete foundations, with reinforced concrete floors, iron siding, and composition roofing. The mill is in two 3,000-ton units, of 6 sections each, giving a capacity of 500 tons daily to each section. Each unit is 300x505' in size, the two units, with their outlying buildings and yards, occupying about 20 acres, and the plant is so designed that two additional units can be constructed, whenever desired, giving the mill a daily capacity of 12,000 tons. Milling was begun June, 1907, with 2 sections, and the 12th and final section of the mill was started circa November, 1908.

The ore-bins are of 30,000 tons capacity, there being bins of 23,000 tons capacity in the coarse crushing department, and of 7,000 tons capacity in the fine crushing department.

Equipment of each section of the mill consists of 2 No. 7½ Gates crushers; 2 sets of 20x54" rolls, of special design; 12 sets of 16x36" rolls, of special design; 18 six-foot Chilean mills, of special design; 36 jigs, of special design; 24 No. 5 Wilfley tables, and 52 six-foot suspended vanners, of special type.

The 13,000-h. p. power plant, circa 2,000' from the mills, has two 26x54x48" Allis-Chalmers Corliss cross-compound condensing engines, direct-connected to two 1,500-kw. alternating current generators, and three 32x70x48" Nordberg Corliss cross-compound condensing engines, direct-connected to three 2,250-kw. alternating current generators. The boiler plant has twenty 500-h. p.

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Heine water-tube boilers, working under 175 lbs. steam pressure, equipped with stokers having separate mechanical drives, of special design.

The machine-shop, 50x105', of steel frame and brick walls, on concrete foundations, is thoroughly equipped for general repair work.

Water formerly was taken from the Garfield Water Co., but a sufficient supply has been developed on the company's own lands. The pumping plant, of 10,500 gallons capacity per minute, has one 12" two-stage turbine pump, direct-connected to a 250-h. p. General Electric induction motor, with capacity of 2,500 gallons per minute; one 12" two-stage turbine pump, direct-connected to a 350-h. p. General Electric induction motor, with capacity of 3,500 gallons per minute; and one 15" two-stage turbine pump, direct-connected to a 450-h. p. General Electric induction motor, with capacity of 4,500 gallons per minute. These pumps force water, from a pond, through 2,000' of 24" pipe, against a head of 230' to a 5,500,000-gallon concrete reservoir. There also is an auxiliary pumping plant, forcing water to a 500,000-gallon high-service concrete reservoir, 100' above the main reservoir, this having 3 Worthington 8" single-stage pumps, direct-connected to induction motors, with combined capacity of 1,500 gallons per minute.

The nature of the ore, which is mainly very finely disseminated chalcocite, necessitates fine crushing, which causes considerable sliming. The ore concentrates easily, but losses in tailings are heavy, having been, 1906, at the old mill, 0.80 to 0.75% copper, and, 1908, the mills treated ore partially oxidized, which did not give very clean extraction, but the mills should do better on ores mined from greater depth. The new mill was expected to put 18 to 23 tons of ore into one, giving concentrates averaging 26 to 30% copper and $6 to $10 combined gold and silver values per ton. For the first eleven days of August, 1907, the ore treated was said to have averaged 1.91% copper, by assay, with an extraction of 1.36% or 27.2 lbs. fine copper per ton, with losses of 0.55% copper in tailings, giving a recovery of 71%. In May, 1908, the mill was putting about 23 tons into one, with a recovery of only about 67% of assay values, and in July, 1908, the mill was said to be making an average recovery of 23 lbs. fine copper per ton. The management hopes, eventually, to increase the extraction to 80% of assay values, but it seems doubtful if this can be done, with ore that slimes so readily, with such high concentration.

Production was 4,698,906 lbs. fine copper for calendar year 1906, and was 33,118,400 lbs. fine copper for year ending June 30, 1908. Production, 1908, was 8,537,989 lbs. for the first quarter, 11,568,390 lbs. for the second quarter, and 12,000,096 lbs. for the third quarter, with a total production of 43,689,875 lbs. fine copper for the year. These figures render it obvious that the mine has a productive capacity of about 50,000,000 lbs. fine copper yearly, with its present milling capacity of 7,000 tons per diem.

Costs were said, for August, 1907, to have been about 45 cents per ton for actual mining, or, with general administrative costs, taxes, etc., 68 cents per ton for mining. President MacNeill stated, early 1908, that mining costs, by steam-shovel, were about 25 cents per ton only. For the second quarter of 1908 net earnings were $493,694, on a production of 11,568,390 lbs. fine copper, made at an estimated average cost of 3.16 cents per lb. For the third quarter of 1908, net earnings were $501,391.60, with copper made at an estimated average cost of 3.73 cents per lb. These figures would indicate the ability of the company to make copper for an average cost under 10 cents per lb., and perhaps for 9 cents per lb., but the estimated average cost of 7 cents per lb. is not likely to be reached. Former estimated costs of $1.75 to $1.85 per ton of raw ore treated, apparently should be increased to $2 to $2.25 per ton, to allow a reasonable margin for safety, and, with an average recovery of 23 lbs. fine copper per ton of ore treated, cost of finished copper would be 8.7 cents per lb.,

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on the basis of $2 cost per ton, or 9.8 cents per lb. on the basis of cost of $2.25 per ton of ore. It is obvious, however, that while the Utah Copper Co. has not reached the extreme low cost predicted by its management, and scarcely seems likely to do so, it has fully demonstrated its ability to make copper, at the rate of 50,000,000 lbs. per annum, at a cost safely within 10 cents per lb., and is making copper, beyond question, at a somewhat lower average cost than the average of costs of the ten largest copper producers of the world, of which the Utah now is one. The ore reserves of the mine are as nearly inexhaustible as those of any mine of any metal.

The Utah Copper Co. has been well managed, and the original owners, connected with the United States Reduction & Refining Co., are regarded with much favor, as thoroughly experienced and capable mining men, but the property has suffered somewhat, in the eyes of conservative investors, through the acquisition of a heavy share interest, said, in some quarters, to constitute a control, by the Guggenheims, and suspicions of the possible future of the property, if under Guggenheim control, were aggravated by newspaper talk of merging this property with other Guggenheim interests, at Ely, Nevada, which merger would not be to the best interests of the shareholders of the Utah Copper Co. Thomas W. Lawson apparently was sold a call on a large block of stock of the Utah Copper Co., in 1908, and endeavored—at least ostensibly—to boost the shares, whereupon they immediately sold lower, this being the usual effect of Lawson's endorsement of a mining property. The management is entitled to commendation for giving quarterly reports that furnish valuable detailed information, and apprise shareholders of the manner in which their interests are being conserved.

UTAH DEVELOPMENT CO. **UTAH.**

Dead. Was succeeded, circa September, 1908, by North Utah Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah. Fully described Vol. VII.

UTAH & EASTERN COPPER CO. **UTAH.**

Office: 127 Church St., New Haven, Conn. Operating office: Herald Bldg., Salt Lake City, Utah. Mine office: Dixie, Washington Co., Utah. Works office: Shem, Washington Co., Utah. Louis E. Stoddard, president; Chas. E. Graham, vice-president; T. W. Farnam, secretary and treasurer; preceding officers, E. G. Stoddard, W. D. Bushnell and Fredk. F. Brewster, directors; Chas. H. Doolittle, general manager. Organized Feb. 7, 1901, under laws of West Virginia with capitalization $1,500,000, increased later to $3,500,000, shares $5 par, in $2,000,000 preferred and $1,500,000 common stock.

Lands, 11 claims, patented, area 220 acres, and a 40 acre smelter site, mining lands including the old Dixie mine, in the Tutsagubet or Cave Springs district, near Green River. Property shows 5 ore bodies, in limestone, one, of 40' estimated average width, carrying cuprite, azurite and massive malachite, giving average assays of 15% copper. Principal development was by a 775' blind shaft, sunk from the breast of a 225' tunnel, but the shaft caved, June 1, 1905, and it was necessary to run a new tunnel, of 500', to reopen the mine. Old workings were said to show about 100,000 tons of ore. The mine uses gasoline power.

The old 25-ton smelter, antiquated and poorly located, is idle. The new smelter, at Shem, has a 100-h. p. water-jacket blast-furnace, with water power, secured from the Santa Clara river, circa 2 miles distant, and an auxiliary steam plant. The smelter is about 50 miles from Acoma, on the Rio Grande Western railway, the nearest shipping point, and transportation for 14 miles of this distance, with a down-grade haul, is by traction engine.

Production has been as follows: 1,448,597 lbs. fine copper in 1904; 400,166 lbs. in 1906; 391,779 lbs. in 1907. The property was closed down, October, 1907, owing to depression in the metal market. Notwithstanding lack of rail

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connections, which is a very serious handicap, property is considered valuable, and management good.

UTAH-ESMERALDA COPPER MINING CO. **NEVADA.**

Office: Provo, Utah. Letter returned unclaimed from former mine office, Fitting, Humboldt Co., Nev. W. M. Roy, president; J. T. Hammond, vice-president; L. A. Croft, secretary and treasurer; preceding officers, L. M. Stole, J. B. Jensen, W. H. Ray and S. H. King, directors; Wm. M. Roylance, general manager; John F. Westphal, superintendent. Organized 1907, under laws of Utah, with capitalization $1,000,000, shares $1 par. Lands, 42 claims, in the Walker Lake district, opened by tunnel, said to show a 16' vein with a 4' paystreak carrying cuprite and native copper. A carload shipment of ore was said to assay 6% copper, 40 oz. silver and $8 gold per ton. Idle.

UTAH EXTENSION COPPER MINING CO. **UTAH.**

Dead. Was merged, 1908, in North Utah Mining Co., of Bingham. Organized Nov. 15, 1906, under laws of Maine, with capitalization $750,000. Officers were L. L. Height, president; E. W. Cuptill, treasurer; I. W. Dyer, clerk. Formerly at Bingham Canyon, Salt Lake Co., Utah.

UTAH GOLD & COPPER MINES CO. **UTAH.**

Mine office: Newhouse, Beaver Co., Utah. Dr. C. E. Watkins, general manager; John T. Breckon, superintendent. Capitalization $1,000,000, shares $1 par.

Lands, 30 claims, in 5 groups, south of Newhouse, in the Washington district of the Needle Range Mountains, also 160 acres at State Line, Iron Co., Utah. The Beaver County lands include the Blue Bell group, having pits and shafts, deepest 50', showing ore, with development mainly by tunnel, showing silver-lead ore assaying up to 17% lead and 14 oz. silver per ton, and copper ore assaying up to 9% in tenor.

UTAH GOLD MOUNTAIN MINING CO. **COLORADO & UTAH.**

Mine office: Marysvale, Piute Co., Utah. Letter returned unclaimed from former mine office, Telluride, San Miguel Co., Colo. Organized October, 1906, under laws of Utah, with capitalization $4,500,000, shares $1 par, as a merger of the Log Cabin Gold & Copper Co., Ltd., and the Gold Development Co. Lands, 67 claims, area 1,300 acres, 12 miles west of Marysvale, in the Mount Baldy district, said to have 3 tunnels, with circa 3,000' of workings, showing a wide vein said to give ore of good average assay value. Is said to have an air-compressor.

UTAH IDEAL MINING CO. **UTAH.**

Letter returned unclaimed from former office, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Wm. H. Flower, president; Wm. Rees, secretary and treasurer. Organized March, 1908, under laws of Utah, with capitalization $30,000, shares 10 cents par. Lands, 7 claims, in Big Cottonwood cañon.

UTAH INDIAN PEAK MINING CO. **UTAH.**

Office: care of Peter Porter, secretary and treasurer, Salt Lake City, Utah. Mine office: Lund, Iron Co., Utah. E. G. Rowe, president. Organized 1907, with capitalization $500,000, shares $1 par. Lands are in the Needle Range Mountains, 8 miles west of Lund.

UTAH MIDLAND COPPER MINING CO. **UTAH.**

Mine office: Basin, Grand Co., Utah. Julius V. Brand, manager. Is said to have ore carrying 2 to 30% copper, and $6 to $50 per ton combined gold and silver values. Presumably idle.

UTAH MINING CO. **MEXICO.**

Mine office: Temosáchic, Guerrero, Chihuahua, Mex. J. C. Warrel, superintendent. Organized under laws of Arizona, with capitalization $3,000,000.

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Lands, adjoining the Tres Amigos mine, are said to carry an 80′ vein, opened by a 100′ tunnel showing copper ore.

UTAH MINING, MILLING & TRANSPORTATION CO. **UTAH.**

Office: Frisco, Beaver Co., Utah. C. P. Pritchard, general manager. Lands include the Hub mine, adjoining the Burning Moscow, in the Star district. Property has a vein of 2′ to 5′ width, carrying argentiferous lead and copper ores, developed by a permanent working shaft of circa 200′ depth.

UTAH & MONTANA COPPER MINING CO. **MONTANA.**

Mine office: Phillipsburg, Granite Co., Mont. Mine is said to have produced, under a former management, considerable low grade ore, from surface workings.

UTAH-NEVADA COPPER CO. **UTAH.**

Office: 801 Equitable Bldg., Denver, Colo. Mine office: Elgin, Grand Co., Utah. John P. Brockway, president; Dr. W. F. Temple, vice-president; Wm. M. Ingersoll, secretary and treasurer; E. P. Wolverton, general manager; preceding officers and N. T. Plummer, directors. Organized Jan. 9, 1905, under laws of Arizona, with capitalization $1,250,000, shares $1 par. International Trust Co., Denver, registrar.

Lands, 45 claims, area 900 acres, also seven 5-acre millsites, in the Keg Springs district of Emery county, Utah, and 1,220 acres of hydrocarbon deposits, in eastern end of Wayne county, Utah, giving total holdings of 2,215 acres. The Keg Springs lands show sundry fissure veins and contact deposits between limestone and porphyry, carrying melaconite and chalcocite, assaying up to 70% copper, 30 to 50 oz. silver and $5 to $15 gold per ton. Development is exclusively by open-cuts, company estimating that 200,000 tons of second-grade ore, worth $50 to $70 per ton, is exposed thereby, which is a serious overestimate. Mill tests of second-grade ore gave concentration of 6 into 1, ore treated being said to assay 18.8% copper, 4 oz. silver and 2 oz. gold, which would give concentrates of the exceptional richness of 112.8% copper, in addition to gold and silver values, unless a considerable portion of the copper were lost, which probably was the case. Ores of such grade do not require concentration.

Owing to serious dissensions, and complaints about the handling of the company's affairs, the management was taken away from Wm. F. Kendrick and associates, after work had been suspended for some time because the latter furnished no funds. Property considered promising, but management is not regarded favorably. Idle and apparently moribund.

UTAH-NEVADA DEVELOPMENT CO. **NEVADA.**

Office: 329 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Black Horse, White Pine Co., Nev.

UTAH-NEVADA DEVELOPMENT CO. **UTAH.**

Mine office: Robinson, Juab Co., Utah. Leslie L. Savage, manager. Has a 100-ton concentrator, completed late 1908.

UTAH-NEVADA GOLD & COPPER MINING CO. **UTAH.**

Office: care of David Jensen, vice-president, Ogden, Utah. Mine office: Promontory, Box Elder Co., Utah. J. Stanley Dee, president; W. D. Pyper, treasurer; I. C. Dallimore, secretary. Organized 1903, with capitalization $500,000, shares $1 par. Lands, 6 claims, in the Newfoundland district of Box Elder and Weber counties, Utah, having sundry open-cuts and shafts of 50′ and 70′, showing 2 veins of 3′ to 5′ width, carrying chalcopyrite and pyrite and quartz gangue, assaying up to 32% copper, 17 oz. silver and $12 gold per ton. Presumably idle.

UTAH & NEW YORK GOLD & COPPER MINING & MILLING CO. **UTAH.**

Office: care of G. D. B. Turner, secretary and treasurer, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. J. E. Galigher, president;

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A. F. Schneider, vice-president. Lands include the Blue Bird group, near the Hickory mine of the Majestic, having a 225' main shaft.

UTAH SOUTHERN GOLD & COPPER MINING CO. **UTAH.**

Dead. Formerly at Milford, Beaver Co., Utah. Described Vol. VI.

UTAH SMELTING CO. **UTAH.**

Dead. Was succeeded, 1908, by Independent Smelting Co. Formerly at Bonneville, Box Elder Co., Utah. Described Vol. VII.

UTAH UNITED COPPER CO. **UTAH.**

Office: 222 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Employs 4 men. John T. Treasure, president; A. J. McMullen, vice-president and general manager; Chas. A. Weaver, secretary; A. D. McMullen, treasurer; D. P. Rohlfing, engineer. Organized Sept. 1, 1908, under laws of Utah, with capitalization $600,000, shares $1 par, as a merger of Wasatch Mining & Milling Co., and Skylark Copper Mining & Milling Co. Annual meeting, second Tuesday in October.

Lands, 12 claims, 2 patented, area 240 acres, also a 10-acre millsite, in the Beaver Lake district, showing fissures and contact veins, in and between limestone and granite-porphyry, there being 3 ore bodies, estimated by company to range 20' to 100', 50' to 200' and 50' to 300' in width, of which one, traceable 6,300', is opened by shafts of 30', 100', 150', 310' and 415', and by 4 tunnels, longest 350', estimated to show 50,000 tons of ore blocked out for stoping. Ore is oxidized to depth of 170', and sulphide below. Ores are claimed to average 6.2% copper, up to 60% lead, 6 oz. silver and $15.40 gold per ton. Company plans continuous development.

UTAH-YERINGTON MINING CO. **NEVADA.**

Office: Provo, Utah. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. John Roundy, president; Jos. Wirthlin, vice-president; Heber C. Jex, secretary and treasurer; preceding officers, Heber C. Harris and Jack Cockrell, directors. Organized 1907, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, 5 claims.

UTE COPPER CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Thos. Weir, president; John Weir, Jr., vice-president; J. M. Burt, secretary and treasurer; preceding officers, Henry Catrow and N. J. Catrow, directors. Organized 1907, under laws of Utah, with capitalization $3,000,000, shares $5 par. Lands, circa 225 acres, patented, including the old Winnimuck mine, which was an important silver-lead producer in early days. Property is opened by the 900' Weir tunnel, and is said to be developing through the tunnel of the Bingham-Butte Mining Co. Has an air-compressor.

UTICA & BISBEE DEVELOPMENT CO. **ARIZONA.**

Office: Utica, N. Y. Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. Organized circa 1906, to take over the Erickson group, in Tombstone Cañon, northwest of Bisbee. Presumably idle.

UTICA MINING & MILLING CO. **COLORADO.**

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Ward, Boulder Co., Colo. Ores carry gold, silver and copper. Has water power and a 20-stamp mill. Presumably idle.

UTOPIA MINING & MILLING CO. **WYOMING.**

Mine office: Centennial, Albany Co., Wyo. Development is by a tunnel, said to show a 12' vein carrying ore giving high assay values in gold, with fair silver and copper values.

COMPAÑIA MINERA DE LAS VACAS Y LOS YELOS. **CHILE.**

Office: Valparaiso, Chile. Mine office: Petorca, Aconcagua, Chile. Organized Aug. 6, 1905, under laws of Chile, with capitalization 400,000 pesos, shares 10 pesos par.

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VAL D'ELSA COPPER CO., LTD. **ITALY.**

Dead. Formerly had an office at 123 Wellington St., Glasgow, Scotland.

VALDEZ-BOSTON COPPER CO. **ALASKA.**

Office: Alaska Bldg., Seattle, Wash. Letter returned unclaimed from former mine office, Valdez Alaska. Lands are near the Alaska-Northwest Copper Co.

VALENCIA. **PERÚ.**

Mine office: Quichin, Camaná, Arequipa, Perú. Property, near the coast, in southern Perú, has argentiferous copper ore.

VALENCIA COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Sherwood, Trinity Co., Cal. Fully described Vol. VI.

SOCIADAD VALENCIANO-ANDALUZA DE ALTOS HORNOS y MINAS DE PEÑAFLOR. **SPAIN.**

Office: Glorieta, 1, Valencia, Spain. Mine office: Peñaflor, Sevilla, Spain. Don Baldomero Deu, president and agent. Capitalization, 1,500,000 pesetas, shares 250 pesetas par. Property is the Elvira mine and extensions, carrying copper and iron pyrites, at Peñaflor, and a group of claims, area 144 hectares, at Pueblo de los Infantes, Sevilla.

VALENSUELLA COPPER CO. **ARIZONA.**

Office: 3543 W. 23d Ave., Denver, Colo.: Mine office: Quartzite, Yuma Co., Ariz. Col. Richard Darling, president and general manager; F. W. Deidesheimer, treasurer; Geo. C. Foulkes, secretary. Organized November, 1901, under laws of Arizona, with capitalization $1,250,000, shares $1 par.

Lands, 7 claims, patented, area circa 100 acres, also a 60-acre mill and smelter site, 12 miles southwest of Quartzite, 70 miles from the Southern Pacific railroad and 15 miles from steamer landing on the Colorado river, supplies being received by water. Country rocks are limestone and schist, carrying 2 contact veins, of fair size, developed by shafts of 200′ and 270′, with about 1,300′ of workings, showing malachite, azurite and oxide ores, giving average assays of 12% copper, 4 oz. silver and $4 gold per ton. Has gasoline power, with two 500′ hoists, 2 engine-houses, 18x24′ smithy, and 6 dwellings, also a 1,000′ artesian well. Has a 30-ton Vulcan water-jacket blast-furnace. Idle.

VALENTINE COPPER & GOLD MINING CO. **UTAH.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah. Described Vol. VI.

VALENZUELA COPPER MINING CO. **ARIZONA.**

Office and mine: Benson, Cochise Co., Ariz. Organized 1907. Lands, circa 25 miles northwest of Benson, near the San Domingo mine of the Hub Mining & Investment Co., are said to show extensive outcrops of self-fluxing copper ore.

VALEO MINING CO. **UTAH.**

Office: care of Hon. Thomas Kearns, general manager, Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. J. P. Boyle, superintendent. Has auriferous and argentiferous copper ores. Idle.

VALERIE MINE. **YUKON**

Mine office: White Horse, Yukon, Canada. Arthur D. Palmer, owner and manager. Mine, circa 3 miles southeast of the Arctic Chief, has a 100′ shaft, in an 18′ vein said to carry ore averaging about 10% copper. Has shipped a little high grade sulphide ore. Employs circa 15 men.

SOCIÉTÉ ANONYME FRANÇAISE DES MINES DE CUIVRE DE VALIEVO. **SERVIA.**

Office: 18 Rue Rougemont, Paris, France. Mine office: Rebelj, Valievo, Servia. M. Ducos, president; A. Bevelley, vice-president. Organized Jan. 10, 1901, under laws of France, with capitalization 2,000,000 francs, shares 100 francs par. Debentures, 50,000 francs, at 6%, in bonds of 100 francs par.

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COMPAÑIA MINERA BRONCES DE VALLENAR. **CHILE.**

Office: Iquique, Chile. Mine office: Vallenar, Atacama, Chile. Organized Nov. 30, 1900, under laws of Chile, with capitalization 36,000 pesos, shares 50 pesos par.

VALLEY MINING & MILLING CO. **COLORADO.**

Dead. Formerly at West Cliff, Custer Co., Colo. Fully described Vol. VI.

VALLEY VIEW MINING CO. **CALIFORNIA.**

Office: San Francisco, Cal. Mine office: Lincoln, Placer Co., Cal. Lands, 90 acres, patented, showing impregnations 250′ wide, with circa 25′ of ore, between schistose walls. Has a gossan outcrop, nearly 110′ wide and 1,000′ long, carrying average gold and silver values of about $4 per ton. Ore shipped has average about 5% copper. Has two 5′ Huntington mills. Idle several years.

VALLEY VIEW MINING CO. **MONTANA.**

Dead. Formerly at Anaconda, Deer Lodge Co., Mont.

VALRUBIO GROUP. **SPAIN.**

Office: care of M. Yglesias, owner, 2 Tokenhouse Bldgs., London, E. C., Eng. Mine office: Paimogo, Huelva, Spain. Property, including the Valrubio, San Carlos and San Andres mines, with total area of circa 200 acres, lying between the Romanera and Monterubio groups, and carrying the western extensions of the San Vicente veins, is under lease to Spanish Copper Co., Ltd.

VALTARO COPPER MINES, LTD. **ITALY.**

Office: 70 Queen Victoria St., London, E. C., Eng. Mine office: Corchia, Borgotaro, Parma, Italy. Marquis N. Melilupi, chairman; F. Lambert, managing director; A. Ireland, secretary. Organized Apr. 25, 1907, under laws of Great Britain, with capitalization £120,000, shares £5 par; issued, £33,485.

VAL VERDE COPPER CO., LTD. **ARIZONA.**

Dead. Formerly at Humboldt, Yavapai Co., Ariz. Fully described Vol. IV.

VAN ANDA COPPER & GOLD MINES CO., LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Van Anda, Texada Island, B. C. Fully described Vol. V.

VAN BRITT COPPER CO. **ARIZONA.**

Mine office: Planet, Yuma Co., Ariz. Organized 1908. Lands, on Bill Williams Fork River, are said to show ore giving average gross assay values of circa $80 per ton.

VANCOUVER & BOUNDARY CREEK DEVELOPMENT & MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Penticton, Boundary district, B. C.

VANCOUVER COPPER CO., LTD. **BRITISH COLUMBIA.**

Office: 4 Sun Court, Cornhill, London, E. C., Eng. Mine office: Mount Sicker, Vancouver Island, B. C. J. Proctor, chairman; Cecil M. Bryant, consulting engineer; W. Copper, secretary; Edw. Stables, superintendent. Organized Feb. 27, 1907, under laws of Great Britain, with capitalization £110,000, shares £1 par; working capital, £30,000. Debentures, £20,000, first-mortgage bonds, at 6%, due July, 1912.

Lands include the Lenora mine, adjoining the Tyee, carrying a continuation of the Tyee ore bodies in a chute of 30′ to 40′ width, with a strong gossan capping. Property includes the 5-mile Mount Sicker narrow-gauge railway, with 1,136 acres of right-of-way, sundry town lots at Crofton, and the Mount Sicker hotel. Also holds, under bond and lease, the Indian Chief group, at Sidney Inlet, Vancouver Island, B. C., from which 2 ore shipments were made, late 1907. Under former management the Lenora ores were divided into 2 grades, first grade averaging 7.95% copper, 3.5 oz. silver and 0.17 oz. gold per ton, and second grade, which constituted about two-thirds of the production, averaging 1.8% copper and 0.045 oz. gold per ton. Production, 1907, of Lenora,

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was circa 1,700 tons of ore, carrying about 140,000 lbs. fine copper. Property considered promising.

VANCOUVER ISLAND COPPER CO., LTD. **BRITISH COLUMBIA.**

Mine office: Sidney, Vancouver Island, B. C. Organized 1907, under laws of British Columbia, with capitalization $100,000, shares $1 par. Lands are at Sidney Inlet, in the Clayquot division of the Alberni district, Vancouver Island, B. C. Is said to have contracted for a 200-ton Riblet aërial tram, to connect with ore bunkers at tidewater.

VANCOUVER ISLAND MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Office: 45 Leadenhall St., London, E. C., Eng. Mine office: Duncans, Vancouver Island, B. C. F. H. Faviell, chairman; J. I. Fifield, secretary. Organized Nov. 18, 1902, under laws of Great Britain, with capitalization £50,000, shares £1 par; issued £35,895. Lands, circa 1,800 acres, apparently held under 2-year option, lying mainly east of the Tyee and supposedly carrying the eastern extension of the Tyee. The Westholm has a 510′ two-compartment shaft, 700′ west of known occurrence of ore in the Tyee, and has about one-half mile of workings, showing, on the 500′ level, a wide mineralized zone with occasional concentrations of 3 to 10% copper tenor. The Blue Bell has a 110′ shaft, from which 5 carloads of ore, shipped 1906, gave returns of 5 to 8% copper.

VANCOUVER RAILWAY SYNDICATE, LTD. **BRITISH COLUMBIA.**

Dead. Property sold, February, 1907, to Vancouver Copper Co., Ltd. Formerly at Mount Sicker, Vancouver Island, B. C.

VAN-ROI MINING CO., LTD. **BRITISH COLUMBIA.**

Office: Salisbury House, London, E. C., Eng. Mine office: Rossland, Trail district, B. C. Lord Ernest Hamilton, chairman; preceding officer, F. C. D. Haggard, A. B. Deablo and H. W. Morrison, directors. Organized July 9, 1908, under laws of Great Britain, with capitalization £34,500, in 30,000 preference shares of 1s. par. Property is the Vancouver group, 8 claims, 1 fractional, in the Slocan district, carrying mainly silver-lead ores.

VARIN & HUGUET. **ALGERIA.**

Mine office: El Miliah, Philippeville, Algeria. Property is the Achaiches mine, which, in 1905, employed 47 men. At last accounts planned to smelt ore at the mine. Presumably idle.

VEILED PROPHET COPPER CO., LTD. **ARIZONA.**

Dead. Formerly at Clifton, Graham Co., Ariz. Described Vol. VI.

VEKOL MINING CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Vekol, Pinal Co., Ariz. Employs circa 50 men. Maj. E. S. Garnett, president; J. V. Neuhaus, vice-president; J. M. Cotton, treasurer; S. J. Garnett, secretary; Wm. Forbach, superintendent.

Lands, 42 claims, said to have been bought for circa $200,000, in the Vekol Mountains, about 35 miles southwest of Casa Grande. Lands include 6 old properties, dating from 1881, with about 6 miles of workings, said to have produced, in the past, circa $3,000,000 in silver and lead, and the old ore dumps are said to contain 350,000 tons of second grade ore that probably can be treated at a profit. The old mines shipped some ore carrying up to 4,000 oz. silver per ton, with considerable lead and a small amount of copper, with strong indications of increased copper values at depth. The mine has a new 380′ two-compartment shaft, said to show good ore.

Equipment includes steam power, air-compressor and 3 hoists, one good for 1,000′ depth. Buildings include a smithy, machine-shop, carpenter-shop, office and laboratory. The mill is of 40 tons rated daily capacity. Property considered promising.

VELARDEÑA MINING & SMELTING CO. **MEXICO.**

Office: 71 Broadway, New York, N. Y. Mine and works office: Velar-

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deña, Cuencamé, Durango, Mex. Wm. C. Potter, chairman executive committee; H. M. Moran, general manager; Wm. Davey, mine superintendent; W. H. Foster, smelter superintendent. Is controlled, through ownership of 60% of capital stock, by American Smelters Securities Co.

Lands, 2,500 pertenencias, area 6,177 acres, including the town of Velardeña, with a population of 5,000. Lands include the Terneres and Santa Maria silver-lead mines, the Copper Queen mine, carrying argentiferous copper ores, and a number of smaller properties. The mines, first opened circa A. D. 1650, were worked originally for silver-lead carbonates, succeeded at depth by zinciferous and cupriferous silver-lead sulphides.

The Copper Queen, or Reina de Cobre mine, also known as El Cobre mine, is 27 kilometers by rail from Velardeña, and the ore is mainly copper, said to average about 3% copper and 250 grams silver per ton, though there is considerable silver-lead. Ores, as developed in this property, are mainly oxidized, and normal production is 400 to 500 tons daily of low grade ore.

The Santa Maria mine, at Velardeña, is opened by numerous shafts, and production is 100 to 500 tons daily of silver-lead ore.

The Terneres mine is said to have produced $22,000,000 worth of ore before coming under the present ownership. Development is by a 600′ main shaft, showing good ore in the bottom, and by a main tunnel with electric haulage. The property has about 25 miles of workings, and production, mainly copper ore, though with considerable silver-lead ore, amounts to about 400 tons daily. The Terneres has an aërial tram to Velardeña.

A 1,200-h. p. central power plant has steam power and gas producers, also a complete electric plant, with power generated partly by water, but mainly by steam and gas engines. Equipment includes electric hoists and electric air-compressors.

Buildings include necessary shops, offices and a considerable number of dwellings for employes.

The company has a private narrow-gauge railroad, known as the Ferrocarril Velardeña, of about 20 miles length, connecting the mines and smelters, the principal branch being a 29-kilometer line from Velardeña to the Copper Queen mine. The company also plans an aërial tram from the mines to the new smelter, 8 miles distant.

The concentrator, rated at 200 tons, may be increased to 500 tons daily capacity.

The reduction works include two smelters, the oldest being antiquated and out of commission.

The new smelter, blown in 1907, is about 4 miles from Pedriceña, on the Mexican National Railway. This has three 150-ton lead furnaces and three 250-ton copper furnaces, with room for an additional copper cupola. There are twelve 250-ton charging-bins, surmounted by a movable electrical steel bridge, for distribution of charges, charging-cars being loaded automatically from the bins, and hauled to the charge-floor by electric locomotives. Each blast-furnace has an elliptical double brick-lined settler, 4x12′ inside measurement, and slags are handled by 10-ton cars, hauled by electric locomotives. There are extensive dust-chambers and flues leading to a 230′ brick stack. A briquetting plant handles flue-dust and fines. The works have no converter, matte being shipped to the Aguascalientes smelter for reduction. The lead smelter includes 5 Godfrey roasters and 5 Huntington-Heberlein converters for the desulphurization of lead sulphides, with a capacity of 125 tons daily.

OLIVERIO L. VELASCO y CA. **MEXICO.**

Office: Apartado 953, Mexico, D. F. Mine office: Chichihualco, Bravos, Guerrero, Mex. Oliverio L. Velasco, general manager. Property is El Mel-

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garnja mine, carrying gold, silver and copper ores. Employed circa 75 men at last accounts.

SOCIÉTÉ ANONYME DES MINES DU VELAY. **FRANCE.**

Office: 19 Rue Dubois, Lyons, France. Mine office: Azerat, Brioude, Haute-Loire, France. Organized June 30, 1906, under laws of France, with capitalization 400,000 francs, shares 100 francs par.

SOCIÉTÉ MINIÈRE DE VELEZ RUBIO. **SPAIN.**

Office: 43 Rue de Courcelles, Paris, France. Mine office: Velez Rubio, Almería, Spain. Organized Feb. 14, 1902, under laws of France, with capitalization 1,500,000 francs, shares 100 francs par.

VELVET-PORTLAND MINE, LTD. **BRITISH COLUMBIA.**

Dead. Reorganized, Nov. 18, 1905, as New Velvet Portland Mine, Ltd. Formerly at Rossland, Trail district, B. C. Fully described Vol. V.

VELVET (ROSSLAND) MINE, LTD. **BRITISH COLUMBIA.**

Dead. Merged, January, 1904, in Velvet-Portland Mine, Ltd. Formerly at Rossland, Trail district, B. C.

VENICE COPPER CO. **MEXICO.**

Dead. Formerly at Soyopa, Urés, Sonora, Mex.

VENITA MINING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Orient, Ferry Co., Wash. Christopher New, superintendent. Lands, 3 miles south of Orient, are opened by tunnel and an incline shaft showing auriferous copper sulphides.

VENTURE HILL MINING CO. **ARIZONA.**

Office and mines: Jerome, Yavapai Co., Ariz. Thos. E. Campbell, president and general manager; Geo. H. Avery, vice-president and superintendent; Chas. F. Avery, secretary; Frank E. Jordan, treasurer. Organized 1900, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 6 patented claims, area 110 acres, 2 miles south of Jerome, showing 2 fissure veins, claimed by company to average 90′ width and to carry average value of 4.7% copper, 6.5 oz. silver and $4 gold per ton, in oxide and sulphide ores, which is an overestimate, developed by shafts of 65′ and 87′, and tunnels of 205′ and 457′. Out of funds and idle several years.

VERDE APEX COPPER MINING CO. **ARIZONA.**

Office: 3 West Main St., Bloomsburg, Pa. Letter returned unclaimed from former mine office, Jerome, Yavapai Co., Ariz. Chas. B. Lutz, president and treasurer; Jas. H. Mercer, vice-president; M. P. Lutz, secretary. Organized 1900, with capitalization $3,000,000, shares $1 par. Property was sold by sheriff, 1906, but redeemed by president for benefit of shareholders. Lands, 6 claims, area circa 90 acres, in Mescal Gulch, about 2 miles south of Jerome, slightly developed by 2 tunnels and a shaft. Idle since circa 1904, and apparently moribund.

VERDE CHIEF COPPER MINING CO. **ARIZONA.**

Office: 1616-20 Broad St., New York, N. Y. Mine office: Jerome, Yavapai Co., Ariz. Chas. L. Tompkins, president; Dr. W. E. Delabarre, vice-president; Frank K. Kohler, secretary and treasurer; B. H. Smith, assistant secretary and treasurer. Organized June 29, 1900, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Annual meeting, first Monday in July.

Lands, 13 claims, area 260 acres, in the Verde district, 7 miles south of Jerome, including the Carrigan & Gadette group, in Mescal Gulch, adjoining the Cleopatra, having circa 1,700′ of workings, showing auriferous and argentiferous sulphides. The Paragon group, 3 patented claims, has tunnels of 185′, 150′ and 1,066′, the 150′ tunnel showing ore. Diamond drilling is said to have given unsatisfactory results, and option on lands held by Lloyd C. Haines was not exercised. Idle.

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VERDE CONSOLIDATED COPPER CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Jerome, Yavapai Co., Ariz. T. E. Campbell, secretary and treasurer. Capitalization $1,500,000, shares $1 par. Lands, 6 claims, 2 miles south of Jerome. Idle several years.

VERDE GRANDE COPPER CO. **ARIZONA.**

Office: 252 Grant Bldg., Kansas City, Mo. Mine office: Jerome, Yavapai Co., Ariz. Hon. I. H. Kinley, president; Wm. A. Forrester, vice-president; M. J. Beirn, Jr., secretary; John McQueeney, treasurer; R. A. Smith, assistant treasurer; J. C. Scott, superintendent; preceding officers, Thos. Taylor, Jos. Larsen and R. B. Kirwin, directors. Also has an advisory board, of Jerome mining and business men. Organized September, 1906, under laws of Arizona, with capitalization $8,000,000, shares $1 par.

Lands, 10 claims, area 120 acres, partly patented, about one mile south and west of the United Verde, on the southern slope of Smelter Hill, the United Verde being on the opposite slope, lands being located on a precipitous hill, with poor roads. Development is by 3 short tunnels and a 730′ two-compartment main shaft on the Little Daisy claim, planned to be sunk 1,000′, sunk in slate and schist showing scattering copper sulphides carrying good gold and silver values, ore occurring mainly in schist. Management believes that lands carry the extension of the United Verde ore body. Equipment includes a 60-h. p. hoist and Rand air-compressor, with bunk-house, eating-house and smithy. Company plans a smelter, but should open a mine first. Work has been pushed vigorously.

VERDE GRANDE COPPER CO. **MEXICO.**

Office: 308 North 6th St., St. Louis, Mo. Operating office: Apartado 98, Hermosillo, Sonora, Mex. Mine office: Ures, Sonora, Mex. J. L. Simmerman, president; Wm. A. James, first vice-president; G. P. Hammer, second vice-president; Thos. Tyson, secretary; R. D. Wood, treasurer; Jairus D. Fresh, general manager; Jas. Penman, superintendent. Organized 1901, under laws of Arizona, with capitalization $2,500,000, shares $5 par.

Lands, 500 acres, in the Ures district, circa 40 miles northwest of Hermosillo, partly timbered with ironwood, cottonwood and mesquite. Main tract of 460 acres includes La Verde Grande, La Cobriza and San Luis groups, claimed to show veins of 10′ to 100′ width, with widest vein lowest in grade. The Verde Grande group has contact deposits in limestone, near igneous intrusives, giving ores assaying 6% copper, 6 oz. silver and $1 gold per ton. La Verde and La Cobriza groups have a contact vein, between granite and quartzite, claimed to be of 30′ to 60′ width, and traceable 7,000′, carrying argentiferous and auriferous ore, assaying 5.5 to 16% copper, with gangue of talcose limestone, said to be interstratified with granite and quartz. Property as a whole has 6 shafts and tunnels, with nearly one mile of workings, claimed by management to show 200,000 tons of ore.

The smelter, 1½ miles from the principal workings, completed 1904, has a 100-ton Allis-Chalmers water-jacket blast-furnace, but company claimed that coke was too expensive and installed a 30-ton Medbury furnace, burning charcoal, made in 8 kilns, from ironwood and mesquite, claimed to be made for 16 pesos per ton. The management reported, Apr. 24, 1906, that "on account of the exceeding hardness of the charcoal, and in order to reduce the speed necessary of the pulverizer, they would add additional machinery which would considerably reduce the power at present required to run the machinery, and thereby lessen the expense of refining the ore." Any managment that finds it difficult to pulverize charcoal should be set to pounding sand, as the next easiest job. At last accounts, June, 1908, the management explained to shareholders, who seemed a trifle disappointed, at the lack of long-promised dividends, that the proposition, as developed, was truly magnificent, but that, owing

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to low prices of copper, it was necessary to tap richer veins, and it was found necessary to develop sulphide ores, the management explaining that sulphur is a fuel, and sulphide ores the least refractory in reduction.

From December, 1907, to June, 1908, production was 51,181 lbs. black copper, of 95 to 96% tenor, 4,021 oz. silver, and 16 oz. gold, sold for 12,495 pesos.

A leaching plant was being installed, 1904, but nothing has been heard of it recently, and presumably it was a failure, like everything else tried by the company. At last accounts the company was considerably in debt, to several large shareholders, who had advanced funds to keep the property going. The advertising of this company has been utterly untruthful, though the present management apparently is not the one that promoted the corporation, hence should not be held responsible for its bad start, but the methods of development and operation employed have been vacillating and inefficient from the beginning, and the company's metallurgical efforts are ridiculous.

VERDE KING COPPER CO. **ARIZONA.**

Dead. Formerly at Jerome, Yavapai Co., Ariz. Fully described Vol. VI.

VERDE MINING CO., LTD. **IDAHO.**

Mine office: Osburn, Shoshone Co., Idaho. L. J. LePage, president; J. E. Lefever, vice-president; W. G. Lefever, treasurer; A. L. Williams, manager; preceding officers and C. C. Gillen, directors. Organized September, 1906, with capitalization $1,000,000, shares $1 par. Lands, 12 claims, in McFarren Gulch, 3 miles from Osburn, adjoining the Gray on the southwest. Has a shaft and tunnel, showing ore assaying up to 6% copper, 11% lead and 28 oz. silver per ton.

VERDE MINING & MILLING CO. **WYOMING.**

Office: 523 Bee Bldg., Omaha, Neb. Letter returned unclaimed from former mine office, Battle, Carbon Co., Wyo. C. M. Jacques, president; J. E. Thacher, secretary and treasurer; G. F. Hinton, general manager; preceding officers, G. H. Lyons and A. H. Crew, directors. Lands, 4 claims, area 80 acres, showing a 35′ fissure vein, carrying malachite, bornite and chalcopyrite, giving assays of 5 to 21% copper, 6 oz. silver and $5 gold per ton, opened by shafts of 40′ and 115′. Has a 40-h. p. steam plant. Idle several years and apparently moribund.

VERDE QUEEN COPPER CO. OF ARIZONA. **ARIZONA.**

Dead. Succeeded, December, 1906, by Jerome Verde Copper Co. Formerly at Jerome, Yavapai Co., Ariz.

VERDE RIVER COPPER CO. **ARIZONA.**

Office: care of Geo. Hundinger, secretary, Newport, Ky. Mine office: Jerome, Yavapai Co., Ariz. Lee Pfau, president; C. M. Werk, vice-president; Samuel Leonard, superintendent. Organized with capitalization $2,500,000, shares $1 par, as a merger of the New England-Arizona Mining Co. and Pfau Gold Mining & Reduction Co.

Lands apparently 35 claims, in the Cherry Creek district, circa 9 miles south of Jerome, including the Pfau group of 10 claims, area 200 acres; the New England-Arizona group of 17 claims, and a new group of 8 claims, carrying fluxing ore and timber, about 5 miles east of the Pfau. The New England-Arizona mine, 2 miles from Turkey, has a number of shallow shafts and short tunnels. The Pfau mine has several thousand feet of working, with steam power and a 100-ton concentrator. Company is not regarded with especial favor.

FRANCISCO VERGARA I. **CHILE.**

Office and mine: Petorca, Aconcagua, Chile. Property is El Mauro mine, opened 1860, and El Mauro smelter, making circa 225,000 lbs. fine copper yearly, when working. Idle several years.

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VERMONT & ARIZONA COPPER CO. **ARIZONA.**

Office: 150 College St., Burlington, Vt. Letter returned unclaimed from former mine office, Tombstone, Cochise Co., Ariz. Hon. Hamilton S. Peck, president; C. G. Norris, vice-president; J. H. McLoud, secretary and treasurer; preceding officers, W. H. Varnum, C. H. Stevens, Geo. A. Kimball, W. R. Cheney, Dr. D. C. Hawley and Hon. W. T. Smith, directors; J. A. Collier, superintendent. Organized July 25, 1899, under laws of Arizona, with capitalization $1,500,000, shares $5 par.

Lands, 11 claims, area 220 acres, 4 miles from Gleeson, in the Turquoise district, on the western slope of the Dragoon Mountains, showing 2 gold and silver veins and several copper veins, latter giving assays of 23 to 43% from selected carbonate ores. Development is by a 230′ main shaft, with circa 1,500′ of workings, there also being about 1,000′ of workings on 10 adjoining claims. Company claims to have developed a large body of low-grade milling ore. Equipment includes steam power. Idle and apparently moribund.

VERMONT & BOSTON MINING CO. **VERMONT.**

Dead. Formerly at Berkshire, Franklin Co., Vt.

VERMONT COPPER CO. **VERMONT.**

Office: 43 Exchange Place, New York, N. Y. Mine office: South Strafford, Orange Co., Vt. F. A. Berthold, secretary. Organized circa 1906, under laws of Arizona, with capitalization $1,000,000, as successor of Elizabeth Copper Co.

Property is the old Elizabeth mine, opened 1793, for magnetic pyrites, used in making copperas. It being found, eventually, that the mine carried an average of about 3% copper, in the form of chalcopyrite disseminated in pyrrhotite, the Elizabeth became the largest American copper producer, previous to the opening of the rich mines of Lake Superior. Ore bodies occur as lenses, in foliated micaceous schists, the leases overlapping and wedging out at bottom. Main ore body at the Elizabeth has been mined for 700′ in length, and at one point was 100′ wide. Main tunnel is 1,340′ long, and mine is estimated, by present management to have about 300,000 tons of ore in sight. Equipment includes a steam plant and small smelter, also a concentrator using the Rowland magnetic separation process. Nearest railroad, 8 miles, is the Boston & Maine. A dam has been started, to develop hydro-electric power, and company plans a 300-ton smelter. Mine was reopened March, 1906, by predecessor of present company.

VERONA MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Forest R. Derrenougue, manager. Development is by a 300′ tunnel.

VERONICA COPPER MINING CO. **MONTANA.**

Dead. Presumably succeeded by Butte & Veronica. Formerly at Butte, Silver Bow Co., Mont.

AKTIESELSKABET VESTERDALENS KOBBERGRUBER. **NORWAY.**

Office: Melderstein, Sweden. Mine office: Neverfjord, Norway. Henning Nordlund, chairman; August Siljeström, superintendent. Organized 1903, under laws of Norway. Production, 1902, was 160 tons first grade and 1,500 tons second grade ore, containing circa 375,000 lbs. fine copper. Employed circa 60 men at last accounts.

VETA GRANDE MINING CO. **MEXICO.**

Dead. Formerly at Baccachi, Arispe, Sonora, Mex. Described Vol. VI.

VETA GRANDE MINING CO. **MEXICO.**

Dead. Property included the Bertha, Carolina and Cadillac mines, carrying auriferous and argentiferous copper ore, with a 20-ton mill. Ferry Sharpe was manager. Former office was Mills Bldg., San Francisco, Cal. Formerly at Altar, Sonora, Mex.

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VETA GRANDE MINING & MILLING CO. **COLORADO.**

Office and mine: Steamboat Springs, Routt Co., Colo. Lands, on Copper Ridge, 4 miles from Steamboat Springs, have a 177′ tunnel, cutting a vein of 20′ estimated width, carrying good gold values.

VETA RICA SILVER & COPPER MINING CO. **MEXICO.**

Dead. Formerly at Charcas, Moctezuma, San Luis Potosí, Mex.

VETERAN-ELY EXTENSION COPPER CO. **NEVADA.**

Dead. Was organized circa 1906, with capitalization $1,000,000, shares $1 par. Formerly at Ely, White Pine Co., Nev.

VETERAN-ELY COPPER CO. **NEVADA.**

Dead. Lands sold, circa 1907, to Cumberland-Ely Copper Co. Formerly at Ely, White Pine Co., Nev.

VETERAN MINE. **NEVADA.**

Owned by Cumberland-Ely Copper Co.

VICKERY-THOMPSON MINING CO. **MEXICO.**

Dead. Succeeded by Thompson-Lehmer Mining Co. Formerly at Ocotlán, Oaxaca, Mex. Described Vol. VI.

VICRAYWIN MINING CO. **NEW MEXICO.**

Mine office: Hachita, Grant Co., N. M. Organized 1906. Lands are on the hill back of the King mine.

VICTOR & BELLE CROWN MINING CO. **ARIZONA.**

Mine office: Salome, Yuma Co., Ariz. John B. Martin, president and general manager; F. C. Piper, vice-president; J. H. Matteson, secretary and treasurer; preceding officers, J. E. Matteson, T. H. Finnegan, W. E. Enos and R. R. McDonald, directors. Lands, 7 claims, in the Harcuvar Mountains, circa 8 miles north of Salome, opened by a 100′ tunnel, showing a 5′ vein with a 3′ paystreak, and a 150′ shaft showing a 7′ vein with a 30″ paystreak assaying 15 to 20% copper and $15 to $20 gold per ton.

VICTOR BONANZA MINING CO. **CALIFORNIA.**

Dead. Formerly at Dos Palos, Merced Co., Cal.

VICTOR CONSOLIDATED MINING CO. **IDAHO.**

Mine office: Wallace, Shoshone Co., Idaho. E. P. Spalding, general manager. Has silver-lead and argentiferous copper ores.

VICTOR CONSOLIDATED MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Vivian McCune, general manager; Joseph Treloar, superintendent. Lands include the Victor, Boss Tweed and other mines, carrying gold, silver and copper ores. Has steam power. Production, 1907, was only 4 carloads of ore.

VICTOR COPPER MINING CO. **ALASKA.**

Mine office: Ketchikan, Alaska. Lands, on Seal Bay, Gravina Island, 12 miles from Ketchikan, are slightly developed by tunnel.

GEWERKSCHAFT VICTORIA BLEIERZ- UND ZINKBLENDE GRUBEN. **GERMANY.**

Office: Köln, Germany. Mine office: Nassau a/L., Rheinprovinz, Germany. Lands, 370 hectares, carrying silver, lead, zinc and copper ores.

VICTORIA BOULDER MINING CO. **COLORADO.**

Mine office: Salina, Boulder Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

VICTORIA CHIEF COPPER MINING & SMELTING CO. **NEW MEXICO.**

Office: 100 Broadway, New York, N. Y. Mine office: Engle, Sierra Co., N. M. Col. Robt. E. Hopper, president; Stephen J. Macy, vice-president; W. H. Weston, general manager; J. H. Bigelow, secretary and treasurer; preceding officers, Wm. Buchanan, Henry G. Munger, Eugene S. Neal, Howard Clinton Dickinson and Dana A. Rose, directors. Organized 1906, under laws of Arizona, with capitalization $3,000,000, shares $1 par.

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Lands, 11 claims, 1 fractional, area 216 acres, owned in fee, and 3 claims, 1 fractional, area 30 acres, held under bond and lease. Property, on the western slope of the Caballo Mountains, is about 2 miles east of the Rio Grande River, 12 miles from the Santa Fé railroad, at Engle, and 85 miles west of Cutler. Company claims its lands are in the same general range of mountains as the Bisbee camp of Arizona, which is absolutely untrue, the Victoria Chief being in the Caballo Mountains, caballo being Spanish for horse, while the Bisbee camp is in the Mule Mountains, and between the two lie the Burro Mountains, burro being Spanish for jackass.

Ore occurs in chutes, in vertical fissures, in quartzite, ores being cuprite, malachite, borazite, and chalcopyrite, from which selected ores are said to assay up to 25% in copper tenor. Management claims to have developed a considerable body of 20% ore, carrying copper, gold and silver values, which statement is not credited. Wm. A. Farish is said to have stated, December, 1906, that the mine could feed a 100-ton smelter with ore of 10% and possibly of 15% tenor, which also is doubted.

The property was bought of the defunct Black Peak Gold Mining Co., at sheriff's sale. The only work of importance is by 2 tunnels, showing occasional ore chutes up to 10′ in width, and 50′ to 100′ long. The ores apparently are shallow, and confined to quartzite. There is a 500′ tunnel on the Marion claim, said to give ore returning average assays of 20% copper and $1.20 gold and silver per ton. The property was said, March 11, 1908, to have 2,200′ of workings. The property is 12 miles from Engle, to which a wagon road has been built, supplies having been packed in previously.

The company is said to have ordered, November, 1906, a 10x10″ compressor, 3 rock-drills and a 32 h. p. gasoline engine. Buildings include a general store, and the company was said, 1907, to be building a fine hotel at Cutler, and to be making wax models of the mountains.

The company was said to plan a $250,000 smelter, which would be the height of folly, until ore is developed. A small amount of ore from the Oahu claim was shipped, by burro, some years ago, by former owners, and the present company shipped a carload of ore, 1907, to El Paso smelter, running 20.3% copper.

The company claims to be free from debt, with lands paid for, and claimed to have $75,000 in the treasury, which is considered doubtful, and is said to have started a national bank at Engle. In October, 1906, the company was selling stock at 75 cents per share, with guaranty to buy some back within 6 months, at 6% interest, if the purchaser were dissatisfied. The company was financed by Hopper & Bigelow, junior member of the firm being a woman. There has been some litigation over titles, said by company not to be serious. Though asked repeatedly, company has failed to furnish any definite statements. The company claimed, in its advertisements, to own 10 full mines, of 20 acres each, which was untrue, as the "mines" were merely claims. The company claimed, in its advertisements, that its mine was located in a country "that has demonstrated, beyond doubt, the greatest possibilities in copper mining in the world." This is about as far from the truth as anyone could get. The company is regarded with suspicion.

VICTORIA COPPER MINING CO. **MICHIGAN.**

Office, 512-60 Congress St., Boston, Mass. Mine office, Victoria, Ontonagon Co., Mich. Employs circ 100 men. Hon. Fred H. Williams, president; Chas. D. Hanchette, vice-president; James P. Graves, secretary and treasurer; preceding officers, Wm. F. Humphrey and Arthur W. Chesterton, directors; Geo. Hooper, superintendent; Thos. Carlyon, mine superintendent; Chas. Caddo, mill superintendent; R. S. Schultz, Jr., engineer; O. R. Everett, clerk.

Organized Jan. 16, 1899, under laws of Michigan, with capitalization

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$2,500,000, shares $25 par; paid in, $12. Has called an assessment of $1, payable Jan. 11, 1909, last preceding assessment having been $1, August, 1905. Net earnings, 1907, after deduction of construction charges, were $13,837.38. Company began 1908 with quick assets of $68,074.23, and bills payable of $19,407.70, leaving a balance of assets of $48,666.53. Shares are listed on the Boston Stock Exchange. First National Bank, Boston, registrar. Annual meeting, fourth Monday in February.

Lands, 2,395 acres, including 2,289 acres mining lands, in Sections 19, 20, 29, 30 and 31, Town 50 North, Range 39 West, and Sections 24, 25 and 36, Town 50 North, Range 40 West, in Ontonagon county, Michigan, giving a tract with an extreme width of 2 miles east and west, and an extreme length, north and south, of 2¾ miles, lying just west of the Ontonagon river, practically all on the mineral belt, only about 100 acres lying on the Eastern Sandstone. The tract may carry the western extension of the amygdaloidal bed under development by the Lake Copper Co. Neighboring mines, all idle for many years, are the West Minnesota on the north, National on the east and Devon on the west. Nearest active property is the Michigan, 3 miles northeast. Litigation over a 40% undivided interest in 320 acres of land, in the main mine tract, resulted, 1908, in a verdict of $9,647.70 damages against the company. The lands are well timbered, with an inexhaustible supply of good sandstone for building purposes. Nearest railroad is the Chicago, Milwaukee & St. Paul, at Rockland, 3 miles distant.

The first attempt at Lake Superior copper mining, in historic times, was made, on what is now Victoria property, in the winter of 1770-1771. The next mining done was in 1849, when the property was opened, under the name of Cushin, on a line of prehistoric pits containing masses of native copper, one weighing upwards of a ton. Name was changed, 1850, to Forest, and the property was reorganized, 1858, as Victoria Mining Co. Under these titles the property made 186 tons 1,279 lbs. fine copper, at a loss of about $180,000. The first stamp-mill was burned by a forest fire, and the second was swept away by a flood. The property was operated regularly, on a small scale, 1849-1855, and thereafter spasmodically. The mine was unwatered in 1881, but remained idle until work was begun, March 1, 1899, by present company.

The mine is located on a high and steep hill, notwithstanding which the solid rock is covered with heavy sand and clay drift. The Forest amygdaloidal bed, on which the mine is opened, is 5′ to 30′ wide, with an average width of circa 12′, very irregular in width, rolling in dip and bunchy in contents, with a strike of N. 66° E., and average dip of 61° to the northwest, the strike giving about 1½ miles of outcrop on Victoria lands. The Forest bed evidently is one of the cupriferous amygdaloids of the Evergreen belt, opened to the northeast by the Mass and Adventure, but which one of the series is uncertain.

The old mine had 4 shafts, numbered from east to west, opened erratically, with shafts and levels at various intervals, lifts being opened at distances of 55′ to 65′, as the spirit moved. Old No. 2 shaft, chosen for new operations, was cut down to 2-compartment size. The formation is much disturbed near the surface, and the lode is irregular in dip, with widening noted at depth, and with more regular walls. Some good stoping ground is shown from the 7th level downward, until near the bottom, where the bed widens to about 80′, carrying only occasional bunches of copper. The Forest amygdaloidal bed is low in grade, but fairly regular in copper contents, showing a little heavy copper, but carrying values mainly in medium grade stamp-rock. All levels down to the 18th are connected by winzes, giving ventilation and safety. The ground stands well and the mine is without timber, except in the shafts. About 400,000 tons of stamp-rock have been developed. The copper chute

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rakes to the southwest, and the best ground, below the 15th level, has been found in the southwestern drifts. The mine operates 18 power drills.

In addition to productive openings, on the Forest lode, the mine has about 3,000′ of crosscuts, showing sundry cupriferous beds, but none of promise equal to the Forest. The footwall crosscuts show an amygdaloid underlying the Forest at an average depth of only 6′, this bed being well mineralized for 4′ to 5′ along the footwall, producing small masses up to 50 lbs. weight, the copper occurring mainly on the foot, with considerable epidote on the hanging-wall. Underlying this epidotal bed, at a distance of circa 60′, is a 6′ amygdaloid, showing much epidote and allied minerals, and a little stamp-rock. An amygdaloid called the Glenn, opened 1900, gave a fair showing of copper at the bottom of a shallow shaft. Diamond-drill borings north of the mine have shown nothing of special promise. The mine has crosscut tunnels of 780′, 150′ and 419′, and some work was done, 1908, in a tunnel on the side of a bluff near the river, where a lode carrying some copper was cut.

No. 1 shaft, which is 240′ east of No. 2, is an old opening, remaining from a previous management, and is 188′ deep, and idle.

No. 3 shaft, 1,190′ west of No. 2, also is an old shaft, of 350′ depth, and is idle.

No. 4 shaft, also an old opening, is only 180′ in depth, and also is idle.

No. 2 shaft, 8x12′ inside measurements, with 2 compartments, is 2,089′ deep, bottomed at the 22d level, with levels opened at 100′ intervals below the 4th. The mine has 29,563′ of workings, estimated to show 400,000 tons of stamp-rock, with 300,000 tons blocked out for stoping. The east drift, on the 22d or bottom level, showed some good ground, but the west drift was in poor ground continuously, during 1908. A crosscut, of circa 1,500′ length, sent south on the 19th level, has shown one amygdaloidal bed of some promise.

No. 2 shaft has a frame shaft-rockhouse, 34x40′, with a 16x36′ wing, and 90′ high. The power-house is 36x40′, with a 24x28′ wing, of wood on stone foundations, with steel roof. There is a 20x48″ Webster, Camp & Lane duplex-cylinder hoist, with single conical drum of 8′ minimum and 12′ maximum diameter and 11′ face, raising 4-ton skips, set on concrete foundation, bedded on rock. The old 12x28″ Nordberg hoist, with drum of 5′ diameter and 6′ 9″ face, rated at only 1,200′ capacity, was used for sinking No. 2 shaft to its full depth of 2,089′. Equipment includes two 12-drill Rand air-compressors and 20 rock-drills.

An exploratory shaft, started October, 1907, circa 2,600′ east of the present shaft, with 140′ deep, March, 1908, and a little drifting was done, meeting with small encouragement.

Buildings include a 30x60′ machine-shop, of wood, with iron roof, a 28x34′ carpenter-shop, 24x50′ smithy, 24x72′ warehouse, a 2-story frame boarding-house and office, 27x64′, with a 10x37′ wing, a 19x41′ frame schoolhouse, stone changing-house, general store and 58 dwellings, with a total of 80 buildings owned by the company. A 10x16x28′ storage cistern holds water from the mine for feeding boilers, and water for domestic use and fire protection is pumped, by a steel windmill, from a well having a storage tank and 750′ of water mains.

The company has a sawmill with a 56″ circular saw, furnishing timber and lumber for requirements of the property, which, 1907, sawed 262,956′ of lumber.

A large water-power has been developed from Glenn Falls, on the west branch of the Ontonagon river, about one mile from the mine, at a cost of $200,000. This is the best natural water-power of the Lake Superior copper district, the stream dropping nearly 150′ in 1½ miles, by a series of small falls, between which are numerous rapids, with sandstone bottoms. Power is developed by means of a dam, canal and shaft. The dam, built up from excava-

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tions in bedrock, is 320′ between abutments, and has 32 eighteen-inch "I" beams, 10′ apart, sunk vertically 5′ to 10′ in bedrock, with cement filling. The dam has an extreme height of 24′, with width of 14′ at the bottom and 8′ at the top, and has a 320′ main section, with wings of 100′ and 160′, giving a total length of 580′, built with an arch up-stream, giving great strength. The dam is faced, on the water side, with 5x10′ plates of ¼″ steel, bolted to the steel "I" beams through the concrete. The center of the dam has an apron 80′ wide, also a floating boom to guide logs, as the stream is used for logging operations, the dam being substantially built, so that it cannot be torn out by a log-jam. The outlet is a 44″ steel pipe, leading from the bottom of the dam to the power canal. In order to insure an equable water supply a storage dam has been built at the head of the river, near Lake Gogebic.

The canal diverting water from the dam, nearly 6,000′ in length, runs for about 2,000′ through sandstone and 4,000′ through alluvium. On the bank of the canal is a pipe-line, providing compressed air for the removal of sand by an air-lift, this being a novel form of dredging. The canal is 25′ wide at the top, 16′ wide at the bottom and 16′ deep. The outlet of the canal has 6 gates, in two sets, separated by a heavy concrete abutment. The gateways are made of 20″ "I" beams, set vertically 6′ apart, with 6 gates of heavy oak planking, worked vertically by rack and pinion, actuated by water power. The canal leads, from the foredam, to 3 vertical inlet shafts, 19′ from center to center, each 5′ in diameter and 334′ 6″ deep, lined with concrete. The shafts were sunk through solid sandstone, by means of 5″ holes bored to the required depth, after which the 5″ holes were enlarged to 5′ holes, by reaming with a special bit having 4 cutting arms, each 30″ in length, actuated by a No. 9 Rand drill.

Air formerly was drawn into the shafts through 5,000 tubes of ⅜″ diameter, but there now is a single opening at the top of each shaft, air being carried downward, as bubbles, by the falling water. At the bottom of the three shafts is a tunnel of 360′ length, leading to a large fan-shaped air-compression chamber, 26′ in height, 18′ wide at the entrace of the tunnel and 60′ wide at the extreme end, lined with boiler plate. The imprisoned air, pulled down the shafts by suction and swept along the tunnel in bubbles by the rushing waters, is released, in the compression chamber, and the constant accession of fresh air-bubbles, in myriads of millions, causes compression, the air being held from escaping backward by the superior pressure of the falling water. The plant was designed for an air-pressure of 123 lbs. per square inch, and, when this pressure is exceeded, the air forces the water in the chamber below the mouth of a 12″ vent-pipe, leading to surface. When, in operation the pressure exceeds 123 lbs. per inch, which it does speedily when the power is not used, the air rushes upward through three hundred feet of pipe, with tremendous force, carrying along with it some of the water which pulled it down, throwing a fine spray hundreds of feet in the air, with terrific roar. Despite reports to the contrary, the air-chamber is not leaking. The outflow shaft, which would be called a tail-race if on surface, is sunk at an angle of 80°, and leads to the lower river.

The hydraulic-pneumatic power plant was completed May, 1906, and begun furnishing 4,000 to 5,000 h. p. under a full head of water, and has shown an efficiency of 82%, under test. This plant is the most powerful single-unit air-compressor in existence, and was the fifth installation of the sort in the world. It is possible to operate one, two or three of the inlet shafts, if so desired, with corresponding variation of the energy developed. There has been some trouble with shortage of water, this being a difficulty that is faced by many power plants dependent upon water. The simplicity and economy of the Victoria power plant lie in its being absolutely automatic. No machinery is required,

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the power being drawn off by a pipe, from the compression chamber. Not a pound of waste nor a gallon of oil is required for the operation of the plant.

The mine and mill are connected by a 4,800' tramline in 2 sections, the upper having a grade of 6% and the lower a grade of 12%. A stationary hoist at the top of the incline serves as a starter, loaded cars bring back empties. A retarding engine might be made to develop power from the tram-line, were it not that the Victoria already has all the power it can use, delivered practically free, except for the interest on the cost of the installation. The tramline enters the mill over a 700' trestle.

The mill, near the hydraulic works, is 50x126' in size, of wood, on concrete foundation, equipped with an Allis-stamp, which was given a 24" cylinder, 1908, increasing its capacity to circa 500 tons daily. Foundations of mill and machinery are of concrete beds, capping solid sandstone, machinery being anchored by eye-bolts cemented into the rock. The stamp, and part of the washing machinery and shafting, were brought from the old mill of the Belt mine. Washing machinery includes 28 Hartz jigs, 4 Wilfley tables, a Standard table taking middlings from the Wilfleys, 8 slime-tables, and 4 sizers. The mill was started June, 1906, and is said to give tailing losses of only about 0.1%. Mineral is smelted by the Calumet & Hecla.

Production has been as follows: 546,334 lbs. fine copper in 1906; 104,783 tons of rock hoisted and 95,035 tons of rock stamped, yielding 1,207,337 lbs. fine copper in 1907, giving an average production of 0.63%, or 12.7 lbs. finished copper per ton, secured at a cost of 15.8 cents per lb. Company ended 1908 stamping circa 425 tons of rock daily, making therefrom about 60 tons fine copper monthly, with an average return of about 12 lbs. per ton. The old mine, as a whole, is not looking especially well, but the company plans crosscutting to the Eastern Sandstone, and, having plenty of land in that vicinity, may be considered to have fair prospects of finding something of greater promise than the present workings. The property has a great advantage in the possession of the cheapest power imaginable, and has a prudent and capable management.

VICTORIA COPPER MINING CO. **UTAH.**

Mine office: Ashley, Uintah Co., Utah. Long idle and apparently moribund.

VICTORIA GOLD & COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Office: English Point, B. C. Mine office: Rossland, Trail district, B. C. Frank E. Starkey, president and general manager; Albert G. Starkey, secretary and treasurer. Capitalization $1,000,000, shares $1 par. Lands, 200 acres, lying west of Rossland. Idle several years and presumably moribund.

VICTORIA MINE. **CALIFORNIA.**

Mine office: Hornitos, Mariposa Co., Cal. Property shows a mineralized zone of schistose diabase between grano-diorite walls, with a gossan of 300' to 600' width carrying cuprite, malachite, azurite, bornite and tetrahedrite, all ores, including those in the gossan, being more or less auriferous. Mine was a considerable producer, circa 1865, employing 300 men. Idle since circa 1906.

VICTORIA MINE. **ONTARIO.**

Owned by Mond Nickel Co., Ltd.

VICTORIA MINING & SMELTING CO. **NEW MEXICO.**

Office: 502 Main St., Joplin, Mo. Mine office: Organ, Donna Ana Co., N. M. Capitalization, $2,500,000. Lands, 25 claims, area 500 acres, on the eastern side of the Organ Mountains, of which 18 are said to be silver-lead claims and 7 copper claims, yielding ore assaying 26% in lead tenor and 9% in copper tenor, with good silver values.

COMPAÑIA MINERA VICTORIAS DE CHACARILLAS. **CHILE.**

Office: Iquique, Chile. Mine office: Pica, Tarapacá, Chile. Organized

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Nov. 28, 1906, under laws of Chile, with capitalization 8,600,000 pesos, shares 100 pesos par.

VICTOR MINING CO. COLORADO.

Office and mine: Grand Junction, Mesa Co., Colo. Organized 1907. Lands, 8 claims, in the La Sal district, said to give assays of $50 gold per ton from surface ores.

VICTOR MINING & SMELTING CO. MEXICO.

Letter returned unclaimed from former office, Nogales, Ariz. Mine office: La Cananea, Arizpe, Sonora, Mexico. J. L. Trauger, acting president; Paul Jones, secretary. Organized May 9, 1905, under laws of Arizona, with capitalization $1,000,000, shares $10 par, increased, 1907, to $1,500,000. Lands, circa 18 miles north of La Cananea, are said to show copper ore. Presumably idle.

VICTORY COPPER MINING CO. ALASKA.

Mine office: Ketchikan, Alaska. Patrick Heany, general manager. Company is said to plan driving a tunnel through a mountain.

FELIX VICUÑA. CHILE.

Office and mine: Higuera, La Serena, Coquimbo, Chile. Property is 5 mines and a smelter. The Champeta mine, opened 1855, the principal property, is the deepest in the district, showing a considerable number of parallel veins, with a main vein of 5' to 7' width dipping at 60° to 80°. The oxidized zone, of about 70 meters depth, is followed by 30 meters of rich secondary sulphides, succeeded by chalcopyrite of 10 to 15% reported average copper tenor, presumably after selection. The Panchita mine, opened 1850, is circa 350 meters in depth. The San Ramón mine, opened 1851, is 270 meters in depth, having a vein of 4' average and 15' extreme width, carrying low-grade ores. La Cortada mine, opened to depth of 150 meters and length of 200 meters horizontally, shows a vein of 3' to 4' average width, ores of La Cortada and San Ramón averaging about 5% copper tenor only, rendering them unavailable at present, though of future promise. La Solitaria mine, opened 1893, is about 130 meters in depth with slight development.

The smelter, at Higuera, 18 kilometers from Totoralillo, the nearest railroad point, has 3 reverberatory furnaces, producing ejes of about 50% average copper tenor. The Champeta mine in 1903 produced 11,950 metric tons of ore, of 10 to 11% average copper tenor, and production of all properties, 1903, was 1,615,282 lbs. fine copper.

SANTIAGO VICUÑA. CHILE.

Office and works: Huasco, Freirina, Atacama, Chile. Property is two smelters. El Astillero works, at Huasco, include a smelter and mill, latter having a rock crusher and stamps. The smelter has 6 three-desk calcining furnaces and 3 reverberatory furnaces, burning imported coke, employing 93 men at average wages of 1.5 pesos daily, and, in 1903, smelted 3,085 metric tons of ore averaging 4.85% copper, making bars of 96% copper tenor, with slags averaging 0.8% copper. Production, 1903, of this smelter, was 1,818,364 kilograms fine copper.

El Ijirio smelter, at Morada, 20 kilometers from Sarco, the nearest railroad station, has 2 reverberatory furnaces, producing ejes of about 50% average copper tenor, with slags running 0.5% copper, employing 50 men, at average wages of 1.75 pesos daily. Carriage charges to railway are 6 pesos per metric ton, and fuel is imported coke, costing 27 pesos per ton. Production, 1903, from 2,929 tons of 15% ore, was 359,070 kilograms fine copper. Production, 1903, of both works, was 3,698,291 lbs. fine copper.

VIDAL I VIDELA. CHILE.

Mine office: Cerillos, Coquimbo, Chile. Property is the Hermanos mine, idle except for leaching mine waters, from which 162 metric tons of precipitate

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of 65% copper tenor were secured, 1903, and sold to smelter at Guayacan, being equal to 283,044 lbs. fine copper.

VIELLA COPPER CO., LTD. **SPAIN.**

Dead. Compulsorily wound up, February, 1903. Formerly at Viella, Huesca, Spain.

COMPAÑIA MINERA VIESCA y COAHUILA. **MEXICO.**

Mine office: San Juan de Guadalupe, Durango, Mex. Property is El Sol, La Luna and La Estrella mines, carrying argentiferous lead and copper sulphides. Has steam power, employing circa 150 men, at last accounts.

VIGSNES KOBBERVAERKS AKTIEBOLAG. **NORWAY.**

Office: Talbodgaden 8B, Christiania, Norway. Mine office: Röros, Trondhjem, Norway. Property includes the Vigsnes and Stavanger, better known as the Meraker mines, old properties opened to great depth, deepest shaft being 2,410'. Properties were among the principal copper producers of Norway, and were worked, 1865 to 1894, by a Franco-Belgian company, producing 900,000 tons of cupriferous pyrites, production, 1895, having been 950 long tons fine copper. Ore averages about 2% copper and 45% sulphur, with small quantities of ore of higher copper tenor. Has a hydro-electric power plant, installed 1907, and about 10 miles of aërial trams, connecting the mines with a concentrator, built 1907. Company plans a production of circa 50,000 tons of cupriferous pyrites yearly, beginning 1909.

VIKING COPPER MINING CO. **WASHINGTON.**

Office: care of Frank P. Mileark, Spokane, Wash. Mine office: Orient, Ferry Co., Wash. Lands, 3 claims, 3 miles from Orient, near the Napoleon mine, in the Pierre Lake district. Mine has a vein of 125' claimed width, carrying low and medium grade auriferous copper ore, with a 50' shaft and a 400' tunnel, planned to cut the vein at depth of 930'.

VILLAGE BELLE GOLD & COPPER CO. **COLORADO.**

Office and mine: Walden, Larimer, Co., Colo. David Hendrickson, president and general manager; M. C. Ward, vice-president. T. John Payne, secretary and treasurer; preceding officers, George Post and Thomas H. Sampson, directors. Organized July 16, 1902, under laws of Wyoming, with capitalization $100,000, shares $1 par. Lands, 4 claims, unpatented, reported by company as 150x300' in size, which would give an area of 4 acres, said to carry an 8' vein having ore averaging 15% copper and 7 oz. silver per ton, opened by a 100' shaft and 150' drift. Has a 20-h. p. steam hoist and a 25x64' mill.

COMPAÑIA MINERA DE VIÑA DEL MAR. **CHILE.**

Office: Santiago de Chile. Mine office: Freirina, Atacama, Chile. Organized Feb. 8, 1905, under laws of Chile, with capitalization 60,000 pesos, shares 200 pesos par.

VINCENNES-ARIZONA COPPER CO. **ARIZONA.**

Dead. Formerly at Kelvin, Pinal Co., Ariz. Described Vol. VII.

VINDICATOR COPPER MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Greenwater, Inyo Co., Cal. Lands, east of Greenwater, were slightly explored, circa 1907. Idle and presumably moribund.

VINDICATOR GOLD & COPPER MINING CO. **UTAH.**

Dead. Formerly at Uinta, Weber Co., Utah. Described Vol. VII.

VINSON CREEK GOLD & COPPER CO. **OREGON.**

Letter returned unclaimed from former mine office, Austin, Grant Co., Ore. Burton Miller, president and general manager. Organized circa January, 1908, with capitalization $1,000,000. Lands, 4 claims, 5 miles from Austin, showing a strong vein, traceable about 2,000', having a 25' shaft showing ore assaying 13.16 to 25.3% copper, with small gold values, and a tunnel planned to cut the vein at a depth of 400'.

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VIOLA GOLD & COPPER MINING CO. **WASHINGTON.**

Office: care of E. M. Kinnear, president, Spokane, Wash. Mine office: Loomis, Okanogan Co., Wash. A. J. Squires, vice-president; T. W. Brown, secretary and general manager; Arthur W. Lindsay, treasurer; preceding officers and Joseph Coleman, directors. Lands, 7 claims, area 140 acres, in the Galena district, on the southern slope of Æneas Mountain, 17 miles south of Loomis, showing a quartz-porphyry dike, carrying ores giving good assay values in copper, lead, silver and gold. Presumably idle.

VIRGILINA MINING CO. **VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. Has gold and copper ores, with a 10-stamp mill.

VIRGINIA-ARIZONA COPPER CO. **ARIZONA.**

Office: Richmond, Va. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Jas. W. Graves, president; Julius A. Hobson, vice-president; Thos. Armstrong, secretary and treasurer. Organized March 13, 1907, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Idle and apparently moribund.

VIRGINIA BELLE GOLD & COPPER MINING CO. **ARIZONA.**

Dead. Lost lands, 1906, to Arizona Belle Mining Co. Formerly at Vail, Pima Co., Ariz. Described Vol. V.

VIRGINIA BELLE MILLING & DEVELOPMENT CO. **MONTANA.**

Office: Seattle, Wash. Mine office: Cooke, Park Co., Mont. Organized circa January, 1908, to take over an old mine, formerly producing silver but latterly showing copper.

VIRGINIA C. MINING, MILLING & SMELTING CO. **MEXICO.**

Office: 16 North Eighth St., St. Louis, Mo. Mine office: Concheño, Rayón, Chihuahua, Mex. Col. Philemon Clew, president; Thos. H. Raines, vice-president and manager; preceding officers, W. W. Candy, R. H. Stevens and W. A. Clayton, directors. Organized under laws of Arizona with capitalization $1,250,000, shares $1 par. Lands, circa 75 miles from a railroad, include the Hidalgo mine, opened by 4 tunnels, the Santiago tunnel showing auriferous and argentiferous copper sulphides assaying 22.12% to 42.73% copper, 7.6 to 13 oz. silver and up to 40 cents gold per ton. Has steam power and plans a reduction plant.

VIRGINIA CONSOLIDATED COPPER CO. **MARYLAND & VIRGINIA.**

Office: 618 Walnut St., McKeesport, Pa. Mine offices: Libertytown, Frederick Co., Md., and Stony Man, Page Co., Va. W. Harry Hamilton, president; J. H. Lohman, vice-president; T. A. Robertson, secretary; George B. Humick, treasurer; Thos. A. Dunshee, general manager; C. C. Cramer, mill superintendent. Organized Oct. 15, 1901, under laws of New Jersey with capitalization $1,000,000, shares $1 par; issued, $515,000.

Lands formerly were 1,070 acres, in 2 tracts, in Maryland and Virginia, but have been reduced to 64 acres of mineral lands, 3 acres of timber lands and a 6-acre millsite.

The Virginia tract, formerly 220 acres, freehold, on Hoak Mountain, has been reduced to 12 acres, and apparently there is a $2,250 trust deed outstanding for that tract. The Virginia property formerly was said to show 3 parallel veins, traversing trap and quartzite, one of which, opened by a 320' shaft, with 950' of workings, was said to be of 12' average width, and to give average assays of circa 6% copper, 4 oz. silver and $1.80 gold per ton, mainly from carbonate ores, with occasional occurrences of native copper. Equipment included a gasoline hoist and 3-drill air-compressor.

The Liberty mine, in Frederick county, Maryland, area formerly 850 acres, was held under a 20-year bond and lease, but holdings have been reduced to 52 acres of mineral land, 3 acres of timber land and a 6-acre millsite. The

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Liberty mine is an old property, long idle, showing 2 ore bodies, reported by company as deposits in limestone, apparently opened to depth of 90' only, showing malachite, melaconite, chalcocite, bornite and tetrahedrite, with values mainly in bornite, giving average assays of 2.16% copper, 4.7 oz. silver and $1.80 gold per ton. Property was estimated, 1906, by management, to show 50,000 tons of ore. The Liberty mine, closed down, 1860, on account of the American Civil War, was reopened, 1866, for a short time only, and has not been a producer since.

Equipment of the Liberty mine includes a 65-h. p. steam plant, with hoist good for 1,000' depth, and a small Sullivan air-compressor. Buildings include a 16x28' machine-shop, 20x28' carpenter-shop, 2 small smithies, an office and 5 dwellings. The old 60-ton wooden concentrator, 20x40', had 3' Sturtevant centrifugal crushers, 3 Wilfley tables and a vanner. Machinery for a new mill was bought of the Wellman-Seaver-Morgan Co., but the Virginia Consolidated Copper Co. being unable to pay for it, machinery was returned. Idle and apparently moribund.

VIRGINIA COPPER CO., LTD. **VIRGINIA.**

Office: 136 Liberty St., New York N. Y. Mine office: High Hill, Halifax Co., Va. Hon. Commodore P. Vedder, president; F. M. Davis, vice-president; Jas. B. Van Woert, secretary; Richard Lamb, general manager; Evan Davies, superintendent. Organized Aug. 31, 1905, under laws of Great Britain, with capitalization £300,000, shares £1 par. Lands, 1,617 acres, including the High Hill mine, in the Virginia district, developed by 8 shafts of 140' to 300' depth, with about one mile of workings. Property shows 2 veins, giving assays up to 15.5% copper, 2 oz. silver and 30 cents gold per ton, from highly silicious ores. Has a 350-h. p. steam plant and concentrator. Idle several years.

VIRGINIA COPPER MINING & SMELTING CO. **ARIZONA.**

Dead. Formerly at Casa Grande, Pinal Co., Ariz. Described Vol. VI.

VIRGINIA MINING CO. **IDAHO.**

Office: 56 Vine St., Salt Lake City, Utah. Mine office: Baker, Lemhi Co., Idaho. Employs 5 men. M. B. Sowles, president; J. D. Pardee, vice-president; W. A. Byers, secretary, treasurer and general manager; preceding officers, J. B. Wardner and John Clark, directors. Organized 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $900,000.

Lands, 12 claims & partly patented, area 240 acres, in the Sand Creek district, showing slate, granite and porphyry, carrying 8 fissure veins, said to average 2' in width and to be traceable 6,000', showing chalcopyrite and galena assaying up to 7% copper, 2% lead, 2 oz. silver and $25 gold per ton. Property is reported to have 3,000' of workings, with 7,000 tons of ore in sight. Equipment includes a 3-stamp mill. Company plans continuing development.

VIRTUE COPPER CO. **OREGON.**

Mine office: Baker City, Baker Co., Ore. E. S. Platts, president; M. N. Thompson, vice-president; Grant Carroll, treasurer; A. W. Butler, secretary; preceding officers and Albert Backus, directors. The property shows copper ore.

VIRTUE MINING & DEVELOPMENT CO. **ARIZONA.**

Office and mine: Paradise, Cochise Co., Ariz. Edw. P. Epley, president; Hugh Rowe, vice-president; Geo. A. Walker, secretary and treasurer. Organized August, 1906, under laws of Arizona, with capitalization $1,000,000, shares $5 par. Lands, 2 claims, area 140 acres, one-half mile from Portal and 6 miles from Paradise, having a 200' tunnel.

MINA LA VIUDA. **CHILE.**

Mine office: Algarrobo, Caldera, Atacama, Chile. Mine, opened 1878, shows, with its extension, large bodies of ore opened to depth of about 300 meters vertically, having a vein of about 7' average width, carrying high

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grade chalcopyrite below a depth of 230 meters. Vein dips at 45°. Production has been greatly hampered by poor transportation facilities, but owners have built about 40 kilometers of good wagon road to Caldera, and, 1906, built a 21-kilometer railroad to Caldera, at cost of 300,000 pesos, greatly reducing shipping costs. Employs circa 125 men, at daily wages of 2.5 to 2.75 pesos. Production, 1903, was circa 4,200 metric tons of ore averaging 11.8% copper, equivalent to an output of 993,599 lbs. fine copper.

VIVANDIERE CONSOLIDATED MINING & SMELTING CO. COLORADO.

Office: Chicago, Ills. Mine office: Turret, Chaffee Co., Colo. Lands, 5 claims, opened by a 615' shaft, showing concentrating ore. Has a steam plant, hoist, air-compressor and 50-ton mill, equipped with a crusher, Elspass mill and concentrating tables. Mine said to be under lease, expiring 1911, to a Leadville syndicate.

VIVIAN & SONS. WALES.

Office and works: Swansea, Glamorganshire, Wales. The Hafod works, at Swansea, dating from 1810, include smelters for treatment of gold, silver and copper ores, and a small electrolytic furnace. Firm also owns the Margam works, at Port Talbot, near Swansea, latter having rolling mills making copper, brass and yellow metal sheets, tubes and other finished products.

COMPAÑIA MINERA VLADIVOSTOCK DE COLLAHUASI. CHILE.

Office: Iquique, Chile Mine office: Collahuasi, Tarapacá, Chile. Organized March 31, 1906, under laws of Chile, with capitalization $10,000 pesos, shares 16 pesos par.

VOLCANIC COPPER MINING & SMELTING CO. CALIFORNIA.

Dead. Formerly had an office at 356 South Broadway, Los Angeles, Cal.

VOLCANIC MINE. BRITISH COLUMBIA.

Mine office: Grand Forks, Boundary district, B. C. R. A. Brown, owner. Lands, 102 acres, on the north fork of the Kettle river, showing a great hill of capriferous pyrrhotite. Vein, claimed to be 600' wide, shows small values in copper and gold near surface, with promise of better values at depth. Has an 800' tunnel, which has not yet reached the ore body. Property, though low in grade, is considered promising, because of vast size of its ore body.

VOLCANIC MINING, SMELTING & DEVELOPMENT CO. BRITISH COLUMBIA.

Dead. Formerly at Grand Forks, Boundary district, B. C. Described Vol. IV.

VON GERMET COPPER, LTD. CHILE.

Dead. Liquidated, October, 1905. Formerly at Antofagasta, Chile.

VORTEX MINING CO. IDAHO.

Letter returned unclaimed from former office and mine, Osburn, Shoshone Co., Idaho. Ira Griggs, president; John Pritchard, secretary; Stanley P. Fairweather, treasurer; Frank DeLong, superintendent. Lands, on Rosebud Gulch, circa 3 miles from Osburn, have a 75' tunnel, showing a vein of about 25' width, and a lower tunnel of 360' length. Idle and presumably moribund.

VULCAN CONSOLIDATED COPPER CO. NEVADA.

Dead. Was succeeded by Nevada Vulcan Mining Co. Formerly at Sodaville, Esmeralda Co., Nev. Described Vol. IV.

VULCAN COPPER CO. OREGON.

Letter returned unclaimed from former office, San Francisco, Cal. Mine office: Takilma, Josephine Co., Ore. Company bought the property of the Mountain View Copper Co., for $24,000. Mine is said to show a promising vein of bornite. Equipment includes a 30-ton Vulcan smelter, never blown in. Idle and presumably moribund.

VULCAN COPPER MINING CO. CALIFORNIA.

Office and mine: Dunsmuir, Siskiyou Co., Cal. Employs 15 men. John R. Lyle, president and general manager; Alvin J. Knight, secretary and treas-

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urer. Organized Oct. 18, 1905, under laws of Oklahoma, with capitalization $3,500,000, shares $1 par; issued, $500,000. Annual meeting, October 26.

Lands, 14 claims, 6 patented, area 250 acres, known as the Great Verde mine, between the Balaklala and Trinity mines, on Squaw Creek, 10 miles from Kennett, showing rhyolite and andesite, with an occasional gossan. Property carries chalcopyrite disseminated in pyrite, estimated by company to average 3.5% copper, 2 oz. silver and $3 gold per ton. Development is by 9 tunnels, of circa 1,200' aggregate length, showing occasional native copper and chalcopyrite up to 20% in claimed copper tenor. Diamond drilling, 1907, is claimed to have developed good sulphide ore, and company shipped, 1907, a little ore to the Kennett smelter.

VULCAN COPPER MINING CO. **WYOMING.**

Office: Wausau, Wis. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. W. M. Monroe, president; W. D. Kolloch, secretary. Organized 1898, with capitalization $1,000,000, shares $1 par. Lands, 120 acres, in the Encampment and Battle Lake districts. Has 3 shafts, deepest about 100', showing a 15' sulphide ore vein. Idle some years and apparently moribund.

VULCAN COPPER MINING & SMELTING CO. **NEVADA.**

Dead. Reorganized, 1902, as Vulcan Consolidated Copper Co. Formerly at Sodaville, Esmeralda Co., Nev.

VULCAN-ELY COPPER CO. **NEVADA.**

Office: Commonwealth Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Geo. W. Wagner, president; S. H. Grove, vice-president; E. G. Smith, secretary and treasurer. Organized circa 1907, with capitalization $5,000,000, shares $1 par. Ely Trust Co., Ely, Nevada, registrar and transfer agent. Lands, 285 acres, in 2 groups of 95 and 190 acres, the smaller, adjoining the Pittsburg-Ely on the west, being claimed to have a good surface showing. Apparently no development undertaken. Presumably moribund.

VULCAN MINING, SMELTING & REFINING CO. **NEVADA.**

Mine office: Cherry Creek, White Pine Co., Nev. P. A. Danaher, general manager. Mine, circa 80 miles from Ely, has copper and silver-lead ores, and, 1907, made frequent small ore shipments.

VULTURE PEAK COPPER CO. **ARIZONA.**

Office and mine: Wickenburg, Maricopa Co., Ariz. Byron Smith, superintendent. Organized 1907. Lands, said to be extensive, which were in litigation until recently, are said to have a 3' vein carrying 17% copper ore, with ore assaying up to 51.8% copper, 8.5 oz. silver and $2 gold per ton. Plans a 1,000-h. p. power plant, on the Hassayampa river, near Wickenburg.

WABASH COPPER MINES CO. **NEVADA.**

Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Lands, 13 claims, known as the Minnesota group, having a contact vein between limestone and granite, with a gossan capping of 50' to 100' width, with several shallow pits, deepest 15', showing ore of 2 to 40% copper tenor.

WABASH MINING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Letcher, Fresno Co., Cal. Dr. J. H. Bryant, president. Lands, 16 claims, adjoining the Copper King, opened by 2 shallow shafts, and tunnels of 300' and 400'. Idle several years and presumably moribund.

WABASH MINING CO. **UTAH.**

Office: 521 Atlas Blk., Salt City, Utah. Mine office: Park City, Summit Co., Utah. Col. Nicholas Treweek, president and general manager; John R. Barnes, vice-president; W. Mont. Ferris, secretary and treasurer; preceding officers, John M. Daugherty and J. Leonard Birch, directors; G. M. Gillett,

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superintendent. Organized under laws of Utah, and reorganized February, 1906, with capitalization $2,000,000, shares $5 par; issued, $750,000. Has levied numerous assessments.

Lands, 320 acres, 140 acres freehold and 160 acres held under bond and lease. Has an 800′ main shaft, with about 3 miles of workings, showing 6 veins, including a big new vein, cut on the 600′ level, ores carrying mainly silver and lead values, with a little copper and gold. Is said to have expended circa $500,000 on development. Employs 30 men. Property considered promising.

WABUSKA COPPER CO. NEVADA.

Mine office: Wabuska, Lyon Co., Nev. J. E. McDermott, manager. Lands, 16 miles from Yerington, have 2 shallow shafts, deepest 120′, showing a 20′ contact vein between limestone and porphyry, carrying sulphide ore of 1 to 30% copper tenor. Has several mine buildings.

WABUSKA COPPER MINES CO. NEVADA.

Mine office: Wabuska, Lyon Co., Nev. Was developing with a small force, at last accounts.

WAGNER AZURITE COPPER CO. NEVADA.

Office and mine: Tonopah, Nye Co., Nev. Employs 10 men. Frank Everett, president and general manager; S. K. Bradford, vice-president; Raymond Lyon, secretary and treasurer; J. T. Spicer, superintendent. Organized July 15, 1907, under laws of Nevada, with capitalization $2,000,000, shares $1 par. Annual meeting, first Tuesday in November.

Lands, 16 claims, unpatented, area 320 acres, in the Wagner district, with two railroads within one mile, showing limestone, porphyry and rhyolite, said to give a good surface showing, opened by a 215′ shaft. Equipment includes a 15-h. p. hoist and a 2-drill air-compressor.

WAGNER-GREEN MINING & MILLING CO. COLORADO.

Dead. Formerly at Pearl, Larimer Co., Colo.

WAHNITA COPPER MINING CO. MICHIGAN.

Dead. Was fraudulent. Name changed to Erie Consolidated Mining & Reduction Co. Formerly at Matchwood, Ontonagon Co., Mich. Fully described Vol. II.

WAHSATCH MINING CO. UTAH.

Office: 2206 Lincoln Ave., Ogden, Utah. Mine office: Brigham City, Box Elder Co., Utah. H. C. Baker, president and general manager; J. W. Abbott, vice-president; H. R. Wadleigh, secretary. Organized April, 1904, under laws of Arizona, with capitalization $1,500,000, shares $5 par, stock issue being divided into 5% cumulative preferred and common shares.

Lands, 505 acres, patented, on the western slope of the Wahsatch Mountains, 4 miles from Brigham City. Mine, as opened, carries mainly lead and silver values, but the company has copper deposits in a prospective stage. Equipment includes a 150-ton concentrator, connected with the mine by a 4,200′ aerial tram. Water is piped to the mine and mill under a considerable head, estimated to be capable of generating 180 h. p. Presumably idle.

WALCOTT COPPER MINING CO. WYOMING.

Office and mine: Walcott, Carbon Co., Wyo. W. C. Sammons, C. A. Hansen, W. W. Petty, O. O. Shields, F. A. Raynor, A. C. Wagner and J. R. Dodd, directors. Organized circa January, 1907, with capitalization $1,000,000.

WALDO SMELTING & REFINING CO. OREGON.

Office: P. O. Box 1487, Colorado Springs, Colo. Mine office: Takilma, Josephine Co., Ore. Chas. L. Tutt, president; K. R. Babbitt, vice-president; Spencer Penrose, secretary and treasurer; J. A. Hall, assistant secretary and treasurer; preceding officers, J. A. Hayes, J. O. B. Gunn and Col. T. Wain Morgan Draper, directors; E. W. Walter, general manager. Organized Dec.

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3, 1901, under laws of Colorado, with capitalization $3,000,000, shares $100 par. Is under same management as Takilma Smelting Co., and owns a share interest therein.

Lands, 20 patented claims, area 400 acres, with millsite, also 650 acres of placer lands, near the Queen of Bronze mine, showing 5' fissure veins, of about 10' average width, carrying sulphide ores of 12% copper and $3 gold average values. Has a shaft and 3 tunnels. The Copper King shaft, about 200' deep, has an 80' crosscut-drift, showing a good ore body. The 700' Lyttle tunnel and the 400' No. 2 tunnel, on the same claim, show good ore bodies. The 310' Cowboy tunnel connects with the incline shaft, 160' below surface, and is to be extended to intersect known ore bodies. Property is about 40 miles from the Southern Pacific railroad. Officers of the company are men of standing, with long and successful mining experience, and the property is considered promising.

GEWERKSCHAFT WALDSTOLLN. **GERMANY.**

Dead. Formerly at Dermbach, Weimar, Germany. Described Vol. VII.

WALES COPPER MINING CO. **ALASKA.**

Dead. Merged, 1904, in Hadley Consolidated Copper Co. Formerly at Hadley, Prince of Wales Island, Alaska. Described Vol. IV.

WALKER LAKE COPPER-GOLD CO. **NEVADA.**

Office: 305 Clay Peters Bldg., Reno, Nev. Mine office: Dutch Creek, Esmeralda Co., Nev. E. R. Dodge, president; E. C. Harris, vice-president; G. H. Cramer, secretary and treasurer; preceding officers, R. H. Long and Michael Knopf, directors. Lands, 34 claims, area 680 acres, in 8 groups, fairly timbered and watered, in the Walker Lake and Mount Grant districts, having an 85' shaft showing auriferous and argentiferous copper ore.

WALKER LAKE COPPER MINING & SMELTING CO. **NEVADA.**

Office: 404 Empire Bldg., Denver, Colo. Mine office: Hawthorne, Esmeralda Co., Nev. Organized early 1907, under laws of Arizona, with capitalization $1,000,000. Lands, 4½ miles east of Walker Lake, are claimed to show a 2' vein of ore assaying 9.2% copper at depth of 9'. Is not regarded favorably.

WALKER LAKE EXPLORATION & DEVELOPMENT CO. **NEVADA.**

Mine office: Hawthorne, Esmeralda Co., Nev. Frank House, general manager; Andrew Bain, superintendent. Lands, on Cat Creek, 8 miles from Hawthorne, show a vein of 9' estimated average width, carrying native copper.

WALKER LAKE INDIAN RESERVATION MINING CO. **NEVADA.**

Office: care of Wm. H. Wilson Co., fiscal agents, Goldfield, Nev. Mine office: Dutch Creek, Esmeralda Co., Nev. G. B. Potter, president; J. L. Lindsay, treasurer; Francis D. Adams, secretary. Capitalization $1,000,000. Lands, 3 lode claims, area 60 acres, and 160 acres of placer claims, west of Walker Lake, said to show a dike carrying ore assaying 10 to 20% copper, with small gold and silver values. Apparently no development undertaken.

WALLACE & MISSOULA MINING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Letter returned unclaimed from former mine office, Nine Mile, Missoula Co., Mont. P. M. Riley, president; J. H. Scott, vice-president; Edw. Blackman, treasurer; preceding officers, Jos. Thomas and Jas. A. Wayne, directors. Organized 1903, under laws of Idaho, with capitalization $1,000,000, shares $1 par.

WALLAPAI COPPER CO. **ARIZONA.**

Mine office: Wickenburg, Maricopa Co., Ariz. J. C. Dobbins, superintendent. Lands, 160 acres, patented, in the Bradshaw Mountains, having a 260' shaft. Formerly employed up to 50 men. Presumably idle.

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WALLAROO CENTRAL COPPER MINING SYNDICATE. SOUTH AUSTRALIA.

Mine office: Kadina, Daly Co., South Australia. Property is the Bingo mine, having a shaft of circa 100' depth. Diamond drilling has shewn copper sulphides.

WALLAROO EXTENDED COPPER MINING CO., LTD. SOUTH AUSTRALIA.

Mine office: Wallaroo, Daly Co., South Australia. Lands, 196 acres, 3 miles west of Kadina, adjoining the western boundary of the Wallaroo mine. Property has numerous pits and trenches, from early-day prospecting, and No. 1 shaft, 96' deep, shows, at 75' depth, a 4' vein, supposedly an extension of the Wallaroo, carrying disseminated bornite and chalcopyrite.

WALLAROO & MOONTA MINING & SMELTING CO., LTD. AUSTRALIA.

Office: Steamship Bldgs., Currie St., Adelaide, South Australia. Mine offices: Wallaroo, Daly Co., South Australia, and Moonta, Daly Co., South Australia. Works office: Port Wallaroo, Daly Co., South Australia. Employed 2,553 men, Jan. 1, 1907, and 1,573 men June 30, 1908, of whom 738 were at Wallaroo, 494 at Moonta and 341 at Port Wallaroo. Jas. Harvey, chairman; preceding officer, Sir J. Lancelot Stirling, Sir R. C. Baker, Simpson Newland and Hon. J. J. Duncan, directors; David Davidson, secretary; H. Lipson Hancock, general manager; Jas. Pryor, assistant general manager; Union Bank of Australia, Ltd., bankers; Elder, Smith & Co., Ltd., London agents.

Organized 1899, under laws of South Australia, as a merger of the Moonta and Wallaroo companies, with capitalization £400,000, shares £2 par; issued, £320,000. To end of 1907 paid 30 dividends, aggregating £444,000, dividends being £80,000 in 1906 and £140,000 in 1907. The Wallaroo company, previous to the merger, produced copper to the value of £2,229,096, paying dividends of £430,254, therefrom, and the Moonta company, before the merger, produced copper to the value of £5,396,146, paying dividends of £1,168,000 therefrom, giving the property a total dividend record, to Dec. 31, 1907, of £2,042,254. Gross profits, 1907, were £49,835 6s. 4d., company ending the year with balance of assets of £112,081 5s. 4d. Liberal allowances are made yearly for depreciation, amounting, 1906, to £15,142 17s. 7d., with total allowance for depreciation, to end of that year, of £142,873 18s. 9d.

Lands are extensive, including the Wallaroo and Moonta groups, about 10 miles apart, with various smaller properties, and site of the reduction works, at Port Wallaroo, all in the Yorke Peninsula, on Spencer Gulf. The Wallaroo mine was discovered 1860, and the Moonta 1861, and both mines have been operated, practically continuously, since 1863.

The mines use waste rock for filling, and, 1907, sent underground 40,000 long tons of attle, for filling depleted stopes. The properties suffer from air-blasts, similar to those of the Lake Superior copper mines, though only slight earth-shocks are experienced. Cornish pumps have been replaced by Bellis & Morcom electric pumps. During 1907 the mines made 5,675' of new openings, and the management very wisely took advantage of two years of high prices for copper to make extensive underground development, and to add largely to surface equipment. The mines having been opened nearly half a century ago, when mining practice was crude, there are entirely too many shafts for economical ore extraction, and the policy of the present management has been, and continues to be, for a reduction of the number of working shafts, and greatly increased hoisting capacity for such shafts as are retained in commission.

The Wallaroo group, 6 miles east of Port Wallaroo, includes the Kurilla, an adjoining property, the entire tract having an area of circa 2,000 acres. The property shows schists and slates, mainly metamorphosed mica-schist,

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carrying 6 practically parallel veins, with ESE. strike, dipping quite uniformly at 60° NW., veins ranging 6′ to 33′ in width, opened for about one-half mile in length, and to depth of circa 2,000′. The gossan showed a little atacamite and carbonate ores, succeeded by a leached zone of 35′ to 40′, followed by native copper, cuprite, melaconite, azurite, malachite and chalcopyrite, but the oxidized ore bodies were worked out, many years ago. At depth the ore is mainly chalcopyrite, associated with pyrite, hematite and occasional molybdenite, with quartzose gangue containing calc-spar and some schistose country rock. Ore is slightly auriferous and argentiferous, and ranges 2 to 4% in copper tenor, as mined, but is hand-cobbed, and concentrated about 4 into 1, before sent to the smelter. The mine maintains good average values in the deepest workings. Ore is won mainly by overhand stoping, and wide stopes are timbered by wooden pillars, with waste filling on either side of the drifts.

The Wallaroo and Kurilla mines, jointly, have about 30 shafts, mainly inclines on the veins, with circa 35 miles of workings, many of the shafts being old and abandoned. Operating shafts hoist with 2-ton and 3-ton skips, the principal shafts being Taylor's, Young's, Office, Boor's and Elder's.

Taylor's shaft, 2,282′ deep, is the principal opening. The old shaft was badly injured by fire, January, 1904, and was replaced by a new vertical shaft from surface, connecting with the lower levels of the old workings. The fire did much damage, destroying the pumping apparatus to a depth of 2,000′, but, by heroic efforts, pumps were installed with compressed air power, since replaced by electric pumps. Extensive storage-bins were installed, 1903, between various levels in Taylor's shaft.

The Office shaft is 1,976′ in depth. Young's shaft is 1,858′. Boor's shaft has been equipped with a big Waddle fan, the suction exhausting foul air from the mine, this scheme of ventilation rendering stoping possible where otherwise work would be out of the question.

The Kurilla mine, opened to depth of 1,170′ on a vein parallel to the main vein of the Wallaroo, has an ore body of 10′ to 12′ width, which is bunchy, carrying high-grade chutes of ore averaging about 11% in copper tenor, after hand-cobbing. The Kurilla is practically a portion of the Wallaroo mine.

The Moonta group, including the Moonta, Moonta Central and North Yelta mines, has an area of 2,673 acres, leasehold from the crown. Country rock is felsite-porphyry, closely jointed, with jointing planes usually showing a green amphibolic coating. The porphyry does not outcrop, but is covered by silicious limestone containing circa 15% silica, which weathers into spherical masses. The Moonta has 27 veins, of 6″ to 20′ width, with 5 practically parallel main veins, having a general average strike of N. 30° E., with numerous stringers and laterals, there also being 2 series of cross fissures. The 5 veins worked, in hard felsite-porphyry, showed considerable atacamite in the upper workings, succeeded by a barren zone of 60′ to 125′, below which were oxidized ores, succeeded by chalcopyrite and occasional bornite, associated with pyrite, with quartz gangue. The Moonta ores are rich, and for years averaged 20% in copper tenor, after hand-cobbing, but are now dressed to about half that tenor only.

The Moonta has 21 trial shafts and 56 working shafts, so-called, having been opened in a period when mining practice was vastly different from that of the present day, consequently most of the working shafts have been abandoned, and extraction is mainly through Taylor's shaft and Treuer's shaft, the mine being opened to depth of 1,720′. Most of the shafts are vertical, for a short distance, thence are deflected to follow the dip of the veins, and the mine has upwards of 40 miles of underground workings, mining being by both overhead and underhand stoping.

The Moonta Central mine was unwatered, 1907, to the 180-fathom level,

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workings being found in good shape, and the mine produced some fluxing ore, but was closed down, April, 1908, and allowed to fill again.

The North Yelta mine is opened by a main shaft, deepened 120′ in 1907, but work was stopped, November, 1907, and the mine allowed to fill.

Equipment formerly included a great number of small, isolated machinery plants, all more or less antiquated in design, and uneconomical in operation. For some years the efforts of the management have been bent toward the consolidation of separate plants, wherever possible, and their replacement by larger and more modern installations. The new central power plant at the Wallaroo, enlarged 1907, has effected a very great saving in operating costs. Some trouble was had, 1907-1908, owing to the poor supply of Beetaloo water.

Buildings include a large number of shops and engine-houses, with large and commodious changing-houses, the principal shafts having shower-baths and lockers.

Transportation is furnished by the government railway, which connects both the Wallaroo and Moonta mines with the reduction plant at Port Wallaroo.

There are concentrators at both groups of mines, and the process followed at each is essentially the same, the exceptional weight and flaky nature of the gangue rendering concentration exceedingly difficult, but the various metallurgical problems have been met and conquered by persistence and technical skill. At the shafts ore is dumped on grizzlies, passing to bins for various sizes, whence drawn off to railway trucks, and carried to the concentrators. At the mills, after wet crushing, material goes to revolving trommels, from which oversize goes to a traveling belt, whence ore is picked by boys, and passes through crushers, with water. Ores passing a ⅝″ mesh are treated on specially designed Hancock jigs, and raggings passing ⅞″ and 1¼″ meshes are treated separately, on other specially designed Hancock jigs, while material rougher than 1¼″ is hand-picked from the traveling belt. The well-known Hancock jig, now in use throughout the world, was designed by H. R. Hancock, the former general manager, for the use of these mines. The largest jigs at the Wallaroo and Moonta mines treat 25 tons of material hourly. About 12 to 15% of the material handled is slimed, slimes going to spitzkasten, for classification and distribution to round tables and vanners, which turn out a product of circa 12% copper tenor.

The Devon mill, at the Wallaroo mine, was enlarged, 1907, by the addition of 5 Ball mills and 6 Card tables, and, 1908, was given one new transmission cable and 2 additional 100-h. p. motors, with a belt-conveyor for stacking tailings from the Wilfley and Card tables.

Coarse material and tailings from the wash are piled in heaps, weathered and leached. Heaps range 20′ to 60′ in height, the tops of the piles of coarser material being laid out in terraces. Ore-heaps are systematically sprinkled, and leach-liquor, carrying 60 to 120 grains of copper per gallon, runs to vats. The leach-heaps cover about 30 acres, and contain upwards of 1,000,000 tons of tailings, a considerable length of time being required for complete oxidation and thorough leaching.

Fine wastes and slimes go to a specially designed leaching plant, and are passed through a series of vats containing leach-liquor, 12 to 20 lbs. of sulphuric acid being added to the leach-liquor for each ton of slimes treated. The slimes in the vats are agitated by revolving arms, the pulp, after agitation, passing to settling dams and clarifying reservoirs. The leach-liquor is drawn off, in earthen pipes, to the main precipitating works, where it joins the liquor from the various tailings heaps, and copper is precipitated therefrom on scrap-iron. The material from the settling dams is weathered and given a second, and occasionally a third, leaching. The average production

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of precipitate from these plants is 15 to 20 long tons weekly. In addition to precipitate, the leaching plant makes considerable bluestone.

The smelter, at Port Wallaroo, does considerable custom work, in addition to treating the company's ores, production, 1907, from custom ores and mattes, amounting to 1,722 long tons, 17 cwts. 23 lbs. blister copper. The works have one large and one small blast-furnace, No 1 furnace having been rebuilt, 1907, and there are 4 refining furnaces. The works have ore-sintering pots for sintering flue-dust from the blast-furnaces in connection with raw ore, and sintered flue-dust is turned mainly into bluestone. Product of the works is a blister copper of exceptional purity, the "Wallaroo" brand of metal having a deservedly high standing among critical consumers. Copper is sold through Aron Hirsch & Sohn, under a 3-year contract, renewed 1907. Slags are granulated and sent back to the mines, for underground filling, this property apparently being the first ever to make such use of slag. The power plant at the smelter has 2 Samuelson's blowers, and a Bellis & Morcom engine, with Babcock & Wilcox boilers and a large coal gantry, added 1907. At the works the company has a private railway, larger locomotives having been added, 1907.

In connection with the smelter are acid works and a bluestone plant, latter rebuilt, 1907. The acid plant, of about 20 tons daily capacity, utilizes fumes from the smelter, furnishing sulphuric acid for the lixiviation works at the mines, and, in addition sells considerable commercial acid. Production of acid, 1907, was 5,378 long tons, made at a cost of 17s. 4d. per long ton.

Labor conditions at the mines and works of the Wallaroo & Moonta are among the best to be found in Australia, where, as a rule, relations are decidedly strained between employer and employe. The company keeps faith implicitly with its men, and is awarded by unusual loyalty on the part of its workmen. Underground work is done mainly on contract, and there is a sliding scale of wages, by which bonuses are added automatically, as copper advances, and are cut off in the same manner on a declining market. The company sells houses to its men, on time, giving them easy terms, and maintains a library and reading-room, well supplied with books and periodicals. The company also has helped to improve living conditions by the construction and maintenance of parks, fostering of musical organizations, and in a variety of other ways, all of which are commendable, and all of which are appreciated by those benefited.

To Dec. 31, 1904, the present company had produced copper to the value of £4,281,342, and total value of production of mines to that date was £12,245,554. Recent production has been as follows: 14,563,097 lbs. fine copper, in 1905; 16,936,640 lbs. fine copper, 327 long tons bluestone, 8,250 oz. silver and 2,326 oz. gold, in 1906; 19,314,480 lbs. fine copper, 223 long tons bluestone, 5,845 oz. silver and 2,009 oz. gold, in 1907. For first half of 1908 production was 2,558 long tons copper, and for year probably was circa 12,000,000 lbs. fine copper. In 1907 the mines yielded 229,674 long tons of material, averaging 3.59% in copper tenor, of which the Wallaroo group furnished 151,977 tons, and the Moonta 77,697 tons. Of the 1907 production, 46,045 tons was called waste, 72,531 tons smelting ore, and 109,507 tons leaching ore. The Wallaroo mines yielded 55,129 long tons of ore, averaging 8.01% copper, returning 4,419 long tons finished copper, and 36 long tons precipitate that yielded 25 long tons finished copper, and the Moonta mines yielded 16,924 long tons dressed ore averaging 10.66% copper tenor, returning 1,804 long tons fine copper, and 835 long tons precipitate that yielded 649 long tons fine copper. Material smelted, 1907, was 75,666 long tons, including ore, matte and regulus, with a recovery of 82.59% of values by wet assay.

Cost per long ton of finished copper, 1906, was £72 11s. per long ton,

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equal to 15.7 cents per pound, but costs were abnormally high in that year, owing to improvements. Like all other copper mines, costs are increasing, unavoidably, due primarily to increased wages, and partially to increased cost of material. The shareholders voted increased remuneration to the directors, March, 1907, but, at the end of that year, the directors voluntarily reduced their compensation to the former figures, on account of greatly decreased earnings, due to the metal market, thereby setting a valuable example, and proving themselves gentlemen of exceptional probity. The mines are good, the management is highly progressive, and the directors are to be commended for the exceedingly full and informing reports that they furnish to their shareholders.

WALL STREET COPPER & GOLD MINING CO. **MONTANA.**

Mine office: Boulder, Jefferson Co., Mont. Property shows ore assaying 18% copper and 7 oz. gold per ton.

WALTHAM MINE, LTD. **COLORADO.**

Office: 155 Fenchurch St., London, E. C., Eng. Mine office: Russell Gulch, Gilpin Co., Colo. Dr. J. H. Gower, managing director; W. F. Coote, secretary. Organized June 16, 1903, with capitalization, £25,000, shares £1 par. Lands include the Waltham mine, carrying gold, silver and copper ores. Idle some years and presumably moribund.

WANDILTA COPPER MINES, LTD. **AUSTRALIA.**

Office; 30 Moorgate St., London, E. C., Eng. Mine office: Kadina, Daly Co., South Australia. A. S. Caine, chairman; J. A. Russell, secretary. Lands, 140 acres, including the Wandilta mine, having a 2′ to 3′ vein, opened by a 240′ shaft, with limited development. Idle some years and moribund.

WAPITI MINING CO. **COLORADO.**

Office: 932 Equitable Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Wapiti, Summit Co., Colo. Ores carry gold, silver, lead and copper. Has a small concentrator. Idle and apparently moribund.

WARATAH MINE. **AUSTRALIA.**

Mine office: Grafton, N. S. W., Australia. Mine, at Fine Flower, near Grafton, has, at 30′ depth, a vein of 4′ 6″ width carrying azurite and malachite.

WARATAH SMELTER. **AUSTRALIA.**

Owned by English & Australian Copper Co., Ltd.

WAR EAGLE CONSOLIDATED MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Office: 49 Wellington St. East, Toronto, Ont. Mine office: Rossland, Trail district, B. C. Geo. Gooderham, president; T. G. Blackstock, vice-president; preceding officers, W. G. Gooderham, A. E. Gooderham, Geo. T. Blackstock, W. H. Beatty, Chas. R. Hanswer and James Cronin, directors; E. B. Kirby, general manager; Carl R. Davis, superintendent; Chas. B. Jenkins, clerk and purchasing agent. Organized January, 1897, under laws of British Columbia, with capitalization $2,000,000, shares $1 par; issued, $1,750,000. Paid dividends of $544,250, June, 1898, to February, 1900, with no dividends since. Is controlled, through stock ownership, by Consolidated Mining & Smelting Co. of Canada, Ltd.

Lands include the War Eagle, Richmond, Crown Point and other claims, carrying auriferous and argentiferous copper ores.

Like all other mines of the Rossland district, ore of the War Eagle is much lower in grade at depth. Is operated in connection with the Centre Star, mines being connected on several lines. Shipments, during 1905, were 60,860 tons, of $890,269.21 gross value, giving an average of $11.34 per ton, from which the company received, after deducting freight, smelting, refining and marketing charges, an average of $5.22 per ton. Production, 1907, estimated at 1,350,000 lbs. fine copper.

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WAR EAGLE COPPER-GOLD MINING CO. **BRITISH COLUMBIA.**

Dead. Lands sold, 1906, to Phoenix Amalgamated Copper Mines, Ltd. Formerly at Phoenix, Boundary district, B. C.

WAR EAGLE MINE. **YUKON.**

Mine office: White Horse, Yukon, Canada. Shipped a little high-grade bornite, 1905. Presumably idle.

WARRA DIVIDEND CO., LTD. **SOUTH AUSTRALIA.**

Office: 29 Grenfell St., Adelaide, South Australia. Mine office: Hergott Springs, South Australia. Hon. Frank Johnson, chairman; F. Stevens, secretary and treasurer. Organized January, 1907, under laws of South Australia, with capitalization £4,000, shares 10s. par, 9s. paid in; issued, £3,977. Annual meeting, in October.

Lands, 160 acres, leasehold from the crown, in the Hergott district, known as the Warra Warra mine, showing kaolinized and indurated slates, sandstone and quartzite, in alternate strata, carrying native copper in fine particles, cuprite, malachite, chalcocite and chalcopyrite. Main ore body is reported as averaging circa 50′ in width, and traceable one mile, carrying ore assaying 3 to 8% copper, hand-cobbed to an average tenor of 36% for shipment. Development is by vertical shafts of 60′, 65′, 80′; 108′ and 266′, and by tunnels of 80′, 110′ and 160′.

Property was under development by the Tasmanian Copper Co., Ltd., but was abandoned, and has been taken back by the owners, who are planning to raise additional capital required for development.

WARRA WARRA PROPRIETARY COPPER MINES, N. L. **SOUTH AUSTRALIA.**

Dead. Lands sold, January, 1907, to Warra Dividend Co., Ltd. Formerly at Hergott Springs, South Australia.

WARREN DEVELOPMENT CO. **ARIZONA.**

Dead. Name changed, 1905, to Warren District Development Co. Formerly at Bisbee, Cochise Co., Ariz.

WARREN DISTRICT DEVELOPMENT CO. **ARIZONA.**

Office: care of C. D. Hanchette, treasurer, Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. John Funkey, president; J. A. Fuller, secretary. Organized 1903, under laws of Michigan, with capitalization $100,000, shares $10 par; issued, $16,000. Lands, 12 claims, area 200 acres, adjoining the Higgins group. Idle since organization.

WARREN REALTY & DEVELOPMENT CO. **ARIZONA.**

Office: 510 Lyceum Bldg., Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Henry B. Hovland, president; Thomas F. Cole, vice-president and treasurer; Charles A. Duncan, second vice-president; Frederic R. Kennedy, secretary; Daniel R. Smith, assistant secretary; William G. Hegardt, assistant treasurer; Col. L. W. Powell, general manager.

Organized June 29, 1905, under laws of Arizona, with capitalization $900,000, shares $15 par; paid in, $12. Controls, jointly with Superior & Pittsburg Copper Co., the Warren Co., with capitalization $665,000, owning the townsite of Warren, and various public utilities therein. Annual meeting, second Tuesday in April.

Lands, circa 1,700 acres, in the Warren district, all of possible mineral worth, but held mainly for surface values. Lands include the Cunningham group, and former holdings of the Calumet & Cochise Development Co., 3 claims of latter being of promise. Considerable diamond drilling was done, 1907, and a shaft started, 1905, on the Lone Star claim, circa 2½ miles southeast of the Junction shaft of the Superior & Pittsburg. The 3-compartment Lone Star shaft, 815′ deep, October, 1908, may find ore, it is thought, at a depth of circa 2,000′. Management is good, and property valuable, primarily

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for surface rights, and secondarily for the chances of making a mine on three of the Calumet & Cochise claims.

WARRIOR COPPER CO. **ARIZONA.**

Office: 316 Crozer Bldg., Philadelphia, Pa. Mine office: Black Warrior, Gila Co., Ariz. E. M. White, superintendent; J. A. Gamble, chief clerk. Organized March 10, 1906, under laws of Delaware, with capitalization $1,600,000, shares $10 par, in $750,000 cumulative 7% preferred stock, and $850,000 common stock, as successor of Black Warrior Copper Co., Amalgamated, which came to grief financially.

Lands, circa 1,500 acres, in 3 groups, known as the Gold Gulch, Diamond H and Montgomery, latter including the Montana and Dadeville mines, adjoining claims, opened by tunnels of circa 1,000′ and 1,200′, with about 3,000′ of workings, 1906, the lower tunnel showing a vein of circa 40′ estimated average width, carrying ore estimated at 10% average copper tenor, which estimate is considered excessive, ore being silicious, and apparently averaging up to 6% copper. The mine has a steam plant, burning petroleum.

Reduction plant includes a 100-ton concentrator, 300-ton leaching plant and 50-ton matting furnace. The leaching plant, in a 62x130′ building, has six 50-ton tanks, each 20x25x5′, heated by steam coils to facilitate lixiviation. Crushed ore is delivered to the tanks from a railroad track running above, planned to be replaced by a belt-conveyor.

Production, 1907, was 1,397,612 lbs. fine copper and 325 oz. silver. Old management was poor, but apparently present management is securing better results.

WARRIOR MINING CO. **COLORADO.**

Office: 622 Main St., Peoria, Ills. Mine office: Fort Garland, Costilla Co., Colo. Dr. L. D. Forman, president; Dr. W. M. Swartz, secretary; A. W. Reagal, treasurer. Organized September, 1902, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, 9 claims, area 180 acres, in the West Blanca district, claimed to show ore assaying up to 12% copper, 20 oz. silver and 2 oz. gold per ton, but from another source it is learned that at last accounts the company had not found ore in place, though the property is considered fairly well located. Out of cash and credit, and idle.

WARROO GOLD & COPPER CO., N. L. **AUSTRALIA.**

Office: Sydney, N. S. W., Australia. Mine office: Stanthorpe, Queensland, Australia. Organized 1908, under laws of New South Wales, with capitalization £10,000, shares £1 par. Lands, 50 acres, leasehold, in tracts of 10 and 40 acres, latter having a 50′ shaft showing a 3′ vein of pyritic quartz carrying a little gold. The 10-acre lease has a 110′ shaft showing a 3′ to 4′ vein carrying ore assaying 8% copper and 1 oz. 6 dwts. gold per long ton. Plans a smelter.

WASATCH CONSOLIDATED MINING CO. **UTAH.**

Dead. Formerly at Milford, Beaver Co., Utah.

WASATCH COPPER CO. **UTAH.**

Office: First National Bank Bldg., Ogden, Utah. Letter returned unclaimed from former mine office, Brigham City, Box Elder Co., Utah. David S. Tracy, president; Lee Harris, secretary and treasurer; W. D. Pyper, general manager; preceding officers, N. J. Harris, Alex Taylor, Harley Taylor and Caleb Parry, directors. Organized May 14, 1906, under laws of Utah, with capitalization $600,000, shares $1 par. Lands, 7 claims, area 140 acres, circa 3 miles north of Brigham City, having a 75′ tunnel and 75′ incline shaft, latter showing auriferous iron ore and copper. Idle.

WASATCH COPPER MINING CO. **UTAH.**

Office: care of J. L. Ross, president, Denver, Colo. Organized October, 1906, under laws of Arizona, with capitalization $1,200,000. Lands, said to be

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circa 200 acres, somewhere in the Pinto iron district of southern Utah, are claimed to show a 150′ vein, traceable for several hundred feet, opened by a 35′ shaft, carrying ore assaying up to 40% in copper tenor. Presumably idle.

WASATCH KING MINING CO. **UTAH.**

Office: Troy, N. Y. Mine office: Milford, Beaver Co., Wash. Joseph Leggett, president; Geo. E. DeFreest, secretary. Organized 1905, under laws of Utah, with capitalization $300,000, shares $1 par. Lands, 6 claims, area 120 acres, including the Wasatch King mine, near the Majestic, 10 miles northwest of Milford, opened by a 560′ tunnel. Presumably idle.

WASATCH MINING & MILLING CO. **UTAH.**

Dead. Merged, Sept. 1, 1908, in Utah United Copper Co. Formerly at Milford, Beaver Co., Utah.

WASHINGTON-ARIZONA MINING CO. **ARIZONA.**

Mine office: Poland, Yavapai Co., Ariz. Mark Bradley, superintendent. Lands include the Express mine, in the Big Bug district, formerly held by those notorious mining fakers, Douglas, Lacy & Co. Mine has an 800′ tunnel, cutting a vein of auriferous copper ore with back of 480′. Shipped, 1906, circa 200 tons of ore. Presumably idle.

WASHINGTON CO-OPERATIVE MINING SYNDICATE. **WASHINGTON.**

Mine office: Fairfax, Pierce Co., Wash. Lands, 2 claims, 17 miles by trail from Fairfax, said to show a 25′ vein, with 3′ paystreak carrying disseminated chalcopyrite, assaying 5 to 33% copper, 5 to 8 oz. silver and $2 gold per ton. Has an available water-power. Was in hands of a receiver, until company's coal lands, near Fairfax, were sold to the Western Iron, Coal & Coke Co. Idle for several years and apparently moribund.

WASHINGTON COPPER & MILLING CO. **WASHINGTON.**

Dead. Was a rank fraud, promoted by the notorious L. E. Pike & Co., who are still permitted, by the federal postal department, to peddle worthless "mining" shares to the credulous public. These swindlers advertised the mine to be "the richest copper property in the United States, with even more flattering prospects than the Calumet & Hecla or United Verde." The "mine" consisted of 50′ shaft, bottomed in gravel. Formerly at Eatonville, Pierce Co., Wash.

WASHINGTON COPPER MINING CO. **MICHIGAN.**

Office: 42 Broadway, New York, N. Y. Operating office: care of Keweenaw Copper Co., Hancock, Houghton Co., Mich. Mine office: Delaware Mine, Keweenaw Co., Mich. Chas. A. Wright, president; Spencer R. Hill, vice president; Chas. A. Wright, Jr., secretary and treasurer; preceding officers and Capt. Thos. Houtson, directors. Organized under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $1,500,000. Is controlled, through stock ownership, by Keweenaw Copper Co. Annual meeting, fourth Tuesday in March.

Lands, 1,050 acres, on the western shore of Mosquito Lake, on which desultory work has been done, at intervals, in the past. Idle since 1901, with no plans for resumption in near future.

WASHINGTON-IOWA COPPER MINING CO. **WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. Property lies on the east fork of Silver Creek, 2 miles above Mineral City, adjoining the Edison Mining & Development Co., and both properties are worked under one management, development being through the 880′ Bonanza tunnel, which has crosscut 4 veins, and is expected to cut 5 additional ore bodies, at depths ranging to 800′ vertically.

WASHINGTON SMELTING & REFINING CO. **WASHINGTON.**

Works office: Keller, Ferry Co., Wash. Organized 1904, with capitalization $1,000,000, shares $5 par, to build a smelter, at West Fork, on the Sans

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Poil river, 15 miles south of Republic, to treat the ores of the Belcher Mining Co. and adjoining properties. No trace of operations.

WASHINGTON-SONORA GOLD & COPPER CO. **MEXICO.**

Office: care of A. Sandoval, treasurer, Nogales, Sonora, Mex. Mine office: Magdalena, Sonora, Mex. A. L. Lewis, president; Percy Sharpe, secretary and general manager. Organized 1902, under laws of Arizona, with capitalization $2,500,000, shares $5 par. Lands, 4 pertenencias, area 10 acres, showing fissure veins and lenses in limestone, carrying a little native copper, and oxide and carbonate ores, having estimated values of 18% copper, 12 oz. silver and $4 gold per ton, slightly developed by shafts and tunnels. Idle several years.

WASHINGTON TUNNEL & COPPER CO. **WASHINGTON.**

Dead. Former office was at Bridgeport, Conn. Lands were 36 claims, on Mineral Hill. Company planned, 1907, an 8,000′ double-track tunnel to test entire property and cut 8 known ledges. Formerly at Conconully, Okanogan Co., Wash.

WASHOE COPPER CO. **MONTANA.**

Office: 42 Broadway, New York, N. Y. Mine office: Butte, Silver Bow Co., Mont. Employs circa 300 men. John D. Ryan, managing director; Wm. Skyrme, superintendent. Capitalization $20,000,000, shares $10 par. Is controlled, through ownership of entire stock issue, by Amalgamated Copper Co. Company holds title to the Washoe Reduction Works, which are leased to the Anaconda Copper Mining Co., and the Washoe Copper Co., at last accounts, owed $7,530,000 to the Amalgamated Copper Co., this being the amount borrowed to construct the Washoe works.

Lands, 37 acres, including the Moonlight, Clear Grit, Cambers and Poulin mines, which were operating, 1907, also the Washoe, Pacific, Oden and Gold Hill claims, mainly fractional. Company had some litigation, 1907, with East Butte Extension Copper Mining Co., claiming latter had trespassed on ore bodies of the Washoe. Miscellaneous lands include 1,900 acres of coal lands on Bear Creek, in the vicinity of Red Lodge, Carbon Co., Mont. The company also holds a controlling interest in the Cokedale Coal Co., owning coal lands and 100 coke-ovens.

The Moonlight mine, which is the principal producer, has ore averaging about 1 oz. silver for each unit of copper. The Moonlight has a 1,500′ three-compartment shaft, connected underground with the Blue Jay, Neversweat, Anaconda and Pacific mines, and is timbered with 10x10″ square and round timbers, in square sets. Equipment includes a 20x48″ Dickson hoist, raising 2 double-deck cages with a 6″ flat cable, and 2 Ingersoll-Sergeant air-compressors, of 50 drills aggregate capacity.

The Cambers mine has a 225′ two-compartment shaft, connected with the Dutton and Henry George mines, equipped with a 10x14″ hoist raising single-deck cages with 1″ round cable.

The Clear Grit mine has a 600′ two-compartment shaft, and is opened to depth of 1,000′ by a 400′ winze, being connected underground with the West Stewart and Mountain Consolidated mines. Hoisting is by bucket, development having been hampered, until 1906, by litigation with the Heinze interests.

The Poulin mine produces a limited quantity of ore averaging circa 2% copper and 5 oz. silver per ton.

The mill, at Butte, known as the Taylor & Brunton sampling works, was bought in 1904.

For year ending June, 1907, production was 124,608 tons of ore, averaging gross returns of $10.92 per ton, costing $4 per ton for extraction and $2.32 per ton for reduction, with net earnings of $266,973, and in the preceding year expenditures were $175,721 in excess of receipts. For year ending June 1, 1908, production was 115,620 tons of ore, yielding gross values of $1,052,956,

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with net earnings of $246,096. Production, October, 1908, was said to be 24,800 tons of ore, yielding 1,785,600 lbs. fine copper, or at the rate of circa 20,000,000 lbs. yearly, with ore averaging 2.35 to 3% copper and 5 to 6 oz. silver per ton. Production is estimated at 6,000,000 lbs. fine copper for 1907, and 9,000,000 lbs. for 1908.

WASHOUGAL GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 5312 Maple Ave., St. Louis, Mo. Mine office: Washougal, Clarke Co., Wash. F. A. Mabee, president; J. D. Wilcox, vice-president; J. B. Jordan and T. A. Altman, secretaries; Dr. Otta Sutter, treasurer; preceding officers constitute the directorate; A. D. Wright, general manager; Orrvis Wright, mine superintendent. Organized 1902, under laws of South Dakota, with capitalization $1,000,000, shares $1 par.

Lands, 560 acres, held on a 30-year lease, from the state, near Mt. St. Helens, in the Bald Mountain district, on the upper Washougal river. Lands, well timbered, show mainly granite, carrying several fissure veins, of nearly vertical dip, of which one, of 6′ estimated average width, developed by 2 tunnels, carries auriferous and argentiferous copper, lead, zinc and silver, estimated to average 5 to 20% copper, 15% lead and zinc, 2 to 70 oz. silver and $1 to $15 gold per ton.

Equipment includes gasoline hoists, a 3-drill Leyner air-compressor, and a hydro-electric power plant, installed 1908, having a Pelton wheel developing circa 150 h. p., under a 500′ head. The company also has a sawmill and brickyard, and, April, 1908, had an Allis-Chalmers blast-furnace on the ground, for installation. Company was free from debt, at last accounts, and employed circa 40 men, April, 1908. Property considered promising, and development seems along sound lines.

WAUCHUSETT MINING CO. **NEW MEXICO.**

Office: Worcester, Mass. Mine office: Orogrande, Otero Co., N. M. John W. Knibbs, president and treasurer; Col. J. A. Prescott, secretary and general manager; Chas. H. Knibbs, superintendent; preceding officers, Theo. Parker; Dr. W. W. Spender, Josiah K. Bennett and G. E. Moffett, directors. Lands include property formerly held by the Boston-Jarilla Copper Co., just west of the Nannie Baird mine, opened by a shaft showing auriferous and argentiferous copper ore, with a bond and lease on the War Dog group of 3 claims.

WAUKEGAN & WASHINGTON MINING & SMELTING CO. **WASHINGTON.**

Dead. Lands sold, for debt, January, 1908, to Stephen H. Kennedy. Formerly at Bossburg, Stevens Co., Wash.

WEBER COUNTY MINING & MILLING CO. **UTAH.**

Dead. Was organized circa October, 1906, and was succeeded January, 1908, by Del Verde Tunnel Co. Albert Scocroft was president. Formerly at Ogden, Weber Co., Utah.

WEBSTER MINING CO. **UTAH.**

Letter returned unclaimed from former mine office, Marysvale, Piute Co., Utah. Wm. E. White, superintendent; Fisher Bros. & White, lessees. Mine has produced some silver, lead and gold ores in the past. Present management has developed ore assaying 5 to 40% copper.

WEILERTHALER BERGWERKE G. m. b. H. **GERMANY.**

Mine office: Markirch, Elsass, Germany. Dr. Recht, president; Jakob Siebenschuh, superintendent. Capitalization, 1,400,000 marks. Is a producer of silver, copper and antimony, mainly from tetrahedrite.

WEIMER COPPER CO. **IDAHO.**

Office: care of John B. Weimer, manager, Salt Lake City, Utah. Mine office: Dubois, Frémont Co., Idaho. Peter Weimer, superintendent. Lands

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originally were 18 claims, area 360 acres, said to have been increased, 1907, to 44 claims, area 880 acres. Mine has an open-cut and 3 tunnels, 2 longest 300′ each. Property shows a contact zone of 100′ to 200′ width, between quartzite and limestone, carrying high-grade ore in pockets and cross-fissures, latter, of 3″ to 2′ width, running at right angles to ledge. Shipped, 1907, considerable ore of 16 to 18% copper tenor, production for year amounting to circa 200,000 lbs. fine copper. Planned a smelter, but company in debt and lands said to be unpaid for. Property considered promising, but company apparently in a bad way.

C. WEISS y CA. **PERÚ.**

Mine office: Nuevo Cañete, Lima, Perú. Mine has auriferous and argentiferous copper ores, worked on a small scale, at last accounts.

WELDON GOLD & COPPER CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Weldon, Pima Co., Ariz. Jas. A. Greene, vice-president; Ferris S. Fitch, secretary, treasurer and general manager; preceding officers, Hon. Samuel W. Smith, Frederick M. Alger and Frank R. Osborne, directors; Luke Turnbull, superintendent; J. M. Martinez, mine superintendent; Clare Turnbull, mill superintendent; J. B. Tomlinson, consulting engineer.

Organized Jan. 26, 1901, under laws of Arizona, with capitalization $2,500,000, shares $1 par; issued, $2,175,000. Was said, August, 1907, to have expended upwards of $100,000. Has circa 450 shareholders. Annual meeting, first Monday in February.

Lands, 49 claims, partly patented, area 980 acres, and 3 millsites, with total area of 1,020 acres, in the Quijotoa district, circa 40 miles from the Arizona & Southern railway. Lands show granite, andesite, shales and limestone, reported to carry 8 contact deposits, between granite and andesite, two said to be traceable 2 miles, of which one, of 200′ claimed average width, carries mainly gold values. The copper ore body shows malachite near surface, and at depth has auriferous chalcopyrite, associated with sphalerite, galena and pyrite, with a brecciated quartz gangue, giving assays of 10 to 30% copper and 5 to 70% lead. Ore values, as a whole, apparently are more in gold, silver and lead than in copper.

Development includes an old 1,800′ crosscut tunnel, not used by present company, driven, circa 1880, by the Peer & Peerless Mining Co. New development consists of shafts of 330′, 200′, 150′, 100′, 112′, 85′ and 60′, and tunnels of 430′, 275′, 200′, 100′, 132′, 101′, 123′, 100′, 200′ and 100′, with total workings of circa 4,500′, at end 1906, estimated to show 1,000,000 tons of ore, which figures are excessive, with 90,000 tons blocked out for stoping.

Equipment is reported by company to include a steam and gasoline installation, aggregating 500 h. p. at the mine and mill. There are two 45-h. p. hoists, good for 700′ depth, and Fairbanks & Morse and Leyner air-compressors of 5 drills aggregate capacity.

Buildings, 17 in number, include an 18x20′ wooden machine-shop, boiler-house, carpenter-shop, smithy, boarding-house, assay office and store.

The 100-ton stamp-mill and concentrator, 75x100′ in size, of wood, sheathed with iron, has 30 gravity stamps and a 250-h. p. engine. Equipment of the concentrator includes 4 Blake and Samson crushers, one 50-ton Elspass centrifugal crusher, and 3 Standard tables. In 1907 the company installed the Hendryx Electro Cyanide process, consisting of an agitator, filter and precipitator, and mill was said January, 1907, to be running double shifts, making about 2 tons of concentrates daily, according to the company's annual reports, but official returns of the Territory of Arizona, covering the year 1907, do not show any production of copper, silver or gold by this company.

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WELLINGTON COPPER MINING CO. **NEW MEXICO.**

Mine office: Cutter, Sierra Co., N. M. Organized circa November, 1907, under laws of New Mexico, with capitalization $3,000,000, by Edw. F. Curtis, J. A. Sherman and Jas. F. Kindall.

WELSH COPPER MINING SYNDICATE, LTD. **WALES.**

Office: 9 Fenchurch Ave., London, E. C., Eng. Mine office: Talybont, R. S. O., Cardiganshire, Wales. John Bell-Irving, chairman; Richard S. Corbett, managing director; W. H. Bartlett, secretary. Organized Apr. 9, 1902, under laws of Great Britain, with capitalization £17,500, shares £1 par. Lands, 933 acres, including the Esgair Hir mine, carrying argentiferous copper and lead sulphides, in 2 fissure veins of 40′ average width, claimed by company to average 3 to 10% copper, 4 to 5% lead and 13 oz. silver per ton, opened by shafts of 150′ and 500′. Has a 40-ton concentrator. Idle some years and presumably moribund.

WENDENDALE GOLD MINING CO. **ARIZONA.**

Mine office: Wendendale, Yuma Co., Ariz. Lands, in the Cunningham Pass district, gave ore that yielded 13% copper and $12 gold per ton, from a smelter shipment, 1906. Presumably idle.

WENDIGO COPPER CO., LTD. **MICHIGAN.**

Dead. Was an offspring of, and, July, 1901, was absorbed by, Isle Royale Land Corporation, Ltd. Formerly on Isle Royale, Michigan. Fully described Vol. II.

WENTWORTH COPPER CO., LTD. **NOVA SCOTIA.**

Mine office: Wentworth, Cumberland Co., N. S. Organized circa February, 1907, to take over lands, bought at foreclosure sale, of Cumberland Copper Co.

WERDENHOFF MINING & MILLING CO. **IDAHO.**

Office: care of Hon. F. W. Hunt, president, Boise, Idaho. Mine office: Warren, Idaho Co., Idaho. Stephen A. Powell, secretary; Horace E. Neal, treasurer. Capitalization $5,000,000, shares $1 par. Lands, 9 lode claims and 2 placer claims, area 240 acres, in the Big Creek district, showing a mineral zone of about 250′ width, carrying mainly gold values, with a little lead and copper.

WESSEL COPPER MINING & MILLING CO. **ARIZONA.**

Office: St. Louis, Mo. Mine office: Casa Grande, Pinal Co., Ariz. Lands, 2 miles north of Toltec, have a 97′ shaft showing a 10′ vein assaying 10 to 14% copper, and about $2 gold per ton, with occasional silver values.

WEST BINGHAM COPPER CO. **UTAH.**

Office: 1104-43 Exchange Place, New York, N. Y. Mine office: Bingham Canyon, Salt Lake Co., Utah. Presumably idle.

WEST BRITISH DEVELOPMENT SYNDICATE, LTD. **IRELAND.**

Office: 1 Crosshall St., London, E. C., Eng. Mine office: Berehaven, Co. Cork, Ireland. Harry V. Kilvert, J. P., chairman; Thos. L. Miller and H. W. Wilson, managing directors; G. S. & T. Holmes, mine managers; R. Shacklady, secretary. Organized Aug. 16, 1905, under laws of Great Britain, with capitalization £31,500, in 30,000 £1 6% cumulative preference shares and 30,000 deferred shares of 1s. par. Property is sundry leasehold lands, at Berehaven, Crookhaven, Borlin and Cahermore.

WEST BUTTE MINING CO. **MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. Chas. Schmidt, president; W. McConnell, vice-president; Carroll G. Dolman, secretary and treasurer. Organized Jan. 31, 1906, under laws of Montana, with capitalization $3,000,000, shares $5 par. Property was options on the Columbia and Montrose claims, in the western part of the Butte district, the Columbia claim, area 9.32 acres, having a 144′ shaft, claimed to have

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produced about $100,000 worth of silver ore, many years ago. Idle and apparently moribund.

WEST CANANEA COPPER CO. **MEXICO.**

Letter returned unclaimed from former office, Bisbee, Ariz. Mine office: La Cananea, Arizpe, Sonora, Mex. John H. Slaughter, president; J. A. Howell, secretary and treasurer; preceding officers, W. T. Hughes, B. N. Norton, C. B. Tarbell and J. C. Gress, directors. Organized Sept. 5, 1906, under laws of Arizona, with capitalization $500,000, shares $1 par. Management is said to have decided to issue fresh stock to clear up a $40,000 indebtedness. Lands, 286 hectares, circa 5 miles west of the Greene Cananea, opened by a tunnel said to have developed considerable ore of fair grade. Shipped, 1907, a little ore to El Paso smelter. Presumably idle.

WEST CLONCURRY COPPER CO., LTD. **AUSTRALIA.**

Dead. Wound up August, 1907. Was organized June 28, 1906, with capitalization £32,000, shares 10s. par. Formerly at Cloncurry, Beaconsfield Co., Queensland, Australia.

WEST COAST MINING CO. **ALASKA.**

Mine office: Latouche, Latouche Island, Alaska.

WEST COAST MINING & SMELTING CO. **MEXICO.**

Office: Pennsylvania Bldg., Philadelphia, Pa. Mine office: Mocorito, Sinaloa, Mex. Howard L. Hains, president; Robert C. Thomas, vice-president; Chas. M. Hicks, secretary; Henry B. Neely, treasurer; preceding officers, Jas. B. Coryell, Gresham C. Colkett and Geo. B. Wilson, directors; Edward H. Hicks, general manager. Organized circa 1906, under laws of Maine, with capitalisation $2,500,000, shares $1 par, in $500,000 preferred 7% stock and $2,000,000 common stock.

Lands, 8 groups, 5 to 20 miles from Mocorito, principal property being Los Tajos mine, area circa 400 acres, showing 6 copper veins, of which 3 under development, with circa 1,500′ of tunnels, are said to give ores averaging 8 to 12% copper and $10 to $12 combined gold and silver values per metric ton. The property was claimed, 1907, to have in sight circa 200,000 tons of ore, of about $80 per ton average value.

Equipment, installed late 1908, includes a mining plant having a 35-h. p. boiler, Ingersoll-Rand air-compressor and 6 Rand power drills. A small concentrator was practically completed at end of 1908, and was planned to be in operation not later than Feb. 10, 1909. Company planned, early 1907, a 50-ton smelter, but apparently has installed the concentrator in preference.

WEST COLUMBUS COPPER CO. **UTAH.**

Office: 44 Broadway, New York, N. Y. Mine office: Alta, Salt Lake Co., Utah. Gen. Stillman F. Kneeland, president; W. F. Adams, treasurer; Jas. A. Shorten, secretary; preceding officers, F. W. Davis, John P. Stone and D. C. Krakauer, directors; Anthony O. Jacobson, manager. Organized circa 1907, under laws of Arizona, with capitalization $400,000, shares $1 par. Lands, 6 claims, area 100 acres, about one-half mile from the Columbus Consolidated and supposed to carry the extension of the ores of the latter. Has a tunnel showing ore assaying up to 12% copper, 90 oz. silver and $4 gold per ton.

WEST COLUSA MINE. **MONTANA.**

Owned by Boston & Montana Consolidated Copper & Silver Mining Co.

WESTERN AFRICA MALACHITE COPPER CO., LTD. **ANGOLA.**

Dead. Formerly at Bembe, Angola.

WESTERN CONSOLIDATED MINING CO. **MEXICO.**

Letter returned unclaimed from former mine office, Hermosillo, Sonora, Mex. Lands, 300 hectares, 18 miles north of Hermosillo, said to show about 20 veins, some worked in the past to shallow depth. Has a 150′ shaft with 2 levels opened on a 4′ silver-lead vein, and a 30′ two-compartment shaft on a

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copper vein. Has two 65-h. p. boilers, a 12x14" hoist with 4' drum, and a 10-drill air-compressor, with a 1½-mile pipe-line to the Sonora River.

WESTERN COPPER CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Property was said to show a 2' vein, assaying 25% copper. Idle and apparently moribund.

WESTERN COPPER CO. **MONTANA.**

Office: Calumet State Bank Bldg., Calumet, Mich. Mine office: Butte, Silver Bow Co., Mont. Organized circa August, 1908, with capitalization $1,000,000, shares $5 par, as a reconstruction of Calumet & Butte Mining Co., and exchanged new stock for old, on a parity, new stock being marked $2 paid in. Merchants & Miners Bank, Calumet, transfer agent.

Lands, 14 claims, area 166 acres, in the vicinity of Columbia Gardens, including 2 claims known as the Albert and Richelieu, near the Altoona, on which the old company spent about $100,000. Development is by 2 shafts, deepest 530', with a crosscut started on the 500' level. Mine has about 3,000' of workings, showing native copper, azurite, and malachite. Shipped, 1907, a little ore, taken from shallow workings, averaging about 12% copper.

WESTERN EXPLORATION CO. **ARIZONA.**

Dead. Was succeeded by Globe Mines Exploration Co. Formerly at Globe, Gila Co., Ariz.

WESTERN EXPLORATION CO. **CALIFORNIA.**

Dead. Formerly at Winthrop, Shasta Co., Cal. Described Vol. VI.

WESTERN MINING CO. **COLORADO.**

Office: 71 Broadway, New York, N. Y. Mine office: Lake City, Hinsdale Co., Colo. Saml. D. Nicholson, general manager; N. A. Nicholson, superintendent. Property includes the Ute and Ulay mines, carrying auriferous and argentiferous lead and copper ores. Has water, steam and electric power and a 200-ton concentrator.

WESTERN MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Apex, Beaverhead Co., Mont. Jas. Willoughby, superintendent. Was held, formerly, by Washoe Copper Co., under a $125,000 bond and lease, dated Dec. 8, 1904, and the Amalgamated Copper Co., or some subsidiary corporation, supposedly owns a considerable share interest.

Lands, one claim, patented, area 20 acres, also a 3-acre millsite, in the Utopia district. Property shows granite, dolomite and quartzite, with 2 contact deposits, between granite and limestone, of 8' to 10' average width, developed by shafts of 150' and 220', and by an 820' tunnel, with 1,600' of workings, estimated to show 50,000 tons of ore, with 10,000 tons blocked out for stoping. Ores are mainly chalcocite and chalcopyrite, with a considerable variety of oxidized ores, giving average returns of circa 9% copper, 4.5 oz. silver and 40 cents gold per ton. Mine, opened 1867, has been worked since, intermittently, by leasers. The mine is said to have found no large ore bodies.

Equipment includes steam and gasoline power, and a small smelter, connected with the shafts by a tramway. The smelter has a 30-ton 36" circular water-jacket blast-furnace, and, when operated, made matte averaging 55% copper, 27 oz silver and 0.13 oz. gold per ton.

Production, 1903, was circa 1,400,000 lbs. fine copper, since which there has been no regular output, though small quantities of ore have been extracted, by lessees, from time to time.

WESTERN MINING & DEVELOPMENT CO. **ARIZONA.**

Office: Chicago, Ills. Mine office: Planet, Yuma Co., Ariz. Lands, 34 claims, known as the Copper Prince group, 12 miles northeast of Planet, on the Bill Williams Fork river, formerly owned by Signal Copper Co., and held

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by present company under bond and lease. Development is by a 150′ shaft, on a large body of auriferous copper ore, of medium to high grade. Water power is available from the Bill Williams Fork river. Property considered promising.

WESTERN MINING & DEVELOPMENT CO. **COLORADO.**

Office: 42 Home Bank Bldg., Detroit, Mich. Mine office: Pearl, Larimer Co., Colo. A. C. Stellwagen, president; F. W. Henninger, vice-president; J. D. Mackay, secretary and treasurer; C. E. Knapp, general manager; Harold Wilson, superintendent. Property was a lease, expiring 1906, on the holdings of the Pearl Copper Mining & Smelting Co. Idle and presumably moribund.

WESTERN MINING & MILLING CO. **UTAH.**

Office: 14 West First St., Salt Lake City, Utah. Mine office: Lincoln, Tooele Co., Utah. J. H. Hurd, agent; John B. Taylor, superintendent. Has silver, lead and copper ores, with steam power, employing about 20 men at last accounts.

WESTERN MINING & STEEL CORPORATION. **CALIFORNIA.**

Dead. Formerly at San Luis Obispo, San Luis Obispo Co., Cal.

WESTERN MONTANA MINING CO. **MONTANA.**

Dead. Former officers were A. H. Gray, president and general manager, and C. L. Butterfield, financial agent. Company, organized 1905, had an office in the Park Building, Pittsburg, Pa. Lands included the Exchequer and Snowdrift mines, lying north of the Richmond and Monitor, developed by a 400′ tunnel. Formerly at Superior, Missoula Co., Mont.

WESTERN NEVADA COPPER CO. **NEVADA.**

Office: 608 Dooly Bldg., Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev Employs circa 40 men. C. E. Loose, president; Frank Knox, treasurer; preceding officers, Samuel Newhouse, Hon. Reed Smoot and D. H. Peery, directors; John Josten, secretary; Maurice M. Johnson, general manager; Frank B. Cook, assistant manager; R. H. Britt, superintendent. Organized circa November, 1906, under laws of Arizona, with capitalization $6,500,000, shares $5 par.

Lands, 8 claims, patented, area 150 acres, known as the Dyer group, also water rights and a smelter site on the Walker River, near the mine. Lands, circa one mile south of the Mason Valley, and said to be in the same contact zone, show a contact deposit of circa 25′ width, between granite and limestone, with strong mineralization in the lime, the ore body having a north and south strike, with dip of 65°, apparently occurring as a replacement, carrying argentiferous azurite, malachite, chalcocite and chalcopyrite, estimated by company to average 5% copper, and mine has produced ore, in quantities, up to 20% in copper tenor. Development is by a 275′ shaft, a 500′ tunnel in ore, and a 1,014′ crosscut tunnel, with 6,100′ of workings, the lower tunnel being 140′ vertically below the upper.

Equipment includes a 150-h. p. plant having a 25-h. p. hoist, good for 500′, and a 5-drill two-stage air-compressor. There are 5 mine buildings. Company plans deepening shaft and continuing developments. Property considered promising.

WESTERN PACIFIC MINING CO. **UTAH.**

Office: 208-69 East Third South St., Salt Lake City, Utah. Mine office: Callao, Juab Co., Utah. E. J. Yard, president; Jackson H. McChrystal, vice-president; Elroy M. Clark, secretary and treasurer; preceding officers, C. O. Baxter and Jos. W. Gwynn, directors. Lands, 320 acres, adjoining the Western Utah, in the Willow Springs division of the Deep Creek district, in Tooele county, just over the Juab county line. Ore shipped to end of 1907 averaged about 13% copper, 25% lead and 22% iron, with several ounces of silver per ton.

WESTERN QUEEN MINES CO. **ARIZONA.**

Mine office: Turkey, Yavapai Co., Ariz. Dr. J. B. McNally, president and

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general manager; John McKenzie, superintendent. Lands, 4 miles from a railroad, lying next west of the Corona Consolidated, having a 400′ shaft, sunk by former owners, showing a vein with a 6″ to 3′ paystreak carrying up to 1,400 oz. silver per ton, balance being low grade auriferous and cupriferous copper ore. Has shipped ore returning 22% lead and 5% copper. Has steam power.

WESTERN SLOPE COPPER MINING & SMELTING CO. **COLORADO.**

Office: Thompson Bldg., Butler, Pa. Mine office: Grand Junction, Mesa Co., Colo. J. S. Shaw, president and general manager; H. M. Armstrong, vice-president; A. F. Regal, secretary; W. R. Cowden, treasurer; F. W. Smith, superintendent; preceding officers, P. H. Sechler, J. W. Thompson, F. M. McClelland and C. M. Harden, directors. Organized July 25, 1900, under laws of Pennsylvania, with capitalization $750,000, shares $1 par, and apparently was reorganized, circa 1908, with a complete and salutary change in management.

Lands, 10 claims, area 200 acres, also a millsite, in process of patenting, in the Unaweep district, 23 miles southeast of Grand Junction and 12 miles from Whitewater, the nearest railroad point. The Nancy Hanks claim has a 250′ shaft, from which 17 carloads of ore, shipped some years ago, gave returns of 11 to 18% copper.

The former management of this company claimed to have a 50-ton matting furnace, blown in June, 1905, but there is no recent information regarding the smelter.

The old management paid regular quarterly dividends of ½%, while peddling stock, but the new directorate is considered a vast improvement upon the old. Property considered promising.

WESTERN THARSIS MINING CO., N. L. **TASMANIA.**

Dead. Formerly at Mt. Lyell, Montagu Co., Tasmania.

WESTERN TIN & COPPER SYNDICATE, LTD. **ENGLAND.**

Dead. Was organized Nov. 21, 1906, under laws of Great Britain, with capitalization £50,000, shares £1 par, and name changed, July, 1907, to Kelynack Tin Mine, Ltd. Formerly in Cornwall, England.

WESTERN UTAH COPPER CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Ibapah, Tooele Co., Utah. W. S. McCornick, president; Duncan McVichie, vice-president; H. H. Green, secretary and treasurer; preceding officers, E. L. White, F. August Heinze, Henry M. Sweet and Hon. John A. Street, directors. Organized circa October 1906, under laws of Wyoming, with capitalization $2,500,000, shares $5 par.

Lands, 20 claims, area 364 acres, 100 miles from a railroad, known as the Gold Hill mine, in the Clifton section of the Deep Creek district. Mine had 14 open-cuts, pits and shafts, deepest variously reported as 170′ and as 600′, showing a 12′ to 15′ vein, with a 3′ paystreak assaying up to 20% copper, 6 to 22 oz. silver and $11 to $14 gold per ton. Mine is claimed to have 100,000 tons of ore blocked out, which estimate is considered excessive. Closed down, late 1907, owing to lack of funds. Property considered promising.

WEST FORK GOLD-COPPER MINING CO. **IDAHO.**

Dead. Was a rank bit of stock-jobbery, promoted by the notorious L. E. Pike, of Boston, when the United States postoffice department, so vigilant in watching petty swindlers and so blind to the big frauds, benignantly permits the continued use of the federal mails for the certain "trimming" of "suckers." Formerly in Idaho county, Idaho.

WEST GREY ROCK MINE. **MONTANA.**

Owned by Butte & Boston Consolidated Mining Co.

WEST LE ROI MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Compulsorily wound up, November, 1901. Formerly at Rossland, Trail district, B. C.

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WEST LYELL EXTENDED MINING CO., N. L. **TASMANIA.**

Dead. Formerly at Gormanston, Montagu Co., Tasmania.

WESTMORELAND COPPER CO. **NEW BRUNSWICK.**

Dead. Formerly at Dorchester, Westmoreland Co., New Brunswick.

WEST MOUNTAIN MINING COMPANY, OF ARIZONA. **UTAH.**

Dead. Lands lost, and money refunded to those who bought stock. Formerly at Bingham Canyon, Salt Lake Co., Utah. Described Vol. V.

WEST MOUNT LYELL COPPER, GOLD & SILVER MINING CO., TASMANIA, LTD. **TASMANIA.**

Dead. Was succeeded, Oct. 7, 1897, by Copper Mines of Mount Lyell West, Ltd., also dead. Formerly at Gormanston, Montagu Co., Tasmania.

WEST MOUNT LYELL, LTD. **TASMANIA.**

Office: 212 Mansion House Chambers, London, E. C., Eng. Operating office: Hobart, Tasmania. Mine office: Gormanston, Montagu Co., Tasmania. R. E. Tyler, chairman; R. J. Cribb, secretary. Organized Oct. 2, 1907, under laws of Great Britain, with capitalization £100,000, shares £1 par, as a reconstruction of Copper Mines of Mount Lyell West, Ltd.

Lands, 8 claims, area 84 acres, adjoining the Mount Lyell Mining & Railway Co., Ltd., showing several wide ore bodies, giving assays of 3 to 7% copper, with small gold and silver values. Development is by 2 tunnels, principal being the Razor Back. Company also has acquired gold mining claims in the Huaraki district of New Zealand. Copper property apparently is idle.

WEST QUINCY MINING CO. **UTAH.**

Office: Atlas Blk., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. G. D. B. Turner, president and general manager; J. R. Rand, vice-president; H. C. Gaw, secretary and treasurer; preceding officers, Dr. E. V. Van Norman, W. H. Dodge, E. E. Hendrick and W. C. Alexander, directors. Organized 1904, under laws of Utah, with capitalization $1,500,000, shares $5 par. Annual meeting, second Tuesday after first Monday in May.

Property is a ⅝ interest, with an option on the remaining interest, in the J. I. C. mine, lands, 5 claims, supposed to carry the extension of the Quincy ore body of the Daly-West mine. Has a 600′ two-compartment vertical shaft, and a crosscut tunnel through property of the Little Bell mine, cutting a contact vein, giving assays up to 20% lead, 160 oz. silver and $2 gold. It is expected that the main ore body will be cut at depth giving a back of 750′, and that the Daly West contact vein will be cut at depth giving a back of 900′. Considerable trouble has been had from shifting ground and a heavy inflow of water. Property was explored, 1907, to depth of 1,300′ by diamond drills.

WESTRALIAN COPPER MINE, LTD. **AUSTRALIA.**

Dead. Was reorganized, circa 1899, as Balla Balla Copper Mines, Ltd., which was reorganized, Apr. 16, 1901, as New Balla Balla Copper Mines, Ltd. Formerly at Port Balla Balla, Western Australia.

WEST ST. DAVID'S GOLD & COPPER MINES, LTD. **WALES.**

Dead. Formerly at Barmouth, Merionethshire, Wales.

WEST SIDE MINING CO. **WASHINGTON.**

Dead. Formerly at Berlin, King Co., Wash. Described Vol. II.

WEST SLOPE MINING & MILLING CO. **UTAH.**

Dead. Formerly at La Sal, Grand Co., Utah. Described Vol. III.

WEST STEWART MINE. **MONTANA.**

Owned by Original Consolidated Mining Co.

WEST VIRGINIA & MONTANA MINING CO. **MONTANA.**

Mine office: Helena, Lewis & Clark Co., Mont. Lands, 4 claims, west of Helena. Mine produced a little silver-lead ore in the past, but shows copper ore of good tenor on the 200′ level.

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WEST VIRGINIA-WYOMING COPPER CO. **WYOMING**

Office: Rawlins, Carbon Co., Wyo. Mine office: Rambler, Carbon Co., Wyo. Employs 8 men. Philip Frankenberger, president; Myer Newberger, vice-president and general manager; Herbert Frankenberger, secretary; George Newberger, treasurer; John W. Buckley, superintendent; W. S. Traynor, assistant superintendent; Geo. H. Hand, consulting engineer. Organized February, 1907, under laws of Wyoming, with capitalization $2,000,000, shares $1 par; issued $1,242,000. Annual meeting, first Tuesday in February.

Lands, 7 claims, area 102 acres, one-half mile from the Doane-Rambler mine, in the Battle Lake district, showing 2 contact deposits, between diorite and quartzite, of which one, under development, of 5′ to 6′ average width, traceable circa 3,000′, gives sulphide ores estimated to average 8% copper, 0.5 oz. silver and 0.5 to 1 oz. gold per ton. Development is by a 150′ shaft and a 250 tunnel. Litigation over title was settled, 1908, in company's favor.

Equipment includes a 45-h. p. steam hoist and a 2-drill Rand air-compressor, and there are 2 mine buildings. Company plans continuous development.

WEST YERINGTON COPPER MINING CO. **NEVADA.**

Office: Provo, Utah. Mine office: Yerington, Lyon Co., Nev. John Roundy, president; O. H. Stone, vice-president; Heber Jex, secretary and treasurer; preceding officers, A. Craven and Jos. Wirthlin, directors. Organized circa June, 1907, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, 12 claims, circa 7 miles southwest of Yerington. Presumably idle.

WHALEN CONSOLIDATED COPPER MINING & SMELTING CO. **NEVADA.**

Dead. Was a swindle, perpetrated by Wm. Whalen. Formerly at Palisade, Eureka Co., Nev.

WHAT CHEER COPPER MINING CO. **WYOMING.**

Office: 171 Westminster St., Providence, R. I. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. Wm. C. Price, president; J. Frank Baird, vice-president; J. F. Freeman, secretary and treasurer; O. S. Alers, manager. Organized under laws of Wyoming, with capitalization $600,000. Lands, 4 claims, near Aetna, on Dunkards Creek, near Purgatory Gulch, opened by a 65′ two-compartment shaft and a 237′ tunnel, showing stringers of copper ore. Equipment includes a steam plant and small sawmill. Idle and apparently moribund.

WHEAL ELLEN MINE. **SOUTH AUSTRALIA.**

Mine office: Woodchester, South Australia. Company bought, 1908, the mining plant of the Strathalbyn Mining Co., and planned resumption circa July, 1908.

WHEAL FORTUNE EXTENDED, LTD. **AUSTRALIA.**

Office: 31 Eagle Wharf Road, Hoxton, London, N., Eng. Mine office: Northampton, Western Australia. A. Rees, secretary. Organized Feb. 20, 1900, under laws of Great Britain, with capitalization £5,000, shares £1 par. Property is lead and copper claims. Idle some years.

WHEALKATE MINING CO. **MICHIGAN.**

Office and mine: Houghton, Houghton Co., Mich. Nathan F. Leopold, president; R. R. Goodell, vice-president; Reginald C. Pryor, secretary; Albert F. Leopold, treasurer. Organized November, 1902, under laws of Michigan, with capitalization $50,000, shares $25 par. Lands, 240 acres, including the old Wheal Kate mine, on which a little sadly misdirected work was done, many years ago. Is primarily a land and townsite company, but owns mineral lands in Section 17, carrying the southern extension of the Isle Royale and other cupriferous beds. Did some diamond driiling, 1907.

WHEAL TURNER COPPER MINING CO., LTD. **AUSTRALIA.**

Mine office: Yudnamutana, South Australia. Lands, known as the Red

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Bluff mine, 6 miles northwest of Yudnamutana, show 8 veins, with northeasterly strike, carrying cuprite, azurite, malachite, chalcocite and tetrahedrite, with quartz gangue and an iron gossan. Hand-dressed samples gave a bulk assay of circa 25% copper. Development is by 4 shallow shafts, deepest 54'. In 1905 had an aid of £1,000 from the state, and was prospecting on the proposed railway line to the Queensland border.

WHEELER GOLD MINES CO. **NEVADA.**

Office: 414 Atlas Blk., Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. Apparently is a twin of the Yerington Copper Co.

WHIM CREEK MINE. **AUSTRALIA.**

Owned by Whim Well Copper Mines, Ltd.

WHIM WELL COPPER MINES, LTD. **AUSTRALIA.**

Office: 62 London Wall, London, E. C., Eng. Mine office: Whim Creek, West Pilbarra Goldfield, Western Australia. Edgar Anderson, chairman and managing director; preceding officer, S. Caldwell, Sidney Fawns, J. Conchie and H. J. Silverlock, directors; Henry Bacon, secretary; Herbert R. Sleeman, general manager; Richard Piper, mine foreman; I. Flegeltaub, metallurgist. Organized July 4, 1906, under laws of Great Britain, with capitalization £150,000, shares £1 par, as a reconstruction of an old company of same name. To May 1, 1908, had expended circa £60,000 on development and equipment.

Lands, 210 acres, partly freehold, known as the Whim Creek mine, 12 miles from Port Balla Balla, also water rights on Balla Balla Creek, sundry town lots and a leased jetty at Balla Balla, and a 30-acre smelter-site at Counguina Pool, a freshwater lake near Balla Balla. Mining property includes 75 acres leasehold, carrying iron ore and limestone for fluxing. Country rocks are shales and schists, latter partly chloritic but mainly hornblendic, carrying mainly irregular tabular impregnations of chalcocite in silicious kaolinized strata having an east and west strike and dip of only 25°, lode being very flat and conformable to bedding of the enclosing slates, which have been considerably crumpled. Ores are cuprite, malachite, azurite and chalcocite, mainly the latter. Ore bodies are 3' to 20' in width, with an average width of 6', and the ore zone is traceable circa 3,000'.

Mine, under former ownership, was poorly developed. Property has 5 crosscut tunnels, of 50', 80', 120', 300' and 300', and a 200' tunnel in ore, with 5 shallow shafts of 60', 69', 74', 77' and 80'. About 2,000' of openings were made in 1907, giving estimated reserves of 30,000 tons of 11% copper ore blocked out for stoping, with about 40,000 tons additional in sight, and 200,000 tons inferrable before reaching the water-level. Average samples from all working faces, about 15 in number, gave assays of 12.18% copper, balance of ore remaining from assorting being estimated to carry 8% copper. Property was tested, 1907, by diamond drill. Water is either alkaline or sulphurous, each destructive to the boilers, but, with careful mixing, gives feed-water causing little corrosion.

The concentrator, of 50 tons daily capacity, has a Gates crusher, mill being merely a crushing and sorting plant. Company has built a 14-mile railway, from the mine to Port Balla Balla, at a cost of circa £15,000, including two locomotives and necessary rolling stock.

Production, 1907, was 1,808 long tons of ore averaging 22.5% copper, equal to 911,232 lbs. fine copper, and before drop in price of copper, company nearly paid expenses from production. Employs circa 75 men. Is considered a property of considerable promise, with a good management.

WHIPPLE MOUNTAIN GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: 803-405 South Hill St., Los Angeles, Cal. Mine office: Needles, San Bernardino Co., Cal. Jas. L. Brice, superintendent. Lands, 21 claims, on Whipple Mountain, south of Needles, 7 miles from a railroad, showing 4 parallel

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veins, up to circa 75′ in width, carrying promising copper and gold outcrops. Has a 175′ vertical shaft, cutting an 18′ vein carrying about 5% copper and $20 gold per ton. Has gasoline power and hoist, with an air-compressor and 4 buildings. Shall shipments, early 1908, to Needles smelter, returned 10.8% copper, 2 oz. silver and $20 gold per ton.

WHIPSAW COPPER CO. **ARIZONA.**

Dead. Apparently shareholders were whipsawed. Formerly at Prescott, Yavapai Co., Ariz.

WHITE BEAR CONSOLIDATED GOLD MINES, LTD. **BRITISH COLUMBIA.**

Dead. Reorganized, circa 1908, as Consolidated White Bear Mining Co., Ltd. Formerly at Rossland, Trail district, B. C. Described Vol. VII.

WHITE CANYON COPPER CO. **UTAH.**

Office: 624 Peyton Blk., Spokane, Wash. Capt. A. E. Wayland, secretary. Lands are said to be 13 claims, in San Juan County, Utah, on which company planned installing a leaching plant during 1908.

WHITE CHIEF MINING & MILLING CO. **MEXICO.**

Letter returned unclaimed from former office, 217 Sansom St., San Francisco, Cal. Mine office: Chinipas, Arteaga, Chihuahua, Mex. M. A. Newman, superintendent. Property is the San Miguel del Castillo mine, carrying auriferous copper ore. Has steam power and a 40-ton mill.

WHITE EAGLE COPPER MINING CO. **TEXAS.**

Dead. Lands sold for debt. Formerly at Burnet, Burnet Co., Texas.

WHITE GIANT MINING & SMELTING CO. **ARIZONA.**

Office and mine: care of G. M. Willard, manager, Jerome, Yavapai Co., Ariz. Lands, 5 claims, area 100 acres, known as the Allan-Hoover group, in the Squaw Peak district, circa 25 miles south of Jerome, having several short tunnels and shallow shafts, deepest 70′, said to show galena assaying up to 55% lead and $100 gold per ton. Presumably idle.

WHITE HORSE MINING CO. **ARIZONA.**

Office: 20 Broad St., New York, N. Y. Mine office: Prescott, Yavapai Co., Ariz. H. R. Frost, president; preceding officer, L. D. C. Ferguson, Maj. R. G. Vassar, S. P. Ostrom and M. J. McGibbon, directors. Capitalization $2,000,000, shares $1 par. Bonds, $50,000. Lands, circa 200 acres, at Squaw Creek, and company also is said to have a group of claims, now idle, in the Walker district. Development is by 2 shafts and a tunnel. Equipment includes a 10-stamp mill. J. F. Wisner was fiscal agent.

WHITE KNOB COPPER CO., LTD. **IDAHO.**

Office: 36 Wall St., New York, N. Y. Mine office: Mackay, Custer Co., Idaho. Wilbur K. Mathews, president; A. M. Poole, secretary and treasurer. Organized originally under laws of West Virginia, as White Knob Mining Co., and reorganized, under present title, Apr. 24, 1900, under laws of New Jersey, and again reorganized, January, 1903, under same charter and title, and yet again reconstructed, 1904, with capitalization $2,600,000, shares $10 par, "once more yet again" reconstructed, or practically succeeded, circa January, 1905, by White Knob Copper & Development Co., Ltd., but apparently the White Knob Copper Co., Ltd., retains corporate existence, though, if so, it is a mere shell, as the mine has been sold to the Empire Copper Co., and the remaining assets apparently are held by White Knob Copper & Development Co., Ltd. For further particulars see White Knob Copper & Development Co., Ltd., in this volume, and White Knob Copper Co., Ltd., in Vol. VI., which descriptions explain, in detail, the miserable flounderings of this company and its predecessors.

WHITE KNOB COPPER & DEVELOPMENT CO., LTD. **IDAHO.**

Office: 36 Wall St., New York, N. Y. Mine office: Mackay, Custer Co., Idaho. Wilbur K. Mathews, president; Arthur Kennedy, vice-president;

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Geo. H. Dupee, secretary and treasurer; preceding officers, Chas. H. Dupee and C. H. Birdsell, directors.

Organized Apr. 6, 1905, under laws of Maine, with capitalization $6,000,000, shares $10 par, fully issued, in $2,000,000 cumulative 7% preferred stock and $4,000,000 common stock, preferred stock being convertible into common at option of shareholders. Company was organized as successor of White Knob Cooper Co., Ltd., assets of which are said to have been sold, under foreclosure, and bought in by holders of securities. Present company is said to have taken over the properties and assets of the White Knob Copper Co., Ltd., of New Jersey, exchanging share for share, plus a $3 assessment. Apparently the White Knob Copper Co., Ltd., of New Jersey, retains a corporate existence.

To give even a remote understanding of this crazy-quilt patchwork corporation, it is necessary to outline the history of the various preceding White Knob corporations, all under the same general management—if such a respectable word as management can be misapplied to such gross mismanagement as this corporation and its predecessors have suffered, from birth.

It is doubtful if in the history of mining there is a finer example of utter incompetency than is afforded by the spectral succession of White Knob corporations, organized in various states, and at frequent intervals, all born with weak constitutions, but all, unfortunately, retaining sufficient vitality to pass along to their progeny the scrofulous taint with which the first was endowed.

The White Knob Mining Co., which seems to have been the ancestor of the entire decrepit family of White Knobs, was organized, circa 1899, under the laws of West Virginia, with capitalization $5,000,000, and was reorganized, Apr. 24, 1900, under laws of New Jersey, as White Knob Copper Co., Ltd., with capitalization $12,500,000, which corporation was reorganized, January, 1903, under the same title and charter, with capitalization reduced to $2,000,000, and was again reconstructed, 1904, with capitalization $2,600,000, shares $10 par, and apparently was succeeded, or at least was rendered a mere shell, Apr. 6, 1905, by the White Knob Copper & Development Co., Ltd., which is the present corporation, though how long it may be for this world the rashest prophet scarce would care to guess, in view of the family history.

The various White Knob corporations expended circa $3,000,000, on the property in Idaho, to most excellent disadvantage, the policies of the White Knobs being consistent only in their utter inconsistency. Mining officials were changed repeatedly; reorganization followed reorganization; stock was increased and decreased, and again increased and decreased; bonds were authorized, issued, and redeemed; the smelter was blown in, blown out and again blown in, and out, repeatedly; local officials were changed so frequently that it scarcely would be an exaggeration to say that nearly every position had three incumbents—one going, one on the job, and one coming. Such a witches' dance of financial and technical lunacy would be difficult to describe adequately.

At one time, in 1905, the smelter at Mackay was partially dismantled, with the intention of removing it to Shasta County, California, where the company supposed it had bought control of the Balaklala, but control of the Balaklala was sold twice, and the White Knob holdings of 50,000 shares of Balaklala were said to have been sold, February, 1906, at an average price of about $9 per share. Circa 1906 the company gave a 5-year lease, on its mine and smelter, without royalty, to the MacBeth Lease, Inc., the company being in a very bad way financially, and this lease was sold, circa 1907, to the Empire Copper Co., which also bought the mine and smelter, the White Knob supposedly receiving, in return for its own property, a 25% share interest in the Empire Copper Co., a proceeding questionable on its face, but actually to the company's benefit, as the White Knob management is far better off owning a

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25% interest in any mine under control of competent men, than to own the mine and smelter entirely, if under its own desperately inefficient management.

The company is supposed to control the Mackay Development Co., Ltd., which furnishes water for the Empire smelter and the town of Mackay. Company also is said to control, through stock ownership, the Argonaut Mining Co., of Jackson, Amador Co., California, having a gold mine with a 40-stamp mill. Apparently the company no longer has a share interest in the Balaklala.

Apparently the present corporation received a $3 assessment from at least a portion of the old shareholders, who shut their eyes and took another chance on the management. It has been said that, when Poole resigned, there was in the treasury circa $450,000 in cash, but the company's annual report, filed Oct. 8, 1907, with the State of New York, claimed that its debts did not exceed $25,000, with assets "of at least $2,000,000," the assets presumably being share interests in other mining corporations, value of which is uncertain.

The management of the company promised information to the minority shareholders, but failed to keep its word, and the minority shareholders, having failed in various attempts to obtain information regarding the company's finances, filed, through Geo. A. Hobe, et al, circa November, 1908, in the Maine supreme court, a bill of equity, asking permission to examine the company's books and records. The company and its management are viewed with utter disgust, and the shareholders with derision.

WHITE KNOB MINING CO. **IDAHO.**

Dead. Reorganized, 1900, as White Knob Copper Co., Ltd. Formerly at Mackay, Custer Co., Idaho.

WHITE PINE COPPER CO. **NEVADA.**

Dead. Was merged, Nov. 17, 1904, in Nevada Consolidated Copper Co. Formerly at Ely, White Pine Co., Nev.

WHITE PINE MINE. **MICHIGAN.**

Office: care of St. Mary's Mineral Land Co., owner, 701-199 Washington St., Boston, Mass. Mine office: Ontonagon, Ontonagon Co., Mich. Lands, 80 acres, in Section 5, T. 50 N., R. 42 W., circa 3 miles east of the Nonesuch, having 4 pits and a 170′ shaft, supposedly sunk on the Nonesuch lode. Is under option to the Calumet & Hecla, and was tested, 1907, by diamond drill borings, which are said to have shown a promising copper bed.

WHITE QUAIL COPPER CO. **COLORADO.**

Dead. Was merged Oct. 21, 1907, in Doyle Consolidated Mines Co. Formerly at Hesperus, La Plata Co., Colo.

WHITE ROCK COPPER MINING CO. **CALIFORNIA.**

Dead. Formerly at Lewis, Mariposa Co., Cal. Described Vol. VI.

WHITE TANKS MINING CORPORATION. **ARIZONA.**

Office: 740 Land Title Bldg., Philadelphia, Pa. Works office: Wickenburg, Maricopa Co., Ariz. Lands, known as the Bert Ford group, are in the White Tanks Mountains, circa 40 miles west of Phœnix. Has a smelter with 50-ton water-jacket blast-furnace, but operations proved unsuccessful. Idle several years, and apparently moribund.

WHITEWATER MINING CO. **NEW MEXICO.**

Mine office: Tyrone, Grant Co., N. M.

WHITNEY REDUCTION CO. **NORTH CAROLINA.**

Mine office: Gold Hill, Rowan Co., N. C. Lands adjoin the Union. Long idle.

WICKENBURG SMELTING & REFINING CO. **ARIZONA.**

Dead. Formerly at Wickenburg, Maricopa Co., Ariz.

WIDIN COPPER SYNDICATE, LTD. **BULGARIA.**

Office: 88 Bishopsgate St. Within, London, E. C., Eng. Mine office: Belogradchik, Vidin, Bulgaria. W. H. Fowler, J. P., chairman; R. Sach, consulting engineer; A. Thorp, secretary. Organized June 24, 1907, under laws of Great

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Britain, with capitalization £20,000, shares £1 par. Property is the Chtastie mine, area 250 hectares, held under lease from the principality of Bulgaria. Mine shows 2 fissure veins, of 30" average width, traceable 600', carrying chalcopyrite assaying up to 18% copper, 8 oz. silver and 2 dwts. gold per ton. Has 15 short tunnels and 3 shafts, deepest 260', showing circa 5,000 tons of ore, at last accounts.

WILD BILL MINE. **MONTANA.**

Owned by Anaconda Copper Mining Co.

WILD ROSE MINING CO. **CALIFORNIA.**

Mine office: Hoveek, Inyo Co., Cal. E. H. Goodpaster, superintendent. Lands, in the Panamint Mountains, have 2 shallow shafts, showing ore giving good assay values in copper, silver and gold, from selected samples.

WILHELMI SILVER & COPPER CO. **MEXICO.**

Mine office: Velardeña, Cuencamé, Durango, Mex. Louis Sandberg, superintendent. Organized under laws of Arizona, with capitalization $3,000,000. Lands, circa 1,500 acres, include the Santa Eulalia, Loma, Cuchereña and other properties, and an option on the Santa Ines mine. Is said to employ circa 100 men.

WILLARD-ELY COPPER CO. **NEVADA.**

Office: 32 Liberty St., New York, N. Y. Letter returned unclaimed from former mine office, Ely, White Pine Co., Nev. Organized circa 1906, as successor of McKinley Mines Co., which succeeded the McKinley Mining & Smelting Co., which succeeded the Canton Mining Co., these being the only successes noted in connection with the property. Lands, 5 claims, known as the Aurora group, scattered and apparently poorly located. The Aurora, formerly worked as a gold mine, but showing copper ores in lower workings, has a 300' main shaft, with about 1,000' of drifts. Idle, and company, by reason of its bad antecedents, is not regarded favorably.

WILLCOCKS' CLONCURRY SYNDICATE. **AUSTRALIA.**

Office: Eagle St., Brisbane, Queensland, Australia. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. Thos. Welsby, secretary. Capitalization £30,000, shares £37 10s. par. Property has 2 shafts, known as the Cornett and Jessie, of circa 100' depth each. Has a small smelter, completed late 1907, and shipped, 1907, a little ore to Townsville. Idle at last accounts.

WILLCOCK'S COPPER MINES, LTD. **AUSTRALIA.**

Office: Brisbane, Queensland, Australia. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. Thos. Welsby, secretary; Cecil Rae, smelter superintendent. Lands include the Jessie mine, having an 80' shaft, which is the principal property, and the Secret mine, worked open-cast. The smelter, blown in 1908, has a reverberatory furnace, treating ore averaging about 20% copper, after selection, and is said to be turning out high grade matte.

WILLIAM PENN MINING CO. **WYOMING.**

Office: Lewisburg, Pa. Mine office: Encampment, Carbon Co., Wyo. J. E. Hedding, president; J. W. Van Valzale, secretary and treasurer; S. E. Phelps, manager. Organized, 1903, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 3 claims, area 60 acres, in the Upper Platte district, showing a 4' vein carrying carbonate ores and chalcopyrite, opened by a 75' shaft. Idle several years.

WILLIAMS, FOSTER & CO. & PASCOE, GRENFELL & SONS, LTD. **WALES.**

Office: Leadenhall Bldgs., Whittington Ave., London, E. C., Eng. Works office: Swansea, Glamorganshire, Wales. Property includes the Morfa copper works and Middle Bank copper works, at Swansea, both old and successful custom smelters.

WILLIAMS LUMAN MINING CO. **WYOMING.**

Office: Buffalo, Wyo. Mine office: Depass, Frémont Co., Wyo. Employs

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22 men. Thos. G. Smith, president and general manager; Theophilus Conzelman, vice-president; W. J. Thom, secretary and treasurer; preceding officers, Wm. Rea, Jr. and Richard Young, directors; M. E. Connell, superintendent. Organized May 2, 1908, under laws of Wyoming, with capitalization $2,500,000, shares $1 par; issued, $2,000,000. On Sept. 1, 1908, company reported $10,000 cash on hand, with $113,200 cash due company, and no liabilities. Annual meeting, second Tuesday in September.

Lands, 9 claims, patented, area 130 acres, 16 miles from a railway, in the Copper Mountain district, showing 8 fissure veins, in granite, diorite and altered schists, main vein being an ore zone of about 50′ to 60′ width, traceable circa 3,400′, in crushed and fissured diorite, much altered, with a 2′ paystreak carrying free gold, copper ore and native copper in thin sheets and nuggets, the ores being cuprite, melaconite, malachite and chalcocite, returning 10 to 80% copper, 5 to 10 oz. silver and $2 to $8 gold per ton.

Development is by shafts of 52′, 30′ and 420′, and by tunnels of 513′, 300′, 70′ and 80′, with circa 1,800′ of workings. Equipment includes an 80-h. p. gasoline plant, with a 15-h. p. hoist and a 2-drill air-compressor. There are 12 mine buildings, of wood, including 16x20′ and 14x16′ shops.

Company plans deepening the shaft to 800′, and making extensive openings, also adding an electric plant, taking current 16 miles from the Boysen dam. Company is operated as a close corporation, money for development being furnished by about 10 shareholders. Property considered promising.

WILLIE ROSE COPPER MINING CO. **ARIZONA.**

Office and mine: Portal, Cochise Co., Ariz. M. D. Taylor, president; E. Towers, vice-president; C. F. McCord, secretary. Organized Jan. 28, 1908, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Mine has 2 shallow pits, of circa 20′ depth, No. 2 showing a 12′ vein carrying chalcocite, and lands have produced a 30-pound nugget of native copper.

WILLOW CREEK COPPER & GOLD MINING CO. **WYOMING.**

Mine office: Thermopolis, Frémont Co., Wyo. Organized, early 1907, with capitalization $500,000, by H. P. Minor, W. Armour Thompson, Robt. MacGowan, Edw. E. Waltman and H. H. Bierman.

WILL SMELTING CO. **ARIZONA.**

Office: 509 Ft. Dearborn Bldg., Chicago, Ills. Operating office: 218 Fleming Bldg., Phœnix, Maricopa Co., Ariz. Works offices: Wickenburg, Maricopa Co., Ariz., and Quartzite, Yuma Co., Ariz. J. R. Deahl, president; Jos. Boyer, superintendent. Property includes 5,400 acres of placer claims near Quartzite, and a new-fangled dry-washing gold extractor, neither apparently of any particular promise. Has a general store and hotel at Wickenburg, with a 40-ton smelter at Wickenburg and a 50-ton smelter at Quartzite. Management is alleged to have sold 100,000 shares at 18¾ cents per share to fiscal agents, who in turn handed them out to the public for 50 cents per share. Charges of mismanagement have been made, and a receiver asked for.

WILMOT MINING CO. **MICHIGAN.**

Office: Calumet, Mich. Mine office: Ontonagon, Ontonagon Co., Mich. W. H. Garlick, president; W. B. Gouchie, secretary. Organized under laws of Michigan, with capitalization $500,000, shares $25 par. Has paid dividends of $17,000, from sale of timber lands, with reservation of mineral rights, and has received $1,500 from assessments. Lands are mineral rights to 3,520 acres, in Ontonagon County. No mining has been done.

WILSON BAY MINING CO. **ALASKA.**

Office: Latouche, Latouche Island, Alaska.

WILTON MINING & MILLING CO. **ARIZONA.**

Office: 615-87 Washington St., Chicago, Ills. Letter returned unclaimed from former mine office, Huron, Yavapai Co., Ariz. W. A. Buchanan, president;

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F. W. Park, vice-president and secretary; Victor Schill, treasurer; Milo Schill, general manager; preceding officers and Thos. McSteel, directors. Organized 1902, under laws of Arizona, with capitalization $1,200,000, shares $1 par.

Lands, 3 claims, area 60 acres, in the Big Bug district, showing fissure veins carrying auriferous copper ore, opened by 4 shafts, deepest 50′, and by a 220′ tunnel, on the strength of which openings the company estimated 1,000,000 tons of $50 ore blocked out, which is absolutely impossible. Has secured assays of 19.5% copper, 3 oz. silver and $4.30 gold per ton. Is not favorably regarded. Presumably idle and moribund.

WINDFALL MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. C. T. Rigg, superintendent. Has 2 tunnels, showing a 4′ vein of auriferous and argentiferous lead and copper ore.

WINDOW MOUNTAIN COPPER MINING CO. **NEW MEXICO.**

Office: 203 Broadway, New York, N. Y. Mine office: Deming, Luna Co., N. M. Employs 6 to 10 men. E. D. Middlekauff, president and treasurer; John W. Fisher, vice-president; Harry C. Tilson, secretary; C. H. Clark, manager; C. H. Smith, mine superintendent. Organized Apr. 4, 1908, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Stock is listed on the Joplin Stock Exchange. Annual meeting, second Thursday in June.

Lands, 16 claims, unpatented area 320 acres, also 40 acres of timber lands, 10 miles from a railroad, adjoining the Stimson mine and 2 miles south of the Castle Dome mine, in the Florida district. Property shows chalcocite assaying 18% copper, 6 oz. silver and $51.50 gold per ton, opened by tunnels of 30′, 40′ and 160′. A carload shipment of ore gave smelter returns of 17 to 34% copper. Property was worked, in a crude way, in early days, by Indians and Mexicans, who shipped some hand-picked silver-lead ore to San Francisco. Company plans continuous development.

WINDSOR MINING & SMELTING CO. **ARIZONA.**

Mine office: Superior, Pinal Co., Ariz. Property is the Windsor and Lobb groups, near the Lake Superior & Arizona. Presumably idle.

WINNEBAGO MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Has gold-silver copper ore.

WINNIPEG MINES, LTD. **BRITISH COLUMBIA.**

Dead. Formerly at Phœnix, Boundary district, B. C.

WINNIPEG MINING CO. **WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. E. R. Fraser, general manager; preceding officer, C. W. Clark, Archibald Wright, W. R. McCracken and Chas. Garber, directors; Jos. L. Lancaster, superintendent. Lands, 8 claims, including the Hawkeye mine, adjoining the Belcher, on Lambert Creek. Mine has a 240′ incline shaft, connecting with a 1,070′ tunnel, showing a vein of 70′ estimated width, carrying auriferous and argentiferous chalcopyrite, associated with considerable quantities of limonite, with smaller amounts of siderite, tetrahedrite, magnetite, pyrrhotite and marcasite. Has an ore-bin on the Belcher railway, 600′ from the tower tunnel, facilitating shipment. Has electric power and an 8-drill Leyner air-compressor. First shipment, made circa August, 1907, returned about 3% copper, ore carrying 35 to 40% iron. Suspended operations December, 1907.

WINONA COPPER CO. **MICHIGAN.**

Office: 713-199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Winona, Houghton Co., Mich. Chas. J. Paine, Jr., president; E. B. O'Connor, treasurer; Dr. Lucius L. Hubbard, general manager; Rex R. Seeber, superintendent; John Broan, mining captain; Frank Lukey, clerk.

Organized 1898, under laws of Michigan, with capitalization $2,500,000,

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shares $25 par; paid in, $17. Assessments were $100,000 in 1905; $300,000 in 1906; $200,000 in 1907; $100,000 in 1908. Company ended 1907 with a surplus of $67,052, and with 291,187 lbs. copper on hand. Is closely allied, in ownership and management, with King Philip Copper Co., under control of St. Mary's Mineral Land Co. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., Boston, transfer agent. Shares are listed on the Boston Stock Exchange. Annual meeting, last Tuesday in March.

Lands, 1,568 acres, in a main tract of 1,440 acres, and a smaller tract of 128 acres, main tract being in Sections 19, 20, 29 and 36, Town 52 North, Range 36 West, also timber rights to 1,768 acres lying 3 to 5 miles south of the mine. An exchange of equal parcels of land with the King Philip Copper Co., 1906, has given improved holdings to both properties. The company also owns a good millsite, at the mouth of the Misery river, with water available from that stream, and may build a mill in connection with King Philip Copper Co.

The main tract carries the outcrop of the Winona amygdaloidal bed for upwards of one mile. The mine was discovered, 1864, by a line of prehistoric pits along the outcrop, and a single shallow shaft was then sunk, but owing to entire lack of transportation facilities, little was accomplished. The property was let on tribute, 1880, but did not furnish sufficient mass copper to pay, and was closed, until taken over by the present company, April, 1898, when the old shaft was cut down, retimbered and deepened, and 3 new shafts sunk, on the Winona lode, an amygdaloidal bed running 12′ to 46′ wide, with an average width of circa 20′, striking N. 59° E., and having an average dip of about 50°. The Winona amygdaloid resembles the Baltic lode in some respects, and also bears considerable resemblance to the Knowlton bed of the Evergreen belt, carrying considerable epidote, calcite and quartz, with a limited amount of mass and barrel copper, bulk of the metal being found as stamp-copper. Diamond-drill borings have located several other cupriferous beds on the Winona tract, but none carried copper in payable quantities, where cut.

The mine is served by a spur from the main line of the Copper Range railroad, which passes nearby.

The older workings show mainly mineral of the finer grades, with somewhat heavier copper at depth, and the best ground is to the south, underground conditions having improved during 1908. During 1907 the mine made 2,232′ of new openings, and the mine ended 1908 with circa 5 miles of workings. Shafts Nos. 3 and 4 are connected on the 3d and 4th levels and during the first half of 1909 connections are to be made on several levels below, this territory showing considerable copper, the showing at the southern end of the mine being much the best. The mine has electric pumps, and runs about 10 drills.

No. 1, the discovery shaft, in the NE. ¼ of the NE. ¼ of Section 29, T. 52 N., R. 36 W., is 8x18′ inside of timbers, with 3 compartments, and is 400′ deep, with 4 levels opened, showing a little heavy copper and some stamp-rock in the northern drifts, but was of little promise, and has been idle since circa 1901.

No. 2 shaft, 900′ northeast of No. 1, sunk at an angle of 72°, 1,000′ deep, with 9 levels opened, shows good copper at depth of circa 200′, but with poor ground below, and has been idle since early 1906. Equipment at No. 2 includes a hoist good for 1,500′ depth.

No. 3 shaft, 1,650′ southwest of No. 2, is bottomed at the 13th level. The 3d and 4th levels have been extended to No. 4 shaft, a distance of 1,700′, showing alternations of good and poor ground. The openings, as a whole, were estimated to show rock carrying 15 to 18 lbs. fine copper per ton, allowing for judicious stoping and reasonable selection of ground broken, but probably

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should be estimated at 12 to 15 lbs. copper per ton. Work was discontinued, late 1908, the shaft having sufficient opening for the present.

Equipment at No. 2 shaft includes a steel shaft-rockhouse, 40x70′ on the ground, 106′ high, remodeled and improved, 1908, equipped with two 24x36″ Portage Lake Farrell crushers and room for a third, pneumatic steel gates, pneumatic trolley cranes, and grizzlies having differential slopes, lower portions being quite flat, grizzlies feeding to crushers, with only one man required for each crusher.

No. 4 shaft, circa 1,700′ southwest of No. 3 and about 400′ from the southern boundary, started June, 1906, is sunk on ground secured from the King Philip in rectifying lines. The shaft is sunk in the footwall, and was opened by simultaneously sinking and raising. This shaft was showing good ground, at the end of 1908. Equipment includes a steel shaft-rockhouse with two 24x36″ Portage Lake Farrell crushers, similar to those at No. 3.

Old No. 3 shaft, 900′ north of No. 2 and about 750′ deep, shows little ground of promise, and has been idle for some years. Old No. 4 shaft, the northernmost, about 1,350′ northeast of No. 1, found nothing of importance and also has been idle for some years. Old No. 5 shaft, started on a wide amygdaloidal bed located by diamond-drill, did not develop good ground, and was discontinued at slight depth, some years ago.

The central power plant, between shafts 3 and 4, has an Allis-Chalmers 2,300-volt 3-phase 60-cycle cross-compound generator, providing an alternating current, with a 535-h. p. induction motor direct-connected to two 250-h. p. direct current generators, speeded for 600 revolutions per minute, delivering direct current to No. 4 shaft of the Winona and No. 1 shaft of the King Philip, each shaft having a 200-h. p. motor geared to the hoisting drum, each hoisting motor having a variable speed of 150 to 1,200 revolutions per minute. No. 4 shaft has an electric hoist good for 1,500′ depth, operating two 3½-ton skips, working in counterbalance, at a speed of 1,200′ per minute. The motor generator set has 2 flywheels, of 20 tons weight each, their momentum caring for variations in load, and also providing power for hoisting, for one hour after the dynamo is closed down, if necessary. The electric generator set has 2 bearings of 11x33″, and 2 bearings of 9x27″, with oil pumped through them at the rate of 16 gallons per minute, automatically filtered and water-cooled, insuring perfect lubrication. The central power-house also has a 40-drill Nordberg air-compressor.

The engine-house, located midway between shafts Nos. 1 and 2, is 40x40′, of steel frame on stone foundations, with corrugated iron siding and roof, having a steam hoist, good for 1,500′ depth, operating shaft No. 2, and the electric hoist previously described for shaft No. 3, also an Ingersoll-Sergeant 12-drill class A 2-stage straight-line air-compressor, and a smaller single-stage compressor. Adjoining is the boiler-house, 40x48′, of steel frame on stone foundations, with iron siding and roof, housing four 80-h. p. boilers. There is a wooden coal-trestle, with tunnel beneath, leading to the boiler-house.

The mine buildings include a 20x40′ carpenter-shop, combination smithy and machine-shop, 22x34′ general store, an office building, 2 boarding-houses and nearly 100 dwellings for employes, the dwellings being in a townsite platted by the company. There also is a sawmill, 30x70′, with a 42x66′ wing for boilers, and a 16x46′ wing containing a shingle-mill, the plant having a daily capacity of 20,000′ of sawed lumber.

Production has been as follows: 1,036,944 lbs. fine copper in 1903; 646,025 lbs. in 1904; nothing in 1905; 278,182 lbs. in 1906; 1,285,863 lbs. in 1907; nothing in 1908. For 1904 returns averaged 18.95 lbs. fine copper per ton of rock stamped. Production was resumed, with a leased head, at the Adventure mill, October, 1906, in which year 19,399 tons of rock stamped returned an average

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of 14.34 lbs. fine copper per ton. Returns, 1907, were 12.59 lbs. fine copper per ton, and production was suspended, November, 1907, on account of the break in the price of the metal. Copper is sold through the Calumet & Hecla Mining Co.

The Winona has proven somewhat disappointing to date, as it was generally held, locally, to be one of the best prospects in the Lake Superior district, before being taken over by the present company. The management is strong and experienced, and the property is being given every opportunity that can be afforded by thorough equipment, technical skill, and economical administration.

WINONA GOLD-COPPER MINING CO. **WYOMING.**

Office: 210 Mercantile Bldg., Denver, Colo. Mine office: Cody, Big Horn Co., Wyo. L. Cavnah, president; Geo. E. House, vice-president; D. J. A. East, second vice-president; Wm. H. McAloney, secretary and treasurer; Hon. N. C. Miller, general manager; preceding officers, Henry F. Power, Jas. Lippincott, W. H. Lippincott and G. G. Hodge, directors. Organized under laws of Wyoming, with capitalization $5,000,000, shares $1 par. Management was changed and company practically reorganized, Dec. 12, 1905.

Lands, 22 claims, area 404 acres, on Silver Creek in the Bear Tooth and Sulphur Mountains, of the Sunlight district, in the northwestern corner of Big Horn county, about 12 miles east of the Yellowstone National Park, well timbered, with water power available, showing porphyry and andesite dykes, with well mineralized quartzite veins of 10′ to 25′ estimated average width, carrying auriferous and argentiferous chalcocite, bornite and chalcopyrite, said by old management to give assays of 15 to 52% copper, 11 to 15 oz. silver and about $1 gold per ton, and said by new management to give assays of 10 to 56%, with an average of upwards of 40% copper, and $10 to $20 combined gold and silver values per ton, presumably from carefully selected samples. Has 2 tunnels, No. 2 being 254′ in length at last accounts, planned to prove the ore system at depth. Property considered promising by Prof. H. C. Beeler, State Geologist of Wyoming. Apparently idle except for assessment work.

WINONA-REX COPPER MINING CO. **WYOMING.**

Office: Winona, Minn. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. John Ludwig, president. Idle several years and apparently moribund.

WINTHROP MINE. **MICHIGAN.**

Owned by Frontenac Mining Co.

WISCONSIN & ARIZONA MINING CO. **ARIZONA.**

Office and mine: care of M. H. Ryan, president and superintendent, Prescott, Yavapai Co., Ariz. J. L. Jacquot, vice-president; E. G. Jones, secretary; Dr. Donald McIntyre, treasurer. Organized December, 1904, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, known as the Copper King group, 4 miles north of Poland. Has shafts of 35′, 35′ and 50′, also a short tunnel showing a 5′ vein carrying 6″ stringers of high-grade auriferous and argentiferous ore. Presumably idle.

WISCONSIN MINING & MILLING CO. **IDAHO.**

Dead. Formerly at Elk City, Idaho Co., Idaho.

WISCONSIN MONTANA MINING CO. **MONTANA.**

Office: Downing, Wis. Mine office: Superior, Missoula Co., Mont. Employs 3 men. A. O. Nichols, president and general manager; D. McDonald, vice-president; D. C. Coolidge, secretary; Dr. P. A. Beebe, treasurer; preceding officers and J. DeWilde, directors; Frederick V. Phinney, engineer. Organized Jan. 29, 1906, under laws of Wisconsin, with capitalization $50,000, shares 5 cents par; issued, $36,820. Annual meeting, first Tuesday in February.

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Lands, 6 claims, area 120 acres, and a 5-acre millsite, in Town 15 North, Range 25 West, one mile from the Missoula river and about 14 miles up the river from Superior. Property shows 2 fissure veins, in quartzite, estimated by company as of 70′ average width, carrying azurite and chalcopyrite giving assays of 2 to 25% copper, opened by a 24′ shaft and by tunnels of 75′, 700′, 200′, 38′ and 35′. Company plans continuous development.

WISCONSIN-WYOMING COPPER MINING CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

WISSENER BERG- UND HÜTTENWERKE AKTIEN-GESSELLSCHAFT. **GERMANY.**

Office: Köln, Germany. Mine office: Wissen-am-Sieg, Rheinprovinz, Germany. Capitalization, 8,000,000 marks. Is an extensive producer of iron ore, 1902 output having been 109,483 metric tons of spathic iron ore and 1,092 metric tons of ore of 10% copper tenor. Employs circa 1,000 men.

WIZARD COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. L. Bryant, manager; H. A. Van Buskirk, superintendent. Property shows a vein of 25′ estimated width, carrying a 3′ paystreak of smelting ore, balance consisting of ore of concentrating grade.

WOLCOTT COPPER MINING CO. **VERMONT.**

Mine office: Wolcott, Lamoille Co., Vt. Organized, circa 1900, with capitalization $500,000, shares $1 par. Idle several years and apparently moribund.

WOLF CREEK COPPER MINING CO. **MONTANA.**

Office: Spokane, Wash. Mine office: Wolf Creek, Lewis & Clark Co., Mont. R. E. Vincent, A. M. Baldwin and P. S. Duchemin, directors. Mine has a tunnel, said to show a 14′ vein of ore carrying 20% copper.

WOLFRAM COPPER CO. **ARIZONA.**

Office: care of Benj. Blanchard, general manager, Prescott, Ariz. Mine office: Parker, Yuma Co., Ariz. Presumably idle.

WOLVERINE & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Dead. Reorganized, March, 1904, as Wolverine & Arizona Mining Co. Formerly at Bisbee, Cochise Co., Ariz. Very fully described Vol. IV.

WOLVERINE & ARIZONA MINING CO. **ARIZONA.**

Office: Lauritm, Mich. Mine office: 61 Mason Hill, Bisbee, Cochise Co., Ariz. John Daniell, president; Paul P. Roehm, vice-president; Edw. Ulseth, second vice-president; W. Frank James, treasurer; preceding officers, Chas. Chynoweth, Benj. F. Chynoweth, W. H. Brophy, Fred C. Smith and Michael J. Cunningham, directors; Hon. Wm. R. Oates, secretary; W. H. Roberts, Jr., superintendent.

Organized March, 1904, under laws of Arizona, as successor of Wolverine & Arizona Development Co., with capitalization $3,000,000, shares $15 par; issued, 97,156 shares, par value $1,457,340, subject to assessment, and 21,792 shares, par value $326,880, of full paid stock. Levied 25-cent assessments March 19, 1906, Sept. 17, 1906, June 17, 1907, and Nov. 18, 1907. Annual meeting, third Wednesday in November.

The preceding corporation, the Wolverine & Arizona Development Co., raised and disbursed $223,433.93. Receipts of present company, to Dec. 31, 1906, were $148,522.78, and for 11 months ending Jan. 1, 1907, disbursements were $46,289.37. For fiscal year 1908, receipts were $27,131.32, with expenditures of $22,581.31, leaving a cash balance of $4,550.01.

Lands, 9 claims, area circa 160 acres, known as the Cairo, Memphis, Kentucky, Georgia, Louisiana, Chicago, Warren, George and Broken Promise. The Georgia claim lies 600′ from lands of the Calumet & Arizona, and is about 3,000′ from the Irish Mag shaft of that company, and from the Spray and Holbrook

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shafts of the Copper Queen. The Uncle Sam and White Tail Deer claims of the Copper Queen are adjacent to the Wolverine & Arizona, and good ore was taken by leasers from the White Tail Deer claim, about 800′ from the Wolverine shaft. Final payments on lands were made Jan. 30, 1907.

The company conducted extensive exploratory work on the Broken Promise claim, which proved true to its name. The shaft on the Broken Promise claim is 700′ deep, with 3 compartments, each 5′x4′6″, well timbered, cutting limestone showing considerable iron. The shaft proved very wet, at depth, and has Nos. 7 and 9 Cameron sinking pumps, and a 500-gallon station pump. A drift on the 500′ level, running 850′ toward the Pittsburg & Duluth group of the Superior & Pittsburg Copper Co., has cut leached ore and ledge matter carrying traces of copper. Drifts running in other directions have shown leached ore, in encouraging quantities, but no ore of workable grade was developed, from the Broken Promise shaft, until 1908, when a drift cut an 18″ vein of silver-lead ore, estimated at $56 value per ton, near the centre of the Warren, or Bootleg, claim. Management plans continuing the drift, 1909, into and through the George claim, in the hope of finding oxidized ores that should lie above the sulphide ore bodies found in the Shattuck-Arizona mine, adjoining. During 1908 work was confined to extending the 300′ level drift to length of circa 2,000′, work being suspended on the 500′ level, to avoid water, which apparently is a mistaken policy, as the principal ore bodies must be gone after at depth.

The lands of the Wolverine & Arizona lie partly on the high hill west of Bisbee, but development was begun on the talus of the 500′ mural escarpment which forms the western side of the hill. Exploratory work to the west of the cliff proving disappointing, diamond drill borings of 2,694′ aggregate depth were made, 1906, on the hill, the last hole, at depth of 410′, passing through 50′ of oxidized ore, of 4 to 10% copper tenor. The ore body so located being inaccessible from the Broken Promise shaft, except under tremendous disadvantages, arrangements were made for use of the Higgins tunnel, on the Twilight claim, reaching this ground from the Bisbee side of the hill, as the ore found was located on 2 claims near the Shattuck-Arizona. Under this arrangement the old Higgins tunnel was extended 310′ through Higgins ground, to the Wolverine boundary, and was continued in a southerly direction, on Wolverine lands, during 1908. The nearest workings of the Broken Promise shaft are circa one-half mile distant, and about 500′ lower. An incline was started, October, 1907, at a distance of circa 2,700′ from the portal of the Higgins tunnel, and, during 1908, a body of oxidized ore, of about 8% average copper tenor, was proven by 497′ of workings, estimated to show 150,000 tons of ore, averaging circa 7% copper, which estimate seems unduly high, but it was estimated, at end of 1908, that these workings exposed circa $500,000 worth of ore, which estimate seems warranted.

Equipment includes a 260-h. p. steam plant, with 2 single-drum hoists and a 6-drill air-compressor. Buildings include a 25x50′ engine-house and office, bunk-house, boarding-house and a 10,000-gallon water-tank, water being pumped from Naco, 8 miles distant. All surface improvements are at the Broken Promise shaft.

Property is considered valuable, but the management should buckle down to business, and go after the ore in earnest, on a broad basis of operations, instead of confining operations to desultory exploratory work, maintained by the levying of irritating 25-cent assessments at irregular but frequent intervals. The Wolverine & Arizona has the makings of a mine, but it will require work, and cash to pay for it, to develop the property from a promising prospect to a regular producer.

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WOLVERINE COPPER MINING CO. **MICHIGAN.**

Office: 15 William St., New York, N. Y. Mine office: Kearsarge, Houghton Co., Mich. Employs circa 500 men. Jos. E. Gay, president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; preceding officers, C. R. Corning and Samuel L. Smith, directors; Fred Smith, superintendent; Willard J. Smith, assistant superintendent; Chas. L. Noetzel, clerk; Barney S. Shearer, mill superintendent; Wm. Pollard, mining captain; F. Wm. Hartmann, engineer; A. B. Holtenhoff, master mechanic.

Organized 1890, under laws of Michigan, with capitalization $1,500,000, shares $25 par. Company owns $80,000 stock in the Michigan Smelting Co. Fiscal year ends June 30th. Adams Trust Co., Boston, registrar; American Loan & Trust Co., Boston, transfer agent. Annual meeting, first Monday in August.

First dividend was paid Oct. 1, 1898, and 21 dividend disbursements, to end of 1908, aggregated $5,100,000. Recent dividends, for calendar years, have been as follows: $330,000 in 1903; $450,000 in 1904; $660,000 in 1905; $1,020,000 in 1906; $1,050,000 in 1907; $600,000 in 1908. Net earnings for fiscal years have been as follows: $557,240 in 1904; $741,334 in 1905; $1,007,820 in 1906; $1,703,304 in 1907; $1,244,443.71 gross and $559,402.17 net earnings in 1908, company ending that fiscal year with a surplus of $811,629.22.

The Wolverine mine was opened, 1882, by local capital, but was not successful, and the company was reorganized, 1890, with present title and management, when new machinery was secured and work resumed. The previous ill-success of the mine rendered investors dubious of its future, and cash for its development was secured with difficulty. Lack of funds imperatively demanded for the operation of the property was met by the late John Stanton, with a heavy loan, advanced from his own pocket, at a time when other shareholders were unwilling to risk a dollar, and it is due to Mr. Stanton's courage that the Wolverine now is, in proportion to its size, the most profitable copper mine in the Lake Superior district. Under Mr. Stanton's management milling was discontinued immediately, and was not resumed until 18 months of underground development had given adequate reserves of stamp-rock. By reason of the sound policy pursued, the mine began making small profits from 1892, when stamping was resumed.

Lands, 320 acres, being 280 acres freehold, and 40 acres of mineral rights adjoining the main tract, lands carrying 3,100′ of the strike of the Kearsarge amygdaloidal bed, on which the mine is opened. Neighboring properties are the North Kearsarge on the north, Mayflower on the east, Mayflower and South Kearsarge on the south, and Centennial on the west.

The Kearsarge bed, on the Wolverine property, averages about 16′ in width, and this is the richest amygdaloidal mine in the Lake Superior district, and is second only to the Calumet & Hecla in richness among all Lake Superior copper mines. The upper workings were lean, returning 16 to 17 lbs. fine copper only, 1892, but no stoping is in progress above the 15th level, below which the lode shows little or no diminution of values with depth. All lower levels are opened at 100′ intervals, some of the upper levels being opened at 75′ to 80′ intervals. All shafts are sunk at an angle of 41°, and all skip-tracks have been given cross-ties, in place of longitudinal stringers, following the plan introduced in the Calumet & Hecla, which unquestionably is an improvement, as it permits the use of a cheaper grade of timber, and allows quicker repairs. For fiscal year 1908 the mine made 5,255′ of new openings. Owing to the uniformity of the cupriferous bed, all levels, from the first to the 23d, inclusive, are opened through the entire property, connecting all 4 shafts to bottoms of Nos. 1 and 2, and connecting Nos. 3 and 4 only below the 17th level. Man-cars are

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installed in shafts Nos. 2, 3 and 4. About one mile of new openings is made yearly, with ground blocked out for about 6 years production, at rate of 10,000,000 lbs. fine copper yearly, with between 20 and 25 years of life ahead of the mine. About 30 power drills are employed, of which two-thirds are stoping, and one-third are employed in opening work.

Lying about 80′ west of and parallel with the Kearsarge bed, is the West lode, opened by a crosscut on the 11th level. A little work was done on the West lode, 1903, and one excellent stope was opened, but the prospects of making a paying mine on this bed are not especially bright, as it would be contrary to precedent were two parallel beds so close together to be found payable. An exploratory crosscut, on the 14th level, driven 2,000′ across the formation, both east and west from the workings on the Kearsarge bed, reached as far west as the Kearsarge conglomerate, which was absolutely barren, where cut, though it is known to carry some copper on the Ahmeek and Seneca properties, to the northward. The west lode gave a little encouragement in the 14th level crosscut, and may be tested further, in the future.

The mine has 5 Knowles electric pumps, of which 3 are in No. 2 shaft, with one each in No. 3 and No. 4, three of these pumps having an average lift of more than 1,000′ each. Current is taken from the Houghton County Electric Light Co., and the electric pumps have given much relief to the air-compressors. The mine has the Johnson electric hoisting signal system, being the first Lake Superior copper property to use electric signals throughout.

The system of underground rock-handling, introduced circa 1905, saves confusion and cash. Tram-cars to the average number of 10 are kept on each level. Trammers leave the full cars at the shaft, and 2 men attend to the dumping in each shaft, these starting at the topmost level where stoping is in progress, and working downward, dumping all loaded cars on each level, in order, then riding, on skips, to the topmost producing level, and repeating the work. By this system, all signaling in each shaft is in the hands of 2 men, and the engineers in charge of the hoists know exactly what is going on underground.

No. 1 shaft, near the Kearsarge line, shafts being numbered from north to south, ran into the boundary at shallow depth, and, tributary ground being worked out, the shaft was abandoned, some years ago.

No. 2 shaft, next south, permanently bottomed at the boundary, at depth of 1,700′, is used exclusively for handling men and supplies. The engine-house has a duplex-cylinder hoist with straight-face drum.

No. 3 shaft, sunk in the footwall, ended 1908 bottomed at the 25th level, and can be sunk to depth of 4,300′, owing to exchange of lands between the Wolverine and the North Kearsarge mine of the Osceola Consolidated. The wooden shaft-rockhouse, burned March 3, 1906, has been replaced by a steel structure, duplicating that of Mohawk shaft, No. 4, in design and equipment. This shaft has an engine-house with duplex-cylinder hoist having straight-face drum.

No. 4 shaft, bottomed on the 30th level, at the end of 1908, is sunk 45′ in the footwall, to guard against drawing. Equipment includes an engine-house, of mine rock with red sandstone trimmings, built 1906, housing a 14x60″ Nordberg duplex-cylinder hoist, with double-conical drum having a maximum diameter of 18′, capable of raising 4-ton skips from one mile depth, with 1¼″ steel cable. The hoist is a duplicate of that at Mohawk No. 4 shaft. The Bullock hoist formerly at No. 4 was sold to the Mohawk. No. 4 engine-house also has a large electric transformer.

Principal mine buildings are at No. 4 shaft, where there are 20-drill and 22-drill Rand air-compressors, and a boiler-house with 3 Stirling water-tube

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boilers, American automatic stoker and Green fuel economizer. At No. 3 there is a model changing-house. There is a private telephone system, with 20 instruments, connecting the underground pump-stations and principal buildings on surface, with the central exchange in No. 3 engine-house. The company maintains a 6-ward hospital, with medical and surgical staff, for employes and their families. The company owns a large number of substantial dwellings, and the mine location is exceptionally neat and prosperous in appearance.

Rock is transported to mill by the Mohawk & Traverse Bay railroad, with a down-grade haul of 13 miles.

The mill, completed 1902, is near the mouth of Tobacco River, on Traverse Bay, Lake Superior, adjoining the Mohawk mill, both served by a single pump, and managed by a joint superintendent. The mill, 180x206' in size, of steel on stone foundations, standing 37' above the lake level, has 2 Nordberg heads, each of circa 550 tons daily capacity, at 110 blows per minute. It has been decided to compound both heads, and work on the first was under way, late 1908. The mill makes extensive use of Wilfley tables, and has a completely appointed machine-shop. Mineral from the heads and wash is sluiced to the basement through iron pipes, going for reduction to the works of the Michigan Smelting Co., at Houghton. To care for tailings there has been installed a Jackson tailings system, which provides for the settling out of water and stacking of tailings, 800' from the mill, by a belt-conveyor. A practically similar system, at the Mohawk, has given very good results.

The boiler-house, just south of the mill, is 42x58', with stone walls and steel truss roof, housing a battery of 200-h. p. Stirling water-tube boilers, fitted with automatic stokers. Coal goes through a lump-crusher, thence to hoppers having 24 hours' storage capacity.

The pump-house, owned and operated jointly by the Wolverine and Mohawk, has a 20,000,000-gallon Snow horizontal triple-expansion pump, with 18", 33" and 54" steam-cylinders, and 22" water plungers, with 36" stroke. There is an 8,000,000-gallon Nordberg triple-expansion water-end pump, with 3 plungers, used as an auxiliary. The pump-house is located on the river, near its mouth, the intake pipe being protected by timber cribs running 300' into the lake, preventing clogging from floating bark and anchor ice.

In connection with the mills there is a wharf, owned jointly by the Wolverine and Mohawk, fitted with coal-hoists. A 40-acre townsite, platted near the mills, is named Gay, in deserved honor of Jos. E. Gay, the president of the company, long and honorably identified with honest and successful copper mining enterprises of the Lake Superior district.

Production for recent years has been as follows: 9,024,034 lbs. in 1903; 9,764,455 lbs. in 1904; 9,464,418 lbs. in 1905; 9,681,706 lbs. in 1906; 9,272,351 lbs. in 1907. For fiscal year 1908, the mine hoisted 367,795 tons of rock and discarded 18,935 tons, or 5.15%, stamping 348,860 tons, which yielded 12,117,000 lbs. mineral that returned 9,356,123 lbs. fine copper, an average return of 1.341%, or 26.82 lbs. fine copper per ton. Costs for fiscal year 1908, were $1.62 per ton for rock hoisted, and $1.71 per ton for rock stamped, and finished copper was made for 6.379 cents per pound, at the mine, with total costs of only 7.321 cents per pound, rendering the Wolverine the lowest cost copper producer of Lake Superior. The management of the Wolverine is as good as that of any mine in operation.

WOLVERINE MINING CO. **UTAH.**

Dead. Was wound up, by receiver, circa 1908. Formerly at Park City, Summit Co., Utah. Fully described Vol. VI.

WOLVERINE MINING & LEASING CO. **COLORADO.**

Office: Niles, Mich. Mine office: Pearl, Larimer Co., Colo. W. S. Leland,

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president; Edwin Miller, vice-president; Dr. Z. L. Baldwin, secretary; Burr T Lobdell, chairman executive committee. Is a development company, composed of shareholders of Coldwater Copper Mining Co., and took over the Coldwater mine, circa 1903, under a 3 to 5 year lease. Idle and apparently moribund.

WOLVERINE & WESTERN DEVELOPMENT CO. **OREGON.**

Dead. Formerly at Roseburg, Douglas Co., Ore. Described Vol. VI.

WONDERFUL MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Lands, on the eastern slope of Stevens Peak, have a 900′ crosscut tunnel, cutting a vein said to give a fair showing of galena and copper ore.

WOOLLEY MINING CO. **ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Lands were 17 claims, between the Saddle Mountain and Troy-Manhattan, held under a $60,000 bond and lease. Idle and presumably out of business.

WORLD'S FAIR MINE. **ARIZONA.**

Office: care of Frank & Josephine Powers, owners, Nogales, Ariz. Mine office: Patagonia, Santa Cruz Co., Ariz. Lands, 13 claims, near Harshaw, south of Patagonia, in the eastern end of the Salero Mountains. The mine has a 600′ main shaft, with about 2 miles of workings, on an 8′ ore body, showing mainly highly argentiferous lead carbonates and sulphides near surface, changing at depth to argentiferous copper sulphides. Property has been a shipper, since circa 1893, of high grade ore, in carload lots, ores ranging in value from $250 to $350 per ton, one 20-ton carload returning $15,000. Mine is popularly reputed to have produced upwards of $500,000 worth of ore. Production, 1907, was 16,733 lbs. fine copper, 106,627 oz. silver and 25 oz. gold. Suspended operations Oct. 5, 1907, on account of low price of copper and silver.

WORLD'S FAIR MINING CO. **ARIZONA.**

Dead. Lost lands to former owner, Frank Powers. Formerly at Patagonia, Santa Cruz Co., Ariz.

WRIGHT & LAWRENCE MINING CO. **CALIFORNIA.**

Office: 8 Jackson Blvd., Chicago, Ills. J. T. Fortin, president; C. Borchardt, vice-president; A. W. Nelson, secretary; Alex J. Liljestrom, superintendent and general manager. Capitalization $1,500,000, shares $1 par. Lands, 16 claims, area 220 acres, in the Doyle district of Riverside county, California, said to have about 250′ of workings. Was a mere bit of rotten stock-jobbery, as promoted, but present management apparently was not responsible for the deliberate swindles perpetrated by the original officers. Property not regarded favorably.

WRIGHT-RUSSELL COPPER MINING CO. **WYOMING.**

Office: 109 South 11th St., Lincoln, Neb. Letter returned unclaimed from former mine office, Battle, Carbon Co., Wyo. J. H. Westcott, president; W. H. Dorgan, vice-president; John P. Dorgan, secretary; John B. Wright, treasurer; H. M. Rice, general manager. Capitalization $1,000,000. Idle and apparently moribund.

W. S. FLETCHER MINING & SMELTING CO. **ARIZONA & CALIFORNIA.**

Dead. Was succeeded, March, 1905, by Arizona-Mexican Mining & Smelting Co. Formerly at Kingman, Mohave Co., Ariz., and Needles, San Bernardino Co., Cal. Described Vol. V.

WYACCA MINE. **AUSTRALIA.**

Office: care of E. Pearce, Broken Hill Chambers, Adelaide, South Australia. Mine office: Blinman, Flinders Co., South Australia. Lands are in the Hundred of Basedow, in the Flinders range, 8 miles southwest of the Blinman mine, and about 260 miles north of Adelaide. Vein ranges 1″ to 26″ wide,

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carrying cuprite, melaconite and chalcopyrite, in a gangue of calcspar and spathic iron. Idle some years.

WYANDOT COPPER CO. **MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Winona, Houghton Co., Mich. Employs 25 men. John C. Watson, president; M. A. O'Neil, vice-president; Chas. E. Adams, secretary and treasurer; preceding officers, Jos. Dorr and Matthew Van Orden, directors; Frank L. Van Orden, superintendent; Louis LaRochelle, mining captain. Organized Feb. 3, 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par; paid in, $8. Has levied assessments of $200,000 since organization. Disbursements, for fiscal year ending March 30, 1908, were $25,905, leaving cash assets of $37,144.17, with liabilities of $1,834.17. Shares are listed on the Boston Stock Exchange. State Street Trust Co., Boston, registrar; Federal Trust Co., Boston, transfer agent. Annual meeting, second Monday in May.

Lands, 1,065 acres, adjoining the Winona, in Sections 16, 20 and 21, Town 52 North, Range 36 West. Exploratory work, begun February, 1899, has been continued uninterruptedly, though hampered by the great disadvantage of a heavy overburden. Early work was done in search of the Winona amygdaloidal bed, and efforts were made later to locate the southern extension of the Baltic lode, after which attention was turned again to the Winona bed, and latterly has been directed toward locating the extension of the Lake bed. Average strike of the Keweenawan formation is N. 53° E., with average dip of 65°, and the Wyandot lands carry the strike of the beds for about 1½ miles. The mine has 11 shafts, some of which are merely pits, with 2 shafts of considerable depth.

No. 1 shaft, 1,000′ deep, located in the SE. ¼ of Section 21, Town 52 North, Range 36 West, is sunk in the footwall of the Winona bed, with a parallel underlying amygdaloidal bed 60′ distant, both broken, and of small promise, though showing occasional patches of well mineralized ground.

No. 11 exploratory shaft, 8x10′, inside measurement, was sunk 350′ on a vein paralleling the Winona lode, at a distance of 1,200′ This lode gave encouragement, when first opened, and diamond-drill holes gave good cores, but work was suspended, until 1907, when the shaft was unwatered and deepened. This shaft, located in the SE. ¼ of Section 21, Town 52 North, Range 56 West, was deepened, 1908, to 700′, and a crosscut, driven to the southeast, passed, late 1908, through an epidotal amygdaloid of circa 50′ width, carrying finely disseminated copper of promising appearance. There also is a footwall chute of 6″ to 4′ width, heavily mineralized, where cut. The epidotal bed, at the end of 1908, had about 100′ of drifting, and gave an encouraging showing of copper. The bed, apparently about 24′ in width, showed very little copper until the footwall was reached, where there was found 6″ to 12″ of heavy mass and barrel copper, at the point cut, but drifts north and south show copper more evenly disseminated through the bed, mainly as stamp-copper, rather than barrel work. The showing at this point is much the best that the Wyandot ever has secured.

Miscellaneous work of the past included a 102′ shaft sunk on a lean cupriferous conglomerate underlying the Winona bed; a 300′ shaft sunk on an amygdaloid identified as the Elm River, which gave no promising ground, and some work was done also, 1904-1905, on the Misery River lode, in Section 16, Town 52 North, Range 36 West, on a 20′ amygdaloid carrying fine copper, but nothing of value was developed at this point.

In addition to underground work, extensive diamond-drill borings have been made, and drilling was in progress at the end of 1908, with holes pitched at an angle of 55°, and further drill work is planned to be carried on, in Section

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16. Several years ago Section 28, Town 52 North, Range 36 West, was optioned, and a vertical shaft sunk near the west quarter post, to depth of 250', and crosscuts driven in both directions, with a total of about one-half mile of workings. The horizon of the Baltic lode was crossed in this work, but the bed was found highly altered, as was the whole country in the neighborhood. Diamond drilling, 1904, gave a core, showing a little copper, from the hypothetical horizon of the Lake lode, but this was not considered important at the time. The ground is being gone over again, with a diamond-drill, and efforts will be made to locate the extension of the Lake bed and give it such test as circumstances may warrant.

Equipment includes a Lidgerwood hoist, good for 1,000', one Ingersoll-Sergeant and 2 Rand air-compressors, of 12 drills aggregate capacity, and boilers. Buildings include a machine-shop, smithy, warehouse, barns and about 12 dwellings. The Wyandot has worked faithfully, for a decade, under most discouraging circumstances, but with great economy and persistence, and the showing secured at the end of 1908 was much the best in the history of the property.

WYOMING & ALABAMA MINING CO. **WYOMING.**

Dead. Formerly at Tie Siding, Albany Co., Wyo.

WYOMING CONSOLIDATED COPPER CO. **WYOMING.**

Dead. Formerly at Encampment, Carbon Co., Wyo.

WYOMING COPPER CO. **WYOMING.**

Office: Jackson, Mich. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Lands are on upper Cow Creek. Idle and apparently moribund.

WYOMING COPPER & GOLD MINING CO. **WYOMING.**

Office: Alma, Kan. Mine office: Encampment, Carbon Co., Wyo. C. B. Henderson, president and manager; J. R. Henderson, secretary and treasurer. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands are said to have shown ore, from the Metal Chief vein, assaying 65% copper. Idle several years.

WYOMING COPPER & MINING CO. **WYOMING.**

Office: 115 Dearborn St., Chicago, Ills. Letter returned unclaimed from former mine office, Rawhide Buttes, Laramie Co., Wyo. Mark E. Bennett, president; Edwin Hall, vice-president and general manager; W. M. Gager, secretary. Organized Nov. 17, 1905, under laws of Wyoming, with capitalization $500,000, shares $1 par.

Lands, 35 claims, area 700 acres, in the unorganized Rawhide Buttes district, also 100 acres timber lands, showing country rocks of quartzite, schist and limestone, said to carry 14 contact veins, of which 4, of 5' average width, are opened by shafts of 30' and 245', showing malachite and azurite above, with sulphides in the lower workings, giving average assays of 8% copper, 4 oz. silver and $3 gold per ton. Mine has 810' of workings, estimated to show 20,000 tons of ore. Equipment includes a 40-h. p. steam plant, with hoist and 4-drill air-compressor, and 4 mine buildings. Nearest railroad is the Chicago & Northwestern, 12 miles distant. Idle.

WYOMING GOLD & COPPER MINING CO. **WYOMING.**

Office; Salt Lake City, Utah. Mine office: Lusk, Converse Co., Wyo. Organized 1906, under laws of Utah. Lands, 3 claims, circa 18 miles south of Lusk, in the northern part of Albany county, said to have a 30' shaft, showing an ore body assaying 16% copper, with gold values.

WYOMING MINING CO. **WYOMING.**

Mine office. Kirwin, Big Horn Co., Wyo. Titus Sheord, president; B. F.

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Brown, secretary; C. A. Tewksbury, superintendent. Has auriferous and argentiferous copper ores. Idle.

WYOMING QUEEN MINING CO. **WYOMING.**

Office: Laramie, Wyo. Mine office: Jelm, Albany Co., Wyo. Louis Miller, president, treasurer and general manager; L. A. Hancock, secretary; preceding officers, C. F. Downing, E. E. Fairbrother, Ole Scar and John Wenzin, directors. Organized January, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par.

Lands, 18 claims, area 360 acres, also 20 acres of placer ground, in the Jelm Mountains, 32 miles southwest of Laramie, nearest railroad point, showing 3 fissure veins, carrying auriferous and argentiferous copper carbonates and sulphides, of good assay values, with a little native copper and galena. Development is by shafts of 70′, 70′ and 100′, on a gold vein, a shaft of 100′ on a vein carrying auriferous and argentiferous copper and lead sulphides, and a 250′ shaft on an auriferous copper vein, mine also having tunnels of 70′ and 250′. Mine is wet, needing pumps. Out of funds and idle several years.

WYONA IRON & COPPER CO. **WYOMING.**

Office: 928 Equitable Bldg., Denver, Colo. Mine office: Battle, Carbon Co., Wyo. Geo. E. Ross-Lewin, president; H. A. McIntyre, secretary and treasurer. Capitalization $2,000,000, shares $1 par. Lands, 16,380 acres, in 4 groups, in Wyoming, carrying iron and copper ores, coal, and indications of oil. Idle several years.

COMPAÑIA MINERA YABRICOYA. **CHILE.**

Office: Iquique, Chile. Mine office: Tarapacá, Tarapacá, Chile. Property is the Aguada mine, carrying argentiferous copper ores, with values mainly in silver. Presumably idle.

YADKIN MINING & IMPROVEMENT CO. **NORTH CAROLINA.**

Office: 508 Herman Bldg., Milwaukee, Wis. Lands, in Yadkin county, North Carolina, include the Tom Dixon mine, carrying gold and copper ores. Idle.

YADKIN & VIRGILINA COPPER & LAND CO. **NORTH CAROLINA.**

Office: care of Egbert B. C. Hambly, Salisbury, N. C. Organized 1903, under laws of North Carolina, with capitalization $750,000, to develop copper properties. Apparently idle since birth, and moribund.

YAEGER CAÑON COPPER CO. **ARIZONA.**

Office: Union Trust Bldg., Detroit, Mich. Mine office: Jerome, Yavapai Co., Ariz. Robert E. Plumb, president; Richard E. Sloan, vice-president and general manager; Geo. B. Russell, secretary; Geo. H. Russell, treasurer; C. E. Brinker, superintendent. Organized Apr. 11, 1903, under laws of Arizona, with capitalization $800,000, shares $1 par.

Lands, 21 claims, area 460 acres, 4 miles southwest of Jerome, in the Black Hills district. Has 3 fissure veins in diorite, one, averaging 14′ width, having shafts of 350′ and 1,200′, with about one-half mile of workings, estimated to show 40,000 tons of ore, and claimed to have 25,000 tons blocked out for stoping, ore being bornite and chalcopyrite, estimated to average 6% copper, 8 oz. silver and $2 gold per ton. Has a 240-h. p. steam plant, with a 140-h. p. hoist and a 10-drill Sullivan air-compressor. A 60-ton concentrator, 30x104′, of wood and iron, has a No. 2 Austin centrifugal crusher, 2 trains of rolls and 5 Wilfley and Bartlett tables. Has been a small producer for several years. Production, 1907, was 145,849 lbs. fine copper. Property considered promising and management good.

YAKUKI MINE CO. **JAPAN.**

Mine office: Fukushima, Japan. Production, 1907, was 390,810 lbs. fine copper, 167,454 momme silver and 8,015 momme gold.

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YALE GOLD-COPPER MINING CO. **BRITISH COLUMBIA.**

Dead. Formerly at Rossland, Trail district, B. C.

YALE MINING CO. **BRITISH COLUMBIA.**

Mine office: Hedley, Boundary district, B. C. F. A. Ross, manager. Lands, 25 claims, area circa 1,250 acres, of which 2 claims, the Nickel Plate and Sunnyside, are worked. The Nickel Plate, primarily a gold and silver mine, carrying a little copper, has water and electric power, and is closely connected with the Daly Reduction Co., which operates the Nickel Plate mill of 40 stamps. Production, normally, is about 3,000 tons of ore monthly, and for 1907 was 31,756 tons, notwithstanding the loss of 3 months time.

YAMAGATATOKITO MINE. **JAPAN.**

Mine office: Nanataki-mura, Kazuno-gori, Rikuchu, Japan. Production, 1906, was 641,120 lbs. fine copper.

YAMATE MINE. **JAPAN.**

Mine office: Takigawa-mura, Kume-gori, Mimasaka, Japan. Is a very ancient mine. Ore is slightly argentiferous chalcopyrite, associated with pyrite, galena and sphalerite, with arenaceous clay gangue, occurring in quartz-diorite. Best grade of ore yields 10 to 13% copper. Latest recorded production, 1899, was 3,044 momme silver and 99,679 lbs. fine copper. Presumably idle.

YAMPA MINE. **UTAH.**

Owned by Tintic Mining & Development Co.

YAMPA SMELTING CO. **UTAH.**

Office: 214 Dooly Bldg., Salt Lake City, Utah. Works office: Bingham Canyon, Salt Lake Co., Utah. Henry Stearne, president; Chas. W. Saxman, general manager; J. C. Dick, general superintendent; G. W. Metcalf, smelter superintendent. Organized 1903, with capitalization $100,000. Is controlled, through stock ownership, by Tintic Mining & Development Co.

Property is a smelter, at Yampa, near Bingham Canyon, built 1904, and enlarged, 1906, to 1,000 tons daily capacity. The works connect with the lower end of the aërial tram of the Yampa mine. Structures include ore-bins, calcining building, furnace building, converter department and a power plant, all buildings having steel frames.

The calcining department has eight 125-ton McDougall calciners, each with 6 superimposed hearths having sets of rabbling arms and rakes, with a dust-chamber 18x30x60', connecting with a 120' brick stack. Calcining reduces ore from 30% down to 5% in sulphur tenor.

The furnace building has 3 blast-furnaces, and a main stack with extreme elevation of 287' above the tuyeres. There are also 3 reverberatory furnaces, each having separate brick stacks The converter department, installed 1907, has 2 stands, with 16 shells, converting matte of 50% average tenor to blister copper, shipped for refining to Chrome, N. J.

Production was 4,699,765 lbs. fine copper 1906, and 5,001,255 lbs. in 1907, and late 1908 works were treating circa 900 tons of ore daily, of which about 300 tons was custom ore. The smelter is threatened with damage suits, on account of fumes, though the injury seems mainly imaginary. The works are modern in design and equipment, and management is good.

YANKEE CONSOLIDATED MINING CO. **UTAH.**

Office: 609 McCornick Bldg., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John E. DuBois, president; Hon. J. E. Frick, vice-president; B. H. Lehman, treasurer; preceding officers, H. C. Edwards and Chas. J. North, directors; C. J. Canfield, secretary; Louis Merriman, superintendent. Organized July 8, 1898, under laws of Utah, with capitalization $500,000, increased, circa February, 1908, to $1,000,000, shares $1 par. Annual meeting, fourth

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Monday in June. Paid dividends of $100,000 to end of 1905, and apparently continued dividends regularly during 1906 and 1907.

Lands, on Godiva Hill, include the Yankee mine and the Mountainview and Lakeview mines, two latter taken over, 1908, from the Mountainview Mining Co. Mines, opened by shaft to depth of 800′, carry mainly silver-lead ores, with small values in gold and copper. Production, 1907, was 224 carloads, or circa 8,000 tons of ore.

YANKEE CONSOLIDATED MINING, MILLING & TUNNELING CO. **COLORADO.**

Mine office: Yankee, Clear Creek Co., Colo. Henry I. Seeman, manager. Has auriferous and argentiferous lead and copper ores, with a 5-stamp mill. Presumably idle.

YANKEE DOODLE MINING CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. J. P. Richardson, manager. Has shafts of circa 100′ and 200′, also a tunnel showing cuprite and azurite, associated with hematite.

YAQUI CAÑON COPPER CO. **MEXICO.**

Office: 408 Gumbel Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. A. J. Davies, president and general manager; S. M. Major, vice-president; Frank B. Foster, secretary and treasurer; W. T. Kerr, secretary; T. W. Foster, superintendent; preceding officers, J. B. Ross and Wm. Herbert Collins, directors. Organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. Lands, 60 pertenencias, area 148 acres, known as the Todos Santos mine, and a 50-acre smelter-site. Has 6 contact deposits between limestone and porphyry, of which 2, slightly developed, are of 10′ average width, showing ores said to give average assays of 7% copper and 50 oz. silver from the copper veins, and 15% lead and 30 oz. silver, with a trace of gold, from the lead veins. Property is an antigua, supposed to be circa 300 years of age, showing considerable low grade ore on the dumps, from ancient operations. Planned reopening by a tunnel to crosscut all known veins, and also planned building a 10-ton reverberatory furnace. Presumably idle.

YAQUI COPPER CO. **MEXICO.**

Office: 170 Broadway, New York, N. Y. Letter returned unclaimed from former operating office, Hermosillo, Sonora, Mex. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. Wm. Sauntry, president; John M. Thurston, vice-president and general counsel; Hon. Geo. E. Green, secretary and treasurer; Chas. Kiser, general manager; Ed. Chamberlain, superintendent. Organized 1902, under laws of West Virginia, with capitalization $5,000,000, shares $1 par.

Lands originally were, or were claimed to be, 6,032 acres of mineral territory, and 119,284 acres timber and grazing lands, also water rights to 25 miles of the Yaqui river, mining lands being in the vicinity of Suaqui de Batuc, Campo Santo Niño, in the Sierra Madre Mountains, circa 120 miles from Hermosillo. Property is claimed to show antigua workings, iron ore and indications of coal. In June, 1906, the Montaña de Cobre company was said to have acquired 1,000 pertenencias formerly held by the Yaqui Copper Co., hence present holdings are uncertain.

Company claims to have contact deposits, between granite and limestone, 80′ to 200′ wide and several miles in length, with one exposure of a quarter-mile depth on the face of a mountain, with main ore body crossed by a smaller vein, at nearly right angles, all of these claims being preposterous. Company claims upper portions of veins show oxidized ores, succeeded by massive chalcocite, bornite and chalcopyrite, and claimed that average assays of a large number of samples give 14.92% copper, 6.6 oz. silver and 2.09 oz. gold per ton,

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which assays are without verification, and probably will continue to lack competent indorsement till the end of time.

Development, begun 1901, is by 2 shafts and 8 tunnels, and, so far as can be learned, the mine has shown practically no ore.

Improvements include an engine and boiler house, office building and store. Company planned the installation of a hydro-electric plant and a concentrator, but failed to secure same.

The Yaqui Copper Co. was organized for the purpose of selling stock, and was a deliberate swindle, and the lying done by its original officers was of a monumental nature. The company claimed possession of the largest copper vein ever located, but was unable to produce the same for the inspection of visitors competent to judge. Mr. Sauntry, the president, who was not connected with the original management, is an experienced lumberman, and an excellent judge of pine timber. The secretary and treasurer is a manufacturer of time-recording machines, and the former superintendent, who was killed by the Yaqui Indians, is said to have managed a photograph gallery with signal success. Apparently an unsuccessful effort was made by the Greene Gold-Silver Co. to secure control of this property. The company is exceptionally hard up, with a considerable floating debt, and is constantly pleading to shareholders for funds, and, March 31, 1908, issued a mimeographed letter to shareholders, offering the company's note for one year, in order to raise $1,600, to pay back salary due the widow of the late superintendent. So far as can be learned the property is practically valueless, and the company practically bankrupt.

YAQUI RIVER CONSOLIDATED GOLD & COPPER CO. **MEXICO.**

Office: Nogales, Ariz. Mine office: Quiriego, Alamos, Sonora, Mex. W. H. Smith, secretary; Walter W. Strickland, manager.

YAQUI RIVER EXPLORATION CO. **MEXICO.**

Dead. Formerly at San Antonio de la Huerta, Ures, Sonora, Mex.

YAQUI RIVER GOLD & COPPER CO. **MEXICO.**

Office: Los Angeles, Cal. Mine office: Nogales, Magdalena, Sonora, Mex. Roy Stearns, president and general manager. Property is the Mina Verde, near Nogales.

YAQUI SMELTING & REFINING CO. **MEXICO.**

Works office: San Antonio de la Huerta, Ures, Sonora, Mex. A. E. Klauser, president; H. R. Klauser, vice-president; H. C. Gerver, secretary and treasurer; Henry Lockhart, Jr., general manager; preceding officers and A. V. Baumann, directors; Samuel James, smelter superintendent.

Lands consist of mining claims in the vicinity of San Antonio de la Huerta, 80 miles east of Torres and 60 miles below Campo Santo Niño, circa 20 miles from the nearest railroad, and a concession has been granted the company for a 40-kilometer aërial tram, to bring ore of various mines to its works.

The reduction plant, of circa 150 tons nominal daily capacity, includes a 2-story sampling mill, one reverberatory furnace and one Allis-Chalmers blast-furnace, latter specially designed to reconcentrate, smelt and refine auriferous ores of both lead and copper. Local coke proving unsatisfactory, imported coke is employed for the blast-furnace, and wood is burned in the reverberatory furnace. The works have electric light.

Buildings include a machine-shop, smithy, laboratory, general store, hotel and an ice-plant. This is the only custom smelter in a rich mineral district, but adequate transportation facilities are lacking, and there has been great difficulty in operating the plant, owing to depredations of the Yaqui Indians.

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YARWELL MOUNTAIN COPPER CO. **COLORADO.**

Mine office: Steamboat Springs, Routt Co., Colo. Organized 1907. Lands, said to have been bought for $60,000, are on Yarwell Mountain.

SOCIEDAD YAURICOCHA, LIMITADA. **PERÚ.**

Office and mine: Huarapampa, Yauyos, Lima, Perú. Mine carries argentiferous copper ore. Was a small producer, at last accounts.

YAVAPAI CONSOLIDATED GOLD-SILVER-COPPER CO. **ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. W. C. Bashford, superintendent. Lands, 30 claims, 13 patented, including the Old Reliable mine, 3 miles from Crown King, opened 1875, which produced rich gold ores; the Wild Flower group, in the Pine Grove district, and the Tiger group, in the Bradshaw Mountains. Properties have several thousand feet of old workings, showing a contact vein between porphyry and syenite, carrying slightly auriferous and highly argentiferous copper ores. Has steam power and a 20-stamp mill, and was said, at last accounts, to employ circa 100 men.

YAVAPAI COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office, 317 Main St., Springfield, Mass. Mine office: Prescott, Yavapai Co., Ariz. Geo. Nightingale, president; Frederick Carpenter, secretary. Organized circa 1900, with capitalization $1,000,000, shares $10 par. Lands, 25 claims, area 500 acres, about midway between Prescott and Jerome. Idle some years, deeply involved in debt, and moribund.

YAVAPAI DEVELOPMENT CO. **ARIZONA.**

Dead. Formerly at Mayer, Yavapai Co., Ariz.

NEGOCIACION MINERA DE CLEMENTE YBARRA. **MEXICO.**

Mine office: Promontorios, Alamos, Sonora, Mex. Clemente Ybarra, owner; Jesús Maria Quijada, manager. Lands include the Almada, Terito, Alvarado and Gloria mines, carrying auriferous and argentiferous copper ores, developed by shafts and tunnels.

There are 2 small smelters, known as La Valenciana, which, 1903, produced 9,200 kgs. blister copper, and Almada y Terito, which, 1903, produced 8,000 kgs. blister copper. Property is primarily a silver mine, copper being secured as a by-product. About 50 men are employed.

YBARRA GOLD MINING CO. **MEXICO.**

Office: 132 Market St., San Francisco, Cal. Mine office: Calmallí, Sur, Baja California, Mex. A. J. Mayer, superintendent. Lands include the Buenaventura, San Francisco and other mines, carrying auriferous and argentiferous copper ores. Has steam power and a 25-ton mill, employing circa 75 men at last accounts.

YELLOW BUTTE COPPER MINING CO. **CALIFORNIA.**

Office: care of W. P. Veuve, president, San Jose, Cal. Mine office: Edgewood, Siskiyou Co., Cal. J. B. Ball, secretary; L. D. Ball, superintendent. Organized 1907. Mine, 12 miles from Edgewood, on the eastern slope of Haystack Mountain, began ore shipments, early 1908, to Kennett smelter.

YELTA NEW COPPER MINING CO., N. L. **SOUTH AUSTRALIA.**

Mine office: Wallaroo, Daly Co., South Australia. Presumably idle.

YENISEI COPPER CO., LTD. **SIBERIA.**

Office: 269 Broad Street Place, London, E. C., Eng. Mine office: Rudnik Julia, Abakansk, Yenisei, Siberia. R. Van Gember, chairman; A. G. Terskoff, Russian agent; Norman J. Wallworth, secretary; Nicholas Henri de Goerke, general manager; Walter J. Stanford, mine superintendent. Organized Apr. 21, 1902, under laws of Great Britain, with capitalization £300,000, shares £1 par; issued, £214,400. Debentures, £5,543 issued. Has an £18,000 note outstanding.

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Lands are 11 copper concessions, area circa 11,000 acres, including the Julia mine, also 10 coal concessions, and timber rights covering about 470,000 acres.

Work has been done on 2 copper claims, principal development being on the Julia, which has sundry old workings, with new shafts of 160′, 100′, 130′, 50′ and 250′, property having been estimated, June, 1906, to have ore reserves of 70,000 long tons, of 5.5% average copper tenor, which was an over-estimate, both as to reserves and tenor. Ore is now reported by company to average 3.4% copper, with about 4% sulphur, 30% silica, 10% magnesia, 17% iron oxide and 34% calcium oxide. Ore is highly silicious and difficult of reduction, and, under test of actual smelting, returned only 3.08% copper.

The 100-ton smelter, one-fourth mile from the mine, blown in 1907, has a 36x120″ Fraser & Chalmers water-jacket blast-furnace, rated at 100 tons, but which, in actual practice, treats only 60 to 75 tons daily, burning charcoal, which is scarce, and making matte averaging 40% copper tenor, which is broken in rolls and roasted with 3% fuel charges, in shaft-ovens, and brought up to metal of 88% copper tenor, which is shipped to Swansea for refining, product being copper of 99.75% copper tenor. Production was 563,319 lbs. fine copper in 1907, and circa 1,820,000 lbs. in 1908. The company has experienced serious labor troubles, and apparently suffers also from lack of adequate cash.

YERINGTON ASSOCIATED COPPER CO. **NEVADA.**

Dead. Was organized 1907, under laws of Arizona, with capitalization $1,500,000. Formerly at Yerington, Lyon Co., Nev.

YERINGTON-B. C. MINING CO. **NEVADA.**

Letter returned unclaimed from former mine office, Wabuska, Lyon Co., Nev. H. Hamlin, superintendent. Organized circa April, 1908. Lands, 8 claims, south of the Wabuska-Yerington, supposedly carrying southern extensions of ore veins of latter. Lands are said to show a 3′ gold vein, and a prominent gossan carrying up to 20% copper, presumably from selected specimens. Company planned development by shaft. Idle.

YERINGTON CENTRAL COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. J. J. Beatty, manager. Mine has a 250′ three-compartment shaft, showing a 3′ to 5′ vein of chalcopyrite, claimed to assay about 10% copper, with a 4″ hanging-wall paystreak of melaconite assaying up to 59.1% copper.

YERINGTON CONSOLIDATED COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. Frank J. Hagenbarth, president; Windsor V. Rice, vice-president; Walter C. Orem, treasurer and general manager; J. H. Turner, secretary; preceding officers, Col. Enos A. Wall, John Dern and Wm. Keiting, directors; S. S. Arentz, superintendent. Organized circa February, 1907, with capitalization $5,000,000, shares $5 par. Lands, circa 225 acres, in 2 groups, known as the Copper King and Copper Deposit, said to lie between the Bluestone and Mason Valley mines, and to show auriferous copper sulphide ore of good tenor.

YERINGTON COPPER CO. **NEVADA.**

Office: Hooper Bldg., Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. Chas. N. Strevell, president; J. H. Pennington, vice-president; C. D. Rooklidge, secretary; H. P. Clark, treasurer; D. E. McPherson, resident director; A. A. Marsal, superintendent. Organized circa July, 1906, under laws of Utah, with capitalization $1,000,000, shares $1 par.

Lands, 14 claims, circa 3 miles east of Yerington, showing a prominent gossan, traceable one-half mile, covering a contact deposit between porphyry and limestone, carrying carbonate ore assaying 15 to 20% in copper tenor, from surface to a depth of 125′, when sulphide ore appears. Has a 25′ shaft

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in ore, and a 400′ tunnel, said to show, on the 325′ level, sulphide ore of 6 to 10% copper tenor. Has gasoline power, and a gasoline pump working against a 300′ head.

YERINGTON COPPER KING CO. **NEVADA.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Lands, known as the Craig group, north of the Bluestone, are said to have shipped a little high grade ore, under former ownership. Idle.

YERINGTON IRONSIDES COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. A. Hanauer, Jr., president; Wm. H. Tibbals, vice-president; J. P. Spaulding, treasurer; J. H. Turner, secretary; preceding officers, Ralph Bettinger and Chas. T. Rooklidge, directors; T. L. Walden, superintendent. Capitalization $1,000,000, shares $1 par. Lands, circa 140 acres, north of the Nevada-Douglas and northwest of Yerington, having numerous pits and cuts, with one shaft and a tunnel on the Ironsides claim, showing a vein said to carry ore averaging 5 to 8% copper. Idle.

YERINGTON KNOB HILL SYNDICATE. **NEVADA.**

Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Apparently only assessment work was done. Idle and apparently moribund.

YERINGTON MALACHITE MINING CO. **NEVADA.**

Office: 214 Atlas Blk., Salt Lake City, Utah. Mine office: Yerington, Lyon Co., Nev. Willard F. Snyder, president; Henry J. Meyer, vice-president; C. O. Ellingwood, treasurer; Grant Snyder, general manager; O. H. Sonne, mine superintendent. Organized under laws of Nevada, with capitalization $5,000,000, shares $5 par.

Lands, adjoining the Mason Valley mine, show a mineralized zone of 50′ to 200′ width, between limestone and diorite, carrying some oxidized ores, but mainly chalcopyrite, estimated to average 6% in copper tenor. Development is by 3 tunnels and a 3-compartment shaft.

Equipment includes an electric hoist, good for 600′ depth, an Imperial air-compressor and 7 air-drills. Company plans continuous development and deepening shaft to 600′.

YERINGTON MOHAWK COPPER ASSOCIATION. **NEVADA.**

Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Organized circa April, 1907, under laws of Arizona, with capitalization $1,000,000. Idle.

YERINGTON NIPPER COPPER CO. **NEVADA.**

Office: 418 Atlas Blk., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Stephen H. Love, president; Hon. Wm. B. Jeffs, vice-president and superintendent; David Kennedy, secretary and treasurer; preceding officers, John C. Lynch, Lewis A. Jeffs, F. A. Flindt, Walter L. Maas and Jay T. Harris, directors. Organized circa April, 1907. Lands are in Mason Pass, between the Ludwig and Yerington-Ironsides. Idle.

YERINGTON QUEEN COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Lands, 6 claims, area circa 120 acres, said to show ore assaying 7 to 40% copper. Idle and apparently moribund.

YERINGTON RED METAL MINING CO. **NEVADA.**

Office: 1 Masonic Temple, Reno, Nev. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. O. A. Dockman, president; J. H. Baker, vice-president; J. F. Haley, secretary; E. F. Adams, treasurer and man-

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ager. Organized circa December, 1906, under laws of Arizona, with capitalization $1,500,000. Lands, 10 claims, circa 6 miles east of Yerington, said to show a mineralized zone of about 300′ width, traceable about 2,000′, carrying ore of 5 to 33% copper tenor.

YERINGTON UNITED COPPER CO. **NEVADA.**

Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. Organized 1907, under laws of Arizona, with capitalization $1,000,000. Idle and apparently moribund.

YERINGTON-UTAH MINING CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Lands, 15 claims, a millsite and a water right, circa 7 miles west of the Nevada-Douglas, said to show carbonate and sulphide ore assaying 2 to 35% copper and up to $126 gold per ton.

YORK HARBOUR COPPER CO., LTD. **NEWFOUNDLAND.**

Dead. Wound up, February, 1902. Formerly at York Harbour, Nfld.

YORK HARBOUR MINE. **NEWFOUNDLAND.**

Mine office: York Harbour, Birchy Cove, Bay of Islands, Newfoundland. Lands, 4 claims, area 6,400 acres, also 26,880 acres of timber lands, giving total holdings of 33,280 acres, on the west coast of Newfoundland. Country rocks are diorite, with 12 known fissure veins in serpentine, of which 5, including one of 50′ width, have been more or less developed, these showing cupriferous iron pyrites, claimed to carry 3 to 18% copper, occasional zinc, up to 50% sulphur, 0.5 to 4 oz. silver and 40 cents to $1.40 gold per ton. Development is by shafts of 54′, 64′, 70′ and 400′, with circa 2,000′ of underground workings. Mine was discovered circa 1870, but active development was not begun until 1900. Equipment includes a 250-h. p. steam plant, with 5 hoists, an 8-drill Norwalk air-compressor, engine-house, boiler-house, sawmill and 15 dwellings. Mine has a crusher, of 300 tons daily capacity, and a substantial wharf, on a good harbor, connected with the mine by a 5,000′ ground-tram, and is 14 miles distant from the Newfoundland railway. Was last held by Humber Consolidated Mining & Manufacturing Co. Idle.

YOSEMITE COPPER MINING & REDUCTION CO. **CALIFORNIA.**

Dead. Formerly at Daulton, Madera Co., Cal. Described Vol. VII.

YOSHIOKA MINE. **JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

YOUNG AUSTRALIAN MINE. **AUSTRALIA.**

Mine office: Wrightville, Robinson Co., N. S. W., Australia. Property, in the Cobar district, was under development in 1908, and was a small producer.

YREKA COPPER CO. **BRITISH COLUMBIA.**

Dead. Formerly at Yreka, Vancouver Island, B. C. Very fully described Vol. VII.

YTTERÖEN MINE. **NORWAY.**

Mine office: Ytterö, Trondhjem, Norway. Property, which is not far from the Meraker field, is a very small producer of cupriferous pyrite. Latest recorded production, 1903, was 1,300 tons of ore.

YUKON PUEBLO MINES CO. **YUKON.**

Office: Spokane, Wash. Mine office: White Horse, Yukon, Canada. Byron N. White, president and general manager. Organized under laws of Washington, with capitalization $500,000. Lands, 9 claims, area 450 acres, circa 4 miles west of White Horse, including the Pueblo, Carlisle and adjoining properties. The Carlisle mine has a 140′ shaft, and 100 tons of ore shipped therefrom gave smelter returns of 22.64% copper and 8 oz. silver per ton. The Pueblo mine is said to show a body of ore about 250′ square, opened to depth of 100′, ore being mainly hematite carrying oxidized copper ores, principally malachite, averaging about 4% copper, with small gold values. The deposits

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carry occasional streaks of rich ore, including native copper, cuprite, azurite, chalcocite, bornite and chalcopyrite. All ores carry a little silver, and occasional gold. Management planned stripping the overburden and working the mine open-cast, which would seem a proper system. Property has been handicapped by lack of railway transportation, now available, but shipped, 1907, to Crofton smelter, 700 tons of roughly selected ore, returning 5.65% copper and 2 oz. silver per ton. Production 1907, estimated at 100,000 lbs. fine copper. Is a property of considerable promise, with a good management.

YUSENJI MINE. **JAPAN.**

Mine office: Satokawa-mura, Nomi-gori, Kaga, Japan. Production was 921,491 lbs. fine copper in 1906 and 940,926 lbs. in 1907.

YUSPENSSKI MINE. **SIBERIA.**

Owned by Spassky Copper Mine, Ltd.

ZACATECAS & DURANGO MINING & SMELTING CO. **MEXICO.**

Dead. Formerly at Chalchihuites, Sombrerete, Zacatecas, Mex. Described Vol. VII.

COMPANHIA DA ZAMBEZIA. **PORTUGUESE EAST AFRICA.**

Offices: 53 Rua do Alecrim, 1°, Lisbon, Portugal, and 10 Rue Lafayette, Paris, France. D. De Brito Capello, chairman. Organized May 20, 1892, under Portuguese royal decree, with capitalization 2,700 contos do reis, shares 4,500 reis (£1) par; issued, 2,025 contos do reis. Property is a concession of 60,000 square miles, on either side of the Zambesi and Shire rivers, extending east of latter to the coast, and embracing the ports of Quelimane and Chinde, Portuguese East Africa. Concession includes copper-bearing fields of prospective value, and company plans organizing a subsidiary corporation to take over copper prospects at Macomba, Marabé, Boroma and elsewhere in its territories.

ZAMBONA DEVELOPMENT CO. **MEXICO.**

Office: 404 Trust Bldg., Los Angeles, Cal. Mine office: Minas Nuevas, Alamos, Sonora, Mex. W. S. Cranz, president; W. L. Patterson, treasurer; Wm. Shuckman, vice-president; S. L. Bosford, secretary; Amos J. Yaeger, general manager; preceding officers and R. R. Coleman, directors. Property is the Purisima mine, carrying native silver, silver sulphides and argentiferous chalcocite, ore values being mainly in silver. Has steam and electric power, and a 20-stamp mill having 4 Huntington mills and a 100-ton cyanide plant, latter planned to be doubled in capacity. Employs circa 450 men.

SOCIEDAD FUNDICIÓN DE ZAPALLO DE QUILE. **CHILE.**

Office: Ovalle, Coquimbo, Chile. Works office: El Zapallo de Quile, Ovalle, Coquimbo, Chile. Organized July 12, 1904, under laws of Chile, with capitalization 53,000 pesos, shares 100 pesos par.

FAHLERZ- UND KUPFERKIESBERGBAU ZAPFENSCHUH. **AUSTRIA.**

Mine office: Altzech Zapfenschuh, Tyrol, Austria. Is an old but small mine, having sulphide copper ores.

ZAPOPÁN GOLD MINING CO. **MEXICO.**

Mine office: La Yesca, Ahuacatlán, Tepic, Mex. G. H. Buttolph, manager. Property includes the Zapopán and San Miguel mines, carrying auriferous zinc, lead and copper sulphides, values being mainly in gold. Has steam power, with a Bryan mill and 30-ton cyanide plant, employing circa 100 men, at last accounts.

COMPAÑIA MINERA ZAPOTECA. **MEXICO.**

Office: Laclede Bldg., St. Louis, Mo. Mine office: Ocotlán, Oaxaca, Mex. Geo. T. Riddle, president; P. R. Flitcraft, secretary; Guillermo W. Thompson, general superintendent; F. J. Tayman, assistant superintendent. Organized January, 1903, under laws of West Virginia, with capitalization $1,000,000, shares $1 par.

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Lands, 33 pertenencias, area 81 acres, also 420 acres miscellaneous lands, in the Taviche district, including the Zapote mine, carrying auriferous copper and argentiferous lead ores, developed by a 400′ main shaft and 300′ tunnel. Has steam power and a 30-h. p. Webster, Camp & Lane double-drum hoist, good for 1,000′ depth. Nearest railroad is the Ferrocaril Oaxaca y Ejutla, 8 miles distant. Employed circa 100 men, at last accounts.

ZARAGOZA COPPER & ZINC MINES, LTD. SPAIN.

Dead. Formerly in Huelva, Spain. Described Vol. VI.

COMPAÑIA MINERA ZAUCUDO. COLOMBIA.

Mine office: Medellin, Antioquia, Colombia. Juan de la Posado, superintendent. Operates the Zaucudo and Savalotas mines, producing gold, silver and copper, latter in small quantities, as a by-product. Has steam power and a small smelter.

GEWERKSCHAFT DER ZECHE THALBURG. GERMANY.

Dead. Formerly at Heiligenhaus, Rheinprovinz, Germany. Described Vol. VI.

ZELAYA HERMANOS. CHILE.

Office and works: Paípote, Copiapó, Atacama, Chile. Works have a cylindrical water-jacket blast-furnace.

ZELLER EHZBERGWERKE G. m. b. H. GERMANY.

Mine office: Altlay bei Zell a/M., Rheinprovinz, Germany. R. Reiser, president. Produces argentiferous lead and copper ores, latter in small quantities only, employing circa 100 men.

ZENITH GOLD & COPPER MINING CO. WYOMING.

Dead. Formerly at Encampment, Carbon Co., Wyo.

ZENOLI SILVER-COPPER CO. NEVADA.

Office: Salt Lake City, Utah. Mine office: Palisade, Eureka Co., Nev. E. O. Howard, president; P. C. Delmas, vice-president; W. M. Wantland, secretary and treasurer; preceding officers, Jos. Lippman and J. A. McAllister, directors; P. D. Delmas, superintendent. Organized December, 1906, with capitalization $150,000, shares $1 par. Lands, 5 claims, opened by tunnel, showing a vein of 2′ to 6′ width carrying silver-lead ore at surface, changing to argentiferous copper ore at depth. Has secured ore assaying up to 204 oz. silver per ton, and shipped a little ore, 1907.

ZIMAPÁN MINING & SMELTING CO. MEXICO.

Dead. Formerly at Encampment, Carbon Co., Wyo. Described Vol. VI.

ZOMEKI MINE. JAPAN.

Mine office: Ikuno-mura, Abu-gori, Nagato, Japan. Ores are slightly argentiferous chalcopyrite and bornite, associated with sphalerite, galena and pyrrhotite, occurring in lenses and fissure veins, near liparite dikes penetrating clay-slate, sandstone and limestone. Presumably idle.

COMPAÑIA MINERA DE ZOMELAHUACÁN. MEXICO.

Mine office: Las Minas, Jalacingo, Vera Cruz, Mex. W. Vogel, manager. Property is La Ascuncion de Maria y anexas, carrying auriferous and argentiferous copper and lead ores. Has water power and a 15-stamp mill, employing circa 150 men.

ZONIA COPPER MINING CO. ARIZONA.

Dead. Formerly at Kirtland, Yavapai Co., Ariz.

ZUMA MINING & MILLING CO. UTAH.

Office and mine: Eureka, Juab Co., Utah. Michael L. Garity, president; Rasmus Nelson, vice-president; P. J. Fennell, secretary; J. E. Driscoll, treasurer. Organized 1907, with capitalization $500,000, shares 50 cents par.

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CHAPTER XXV.

ADDITIONAL COPPER MINES.

Owing to reasons fully set forth in the preface of the present volume, the mine descriptions appear in two chapters in the present edition. The preceding chapter is a reprint of the mine descriptions appearing in Volume VIII, while the present chapter gives upwards of 750 additional titles, arranged in full alphabetical order, on the same plan as the preceding chapter.

AAI MINING & MILLING CO. **IDAHO.**

Mine office: Lewiston, Nez Perçe Co., Idaho. A. B. Williams, manager. Lands, 8 claims, at Wild Goose Rapids, on Snake River, 35 miles above Lewiston, developed by a 400′ tunnel, planned to cut, at 1,100′ from portal, the main vein, showing auriferous and argentiferous copper ore, said to give average assays of $24 per ton. Property lack shipping facilities, but, early 1909, had several cars of smelting ore on the dump.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE DU AALEN. **NORWAY.**

Office: Theodore Verstraete, Gand, Belgium. Mine office: Engsvold, Aalen, Trondhjem, Norway. Nöerk Olsen, superintendent and engineer. Capitalization, 200,000 kroner. Production, 1907, was 287 metric tons of cupriferous pyrite.

ACE MINE. **AUSTRALIA.**

Mine office: Beaconsfield, Kennedy Co., N. S. W., Australia. A. H. Dight, owner. Property shows outcrops of iron gossan estimated to carry 1 to 2.5% copper, traceable for about 1,000′. Underlying the gossan is a vein of 3′ to 6′ width, developed by a 321′ main shaft, on the underlay, with levels opened at 170′, 220′ and 270′, the vein at the bottom of the mine being only 18″ wide, with a paystreak of 6″ to 8″, remainder of vein being pyrite, estimated to carry 1.5% copper. There are oxide and carbonate ores and gray copper ore on the 170′ level, with native copper and secondary sulphides on the 220′ level, and chalcocite and chalcopyrite in the paystreak on the 270′ level, good ores being estimated to carry an average of about 15 dwts. silver per ton, with a trace of gold. Management contemplates building a smelter when sufficient ore is developed.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE DE ACHAICHES. **ALGERIA.**

Office: 11 Rue Godot de Mauroi, IXe, Paris, France. V. Bargas, J. Delury, A. Warin and T. Warin, directors. Organized Oct. 27, 1906, under laws of France, with capitalization 1,000,000 francs, shares 100 francs par. Property supposedly is located in Algeria.

C. F. ACKERMANN. **PERÚ.**

Mine office: Islay, Perú. Property is the Victoria mine, situated on the railroad line near Mollendo, showing ore of 6 to 10% average copper tenor, with some gold values, in quartz gangue. Mine is well located for shipping.

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SOCIÉTÉ ANONYME DES MINES D'AÏN-KECHERA. **ALGERIA.**

Office: 11 Rue Godot-de-Mauroi, IXe, Paris, France. Mine office: Philippeville, Constantine, Algeria. L. Pelletan, F. Urrity, E. Maurice, M. Martin and L. Schwob, directors. Organized Feb. 14, 1905, under laws of France, with capitalization f600,000. Lands carry complex argentiferous sulphide ores of zinc, lead, copper and antimony.

AKUTOZAWA MINE. **JAPAN.**

Mine office: Yokokawame-mura, Waka-gori, Rikuchu, Japan. Property, in the district of Iwate, produced 91,869 lbs. fine copper in 1907.

ALAMOS MINES CORPORATION. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Property is the Promontorios mine, once a considerable producer of silver, said to have been worked, at intervals, for upwards of 200 years. Assays show ore carrying 7 to 24% copper, 4 to 8 oz. silver and $10 gold per ton. Company also owns the Plata Rey mine, area 10 hectares, 15 miles west of Alamos, showing a ledge said to be traceable 1,800', giving assays, from surface ores, of 4% copper and 130 oz. silver per metric ton, with variable gold values. Some small ore shipments have been made by present company to the Quintera smelter.

ALASKA DEVELOPMENT CO. **ALASKA.**

Office: Seattle, Alaska. Mine office: McCarthy Creek, Copper River district, Alaska. L. C. Dillman, general manager. Property is in the neighborhood of the Bonanza mine.

ALBANY COPPER CO. **NEVADA.**

Mine office: Buckskin, Douglas Co., Nev. J. E. Lutz, superintendent. Property has auriferous copper ores, under development, with gasoline power.

ALFRED MINES, LTD. **ENGLAND.**

Office: Perranporth, Cornwall, Eng. Mine office: Bolingey, Cornwall, Eng. F. Marshall, secretary; preceding officer, A. J. Swaab, and B. Reed, directors. Organized March 28, 1906, under laws of Great Britain, with capitalization £40,000, shares £1 par, fully issued and fully paid. Debentures, £5,000. Property is the New Wheal Leisure mine, carrying chalcopyrite and sphalerite.

ALICE DEVELOPMENT CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. W. F. Shaffer, manager. Mine is opened by a tunnel, said to show a vein, upwards of 75' in width, of ore averaging about $4 per ton in copper, gold, and silver. Property has a 12-stamp mill.

ALLEN MINING CO. **ARIZONA.**

Office: Chicago, Ills. Mine office: Old Glory, Santa Cruz Co., Ariz. Lands are near the Oregon & Arizona Mining Co. Presumably idle.

ALLONGOSSUK MINE. **GREENLAND.**

Office: care of Nyeboe & Nissen, Bellevue, Raadhuspladsen, Copenhagen, Denmark. Mine office: Julianehaab, Greenland: M. Ib. Nyeboe, managing director. Property, in the extreme southern part of Greenland, about 50 miles west of Cape Farewell, was under development, 1909.

ALMA PROSPECTING SYNDICATE. **TASMANIA.**

Mine office: Forth, Tasmania. Lands include the old Barrington or Alma mine, above Wilmot bridge, west of the Forth River, opened circa 1880, at which time about £1,000 was expended on development. Property shows a strong gossan, and has a 35' shaft, with main development by a tunnel parallel with the gossan, which covers a contact deposit carrying a little chalcopyrite in barite, between slate and breccia of Cambrian age.

ALMONTE COPPER CO. **NEW MEXICO.**

Mine office: Hanover, Grant Co., N. M. Company was organized, with capitalization $100,000, by Albert G. Dunlap, D. E. Notley, J. Calvin Hess and Wharton Barker. Dunlap, who has a prison record, was arrested, June 24, 1909,

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on a charge of obtaining money under false pretenses on account of this company. Is not regarded favorably.

ALPENA COPPER MINING CO. **MONTANA.**

Office: Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. C. W. Beale, president; Timothy Kelly, vice-president and manager; A. H. Featherstone, secretary and treasurer; preceding officers, Alex. Muir and A. P. Cochrane, directors. Lands, near the Monitor mine, and 2 miles from a tunnel on the Chicago, Milwaukee & Puget Sound railroad, are developed by 2 long tunnels and a shaft, showing chalcopyrite assaying up to 34% copper, with small silver and gold values. Equipment includes several buildings.

ALPHABET COPPER CO. **ARIZONA.**

Mine office: Courtland, Cochise Co., Ariz. Frank Armstrong, superintendent. Company was organized circa January, 1909. Cannot be learned that any work has been done.

ALTA CONSOLIDATED MINING CO. **UTAH.**

Dead. Lands were owned, 1908, by Flagstaff Copper Mining Co. Formerly at Alta, Salt Lake Co., Utah.

ALTA COPPER MINES. **MONTANA.**

Office: 60 Congress St., Boston, Mass. Mine office: Corbin, Jefferson Co., Mont. Apparently has some connection with the Alta-Montana Copper Co., and treasury stock was being offered, February, 1909, by Hewett, Wood & Co., of Boston.

ALTA-CORBIN COPPER CO. **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Organized circa January, 1909, with capitalization $1,000,000. Property is the Flambeau group, area 4 claims.

ALTA-MONTANA COPPER CO. **MONTANA & NEW MEXICO.**

Mine offices: Corbin, Jefferson Co., Mont., and Kelly, Socorro Co., N. M. Marcus L. Hewett, general manager. Organized circa 1909, with capitalization $3,000,000, shares $10 par, apparently as successor or reorganization of Kelly Smelting & Refining Co.

New Mexico lands are known as the Kelly group. Montana lands, 12 claims, including the Alta group of 8 claims, carrying about 1½ miles of the Alta or mother lode of the Corbin camp, also 664 acres of placer ground, near Corbin, including a townsite. The Alta mine is claimed to have produced upwards of $30,000,000 from old workings in the past, mainly in silver, no attention having been paid to copper values, and the first smelter in Montana was built to treat the ores from the Alta and Comet mines. The management plans reopening old workings on the 500′ level, and below, hoping to obtain good silver and copper values. In May, 1909, company was said to plan sinking a 3-compartment shaft to depth of 1,000′, and to plan adding an electric hoist and 600-ton concentrator later in the season, but apparently the concentrator failed to materialize. Is not regarded favorably.

ALTON MINING CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. R. C. Hamilton, president; C. E. Freeman, secretary; M. Freeman, superintendent. Lands, 6 claims, northeast of the Dunkirk and southeast of the Eagle, in the Whipple Mountains, 8 miles from the Colorado River. Nearest railroad point is Parker, 15 miles by wagon-road. Lands show schists, limestone, diorite and slate, with intrusive dykes, ore occurring in and near the dykes, which frequently are completely metamorphosed. Ore bodies usually have a northwest and southeast strike and carry oxidized copper ores having gold values and a little silver. Development is by prospecting shafts, pits and an opencut, principal workings being a 50′ shaft and a 800′ tunnel. Property is said to have yielded ore samples assaying up to $35 per ton.

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ALVIN DEVELOPMENT CO. **ARIZONA.**

Office: Houghton, Mich. Mine office: Salome, Yuma Co., Ariz. A. Tennyson Pryor, president; Ward Smith, vice-president; Heaton Wright, secretary; Wm. D. Calverley, treasurer; Albert Cronkheit, superintendent. Organized 1908, under laws of Arizona, with capitalization $200,000, shares $1 par. Of the capitalization 25,000 shares went for promotion, and in exchange for the option on lease. Lands, 18 claims, area 360 acres, known as the Ultimatum group, one-half mile east of the Cobralla mine, east of Tank Pass and 10 miles from Salome, in the Harcúvar Mountains.

Property shows limestone, alternating conformably with metamorphic schists dipping to the north at an angle of 45°, with numerous intrusive diabase dykes, standing practically vertically and showing good gossans. Property has a 100′ shaft, and some churn drilling was done, 1909, workings showing promising oxidized ores. Equipment includes a 60-h. p. gasoline hoist and several mine buildings. Property considered promising.

AMALGAMATED ARIZONA COPPER CO. **ARIZONA.**

Dead. Property was the Signal mine. Formerly at Swansea, Yuma Co., Ariz.

AMAZON-DIXIE MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Wesley Everett, president and general manager; H. E. Chaney, vice-president; Herman J. Rossi, secretary and treasurer. Lands, 7 claims, surveyed for patent, said to be of 280 acres area, in which case they would be placer claims, east of Mullan and near the railway. Property shows a 4′ vein in quartzite, carrying galena, chalcopyrite and lead carbonates, associated with pyrite, with values apparently mainly in galena. Development is by a 35′ shaft, and February, 1909, company planned an 1,100′ tunnel, starting 2,000′ east of Copper Creek, to give a back of 700′. Management also planned damming Copper Creek and the St. Regis River, and connecting with a new power-house by 9,000′ of 12″ pipe. Management also planned installing a 10-drill air-compressor, in addition to a 2-drill compressor already on the ground. Equipment includes a 20,000′ sawmill.

AMERICAN BANNER COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Property, near the Rose Consolidated and not far from Miami, area supposedly 160 acres, known as the Black Copper group, is developed by 10 shafts and tunnels, and was claimed, circa 1905, by former owner, the Arizona Banner Copper Co., to have 20,000 tons of 15% ore in sight, which estimate is considered too high. Property was idle since 1901, until taken over by present company, and apparently no work has been done by present corporation.

AMERICAN COPPER CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Lands adjoin the Last Chance Mining Co., in Big Cottonwood cañon. Presumably idle.

AMERICAN MINING & SMELTING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Twisp, Okanogan Co., Wash. Lewis Husk, president; C. O. Cobbs, vice-president; J. M. Moore, secretary; F. W. Isham, engineer. Organized circa February, 1909, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, near Twisp, are said to show ore assaying 20 to 30% copper, in a vein hoped to be 70′ wide. Company is said also to have bonded claims in the Princeton district of Montana. As the management has the husk and cobs, it is to be hoped the shareholders may get the corn.

AMY SILVERSMITH MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Property is in the silver-zinc zone, to the north of the proven copper zone of Butte. In January, 1909, several lessees were working, on the 300′ level.

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ANACONDA-CORRAL CONSOLIDATED MINES CO. **ARIZONA.**

Mine office: Bouse, Yuma Co., Ariz. A. J. Kellis, superintendent. Lands, circa 20 claims, in the Big Horn Mountains, near Bouse, showing high grade copper ore and free gold.

ANGLO-SIBERIAN CO., LTD. **RUSSIA.**

Office: 5 Fenchurch St., London, E. C., Eng. T. Blair Reynolds, chairman; L. Urquhart, managing director; preceding officers, C. F. H. Leslie, A. J. Hugh Smith and S. G. Sheppard, directors; John Owler, secretary. Organized Dec. 6, 1906, under laws of Great Britain, with capitalization £100,000, shares £1 par. Company floated the Perm Corporation, Ltd., to take over the Kyshtim property, and the latter, 1908, promoted the Kyshtim Corporation, Ltd. Property of the Anglo-Siberian Co., Ltd. is a 50% share interest in the Kyshtim Corporation, Ltd.

ANNIVERSARY COPPER MINES, LTD. **AUSTRALIA.**

Office: Townsville, Queensland, Australia. Mine office: Herberton, Cardwell Co., Queensland, Australia. Organized August, 1909, under laws of Queensland, with capitalization £40,000, shares £1 par; issued, 15,000 fully paid shares and 25,000 shares 12s. paid. Company was organized to take over the New Anniversary Copper Prospecting Syndicate, Ltd., and property is described under latter title.

ANTELOPE MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. John D. Dixon, president; Arnold Dixon, secretary. Organized circa April, 1909, under laws of Utah, with capitalization $50,000, shares 5 cents par. Lands, 3 claims. Cannot be learned that any work has been done.

ANTERO MINING CO. **COLORADO.**

Office: Spirit Lake, Iowa. Mine office: Salida, Chaffee Co., Colo. C. W. Budd, president; A. B. Rose, vice-president and superintendent; John Burmeister, secretary and treasurer; preceding officers, B. E. Nefzger and W. L. McKelvey, directors. Organized under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands, known as the Tip Top group, are on the northeast slope of Mount Antero, in the Chalk Creek district, 4 miles from the Gunnison branch of the Colorado Southern railroad, and 25 miles northwest of Salida. Property has a vein of 4′ to 12′ width, with a claimed average of 6′, carrying mixed sulphides and oxidized ores, with assay values, in copper, gold and silver, up to $120 per ton. Property also has a vein 60′ from and apparently parallel with the main vein, carrying auriferous and argentiferous copper, lead and zinc sulphides, and also has various smaller veins.

AOSTA CENTRAL MINING CO., LTD. **ITALY.**

Office: Finsbury Pavement House, London, E. C., Eng. Mine office: Aosta, Italy. J. Jones, managing director; P. Casparis, secretary; Francois Farinet, mine manager. Organized Apr. 20, 1907, under laws of Great Britain, with capitalization £50,000, shares £4 par, fully issued, with £11,250 vendors shares fully paid, and 1,250 shares 36s. paid. Lands, 495 acres, in the communes of St. Rhemy and Oyen, carrying ores of copper, lead and antimony.

APACHE MINING CO. **WASHINGTON.**

Mine office: Nespelem, Okanogan Co., Wash. Lands, in the Moses district, are developed by a 100′ incline shaft and a 350′ tunnel, showing ore with a high grade footwall paystreak and quartz gangue, main ore body carrying 2 to 3% copper and about 5% lead, with some antimony and zinc, and occasional high values in gold and silver. Company planned resumption, late 1908, but apparently property continued idle.

APEX COPPER CO. **IDAHO.**

Mine office: Lost River, Blaine Co., Idaho. Lands, in Caine's Cañon, carry

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2 fissure veins, under development by tunnel, one vein of 6′ to 10′ width being said to be traceable nearly one mile.

APEX MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jesse Knight, president; Elmer B. Jones, vice-president; R. E. Allen, secretary; M. H. Walker, treasurer; preceding officers, Lafayette Hanchett, W. Lester Mangum and Amanda M. Knight, directors; Frank P. Schwindler, general manager. Organized circa October, 1908, under laws of Utah, with capitalization $1,000,000, shares $1 par. On February 10, 1909, company had $21,125.11 cash on hand. Lands, near the Grand Central mine, are developed by a 3-compartment shaft of 1,325′ depth. Equipment includes a good hoist and air-compressor.

SOCIETÀ ANONIMA PER LE MINIERE APRILE. **ITALY.**

Mine office: Santa Lucia del Mela, Italy. Salvatore Aprile, manager. Property shows chalcopyrite and cupriferous pyrrhotite, latter giving average assays of 1.83% copper, 26.66% sulphur and 120 grams silver per metric ton, the chalcopyrite giving average assays of 9.96% copper and 7 grams gold per metric ton. Property was under development at last accounts.

APSLEY MINE. **AUSTRALIA.**

Mine office: Perth, N. S. W., Australia. Francis Drake, manager. Mine, 5 miles from Perth, has been worked intermittently, under different owners, since about 1875, and production, 1876, was 20 tons fine copper. Mine was reopened, February, 1907, by a syndicate under the management of T. K. Longton, but operations were suspended shortly, and option was then taken by Mr. Drake. The ore occurs as impregnations in schists, without defined walls, but the payable ore usually ranges 3′ to 5′ in width. Development is by a 240′ shaft. On the 180′ level, for a length of 45′ and width of 5′, the ore was chalcopyrite and sphalerite, associated with pyrite, assaying 7.13% copper, and for 53′ on the 240′ level, with an average width of 7′ 6″, the ore averaged 7.92% copper. Ore carries up to 3 oz. silver per long ton, with a trace of gold. Property considered promising.

ARIZONA-BOUSE COPPER CO. **ARIZONA.**

Dead. Formerly at Bouse, Yuma Co., Ariz. Was reorganized June, 1909, as Little Butte Consolidated Mines Co.

ARIZONA & CHICAGO MINING CO. **ARIZONA.**

Mine office: Cave Creek, Maricopa Co., Ariz. Lands, 21 claims, showing ore giving average assays of 9% copper, with considerable gold and silver values. Mine has about one-half mile of workings. Company planned installation of a 10-stamp mill, at last accounts, March, 1909.

ARIZONA & CLEVELAND MINING CO. **ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. J. B. Richardson, manager. Mine, opened to depth of circa 225′, shows ore carrying values apparently mainly in gold, silver and lead.

ARIZONA COPPER MINES & SHIPPING CO. **ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. Organized circa June, 1909, and planned development by sinking a 500′ shaft, at last accounts.

ARIZONA EMPIRE COPPER MINES CO. **ARIZONA.**

Office: Los Angeles, Cal. Mine office: Parker, Yuma Co., Ariz. W. A. Moses, president; Gen. E. Bouton, vice-president; L. H. Knowlte, secretary; Newton Evans, treasurer; preceding officers and F. X. Pfaffinger, directors; C. W. Mitchell, general manager; Jas. H. Watson, superintendent. Organized circa August, 1909, with capitalization $5,000,000, shares $5 par. Lands, bought of Carnation Mining Co., are 411 contiguous claims, area 820 acres, about 10 miles north of Parker and 3 miles from Eagle Landing on the Colorado River, including the Eagle, Carnation, Belcher and Cyclone groups. Company also has 160 acres of ranch lands on the Colorado River, including Eagle Landing,

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held for a smelter site. Geological conditions are markedly similar to those at the Planet and Clara mines. The Carnation ore body, traceable 2,000′, is estimated at 50′ to 100′ width, and the Eagle group shows veins of 5′ to 50′ width, giving assays of 4 to 25% copper and $2 to $20 gold per ton. The property, as a whole, has about one mile of workings, deepest circa 300′, showing a large amount of copper carbonates, with sulphide zone not yet reached. The Eagle group has incline shafts of 70′ and 300′, and 1,500′ of tunnels, showing considerable ore of smelting grade, with several hundred tons of ore on the dumps assaying 15 to 25% copper, and $5 to $20 gold per ton, planned to be shipped immediately. The Walters crosscut tunnel cuts a 30′ vein, with back of 300′, assaying about 5% copper and $5 gold per ton. On the 200′ level of the Carnation shaft an ore body of 50′ estimated width is said to assay 5% copper and $5 gold per ton, carrying a 10′ paystreak estimated to average 10% copper and $6 gold per ton. Management plans building a 200-ton smelter at Eagle Landing. Property considered promising.

ARIZONA-INTERNATIONAL MINING CO. **ARIZONA.**

Mine office: Yucca, Mohave Co., Ariz. Fred W. Morrison, president. Property, about 12 miles east of Yucca, formerly was operated on a small scale for copper.

ARIZONA METALS CO. **ARIZONA.**

Mine office: Teviston, Cochise Co., Ariz. Hon. Chas. F. Dick, president. Lands, 540 acres.

ARIZONA & MICHIGAN MINING CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Globe, Gila Co., Ariz. Employs 40 men. Capt. Jas. Chynoweth, president; Frank L. Van Orden, vice-president; S. C. Chynoweth, secretary; Wm. B. Anderson, treasurer; preceding officers, James L. Nankervis and Anton Trojanovich, directors; Spencer W. Clawson, general manager; Nels A. Nelson, superintendent.

Organized December, 1908, under laws of Arizona, with capitalization $1,500,000, shares $10 par, divided into $150,000 full paid and $1,350,000 common stock, latter $1 paid in. Merchants & Miners Bank, Calumet, Mich., registrar. Annual meeting, third Tuesday in January.

Lands, 34 claims, area circa 620 acres, known as the Trojanovich group, adjoining the Superior & Boston on the northeast and lying northeast of the Black Hawk mine of the Arizona Commercial. Property is held under a $230,000 bond and lease, of which 10%, or $23,000, was paid Feb. 1, 1909, and 20%, or $46,000, is due Feb. 1, 1910, with balance of 70%, amounting to $161,000, due Feb. 1, 1911. No assessment is expected until early 1910. Development is by the 519′ vertical 3-compartment Telfair shaft, having a 210′ north crosscut and 225′ south crosscut on the 500′ level. Shaft was sunk through shale, carrying leached iron with copper stains, and shows some specks of chalcopyrite in diorite. The crosscuts show considerable pyrite, which also is encountered in the shaft. Property is hoped to carry the extension of the Old Dominion veins and the Black Hawk vein of the Arizona Commercial. The shaft has a gallows frame. Improvements include 10 buildings, one a boarding-house.

ARIZONA-NEVADA COPPER CO. **ARIZONA.**

Mine office: Hillside, Yavapai Co., Ariz. Jos. L. Giroux, president and general manager. Lands, on Copper Creek, circa 35 miles northeast of Hillside, taken over from Copper Creek Development Co., are said to be 105 quartz claims, 2 patented, 6 placer claims and a millsite. Mine has a tunnel, said to show ore of good average tenor, with copper values increasing in depth. Transportation is by a poor wagon-road to Hillside, but it is proposed to construct a railroad from Seligman, on the Santa Fé railway, to the mines, a distance of 50 miles, over which it is said an easy grade is obtainable.

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ARIZONA PROSPECTING & DEVELOPING CO. **ARIZONA.**

Mine office: Wickenburg, Maricopa Co., Ariz. Organized circa January, 1909. Property includes the Angel group, 6 claims, about 2 miles from the Vulture mine, having a 200′ shaft, with considerable development, also the Maricopa group. Both properties are said to carry ores giving good assays in copper, gold and silver.

ARIZONA UNITED MINING CO. **ARIZONA.**

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Johnson, Cochise Co., Ariz. Alfred S. Miller, president; Wilson H. Brown, vice-president; A. Jackson Wright, secretary; David H. Ross, treasurer; Hale McCormick, superintendent; Wm. Robinson, mine superintendent. Organized July 21, 1904, under laws of Delaware, with capitalization $1,000,000, shares $1 par, as Arizona Consolidated Mining Co., and name changed, February, 1909, to present title. Reconstruction was for purpose of retiring preferred stock formerly outstanding, and combining the ownership of the Copper King claims. All preferred stock issued by the Arizona Consolidated Mining Co. has been withdrawn and cancelled, present company having no preferred stock, bonds, mortgage or encumbrance of any sort, and cash is paid for all supplies. Company is operated as a close corporation.

Lands, 21 claims, 18 patented, circa 7 miles northwest of Cochise station, on the Southern Pacific railway. Property includes the Mammoth and Republic or New Republic groups, 12 claims of which formerly were owned by the Russell Consolidated Copper Co. Property was idle from 1907 until circa May, 1909. Lands show 5 ore bodies, of which 3, under development, range 4′ to 6′ in estimated average width, carrying carbonate and sulphide ores, mainly latter, estimated by former company to average 8% copper and 1.2 oz. silver per ton. Sulphide ore was encountered at depth of 671′. Development is by 6 shafts.

The Republic mine, opened to depth of 550′, with about one mile of lateral workings, has an incline shaft. The Mammoth mine has a 350′ shaft with about 1,000′ of laterals and tunnels. The Chicora mine was said, October, 1909, to show ore averaging about 15% copper and 75 oz. silver per ton.

Equipment includes a power plant with good hoists at the Republic and Mammoth mines, an electric plant and 4 Ingersoll-Temple electric drills. Transportation is by a railway from Johnson to Dragoon, connecting with the Southern Pacific line.

The 125-ton smelter at the Republic mine, built by the Traylor Engineering Co., treats ore from the company's mine and the Black Prince property, and was blown in October, 1909, making only matte, having no converters.

The Russell Consolidated is said to have produced, in the past, considerable quantities of rich carbonate ores of 30% average copper tenor. Production, 1907, was 245,040 lbs. fine copper and 3,122 oz. fine silver, valued at $51,057.08, and production, 1908, was about 12,500 tons of ore, netting about $12.50 per ton. Property considered promising.

COMPAÑÍA DE COBRE DE ARIZPE. **MEXICO.**

Office: Hermosillo, Sonora, Mex. H. J. Smith, president and general manager. Is incorporated under laws of Mexico. Lands include considerable undeveloped property in the district of Arizpe.

COMPAÑÍA MINERA ARMANDO. **MEXICO.**

Office and mine: Zautla, San Juan de los Llanos, Puebla, Mex. Property is the Armando mine, ores of which carry values mainly in copper, with small quantities of gold and silver.

ASSOCIATED COPPERS CORPORATION. **ARIZONA.**

Office: Cassville, Oneida Co., N. Y. E. B. Moore, president; S. Howard Leech, vice-president; John H. Spring, secretary and treasurer; Col. L. S.

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Judd, manager. Capitalization $1,500,000. Lands, 57 claims, area 1,280 acres, in the Desert Valley Mining district of Yuma County, Arizona.

ATLANTIC-PACIFIC COPPER CO. **CALIFORNIA.**

Atlantic City, N. J. Mine office: Smith River, Del Norte Co., Cal. H. F. Sowers, president. Lands, 14 claims, adjoining the Union mine on the north, with tunnels of 500′ and 700′. Presumably idle.

AUGUST MINE. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Wm. Kemp, general manager. Mine has a 250′ shaft, said to show ore averaging 17% copper and 7 oz. silver per ton, and management was said, May, 1909, to have closed a contract with the Old Dominion smelter for shipment of 1,000 tons of ore monthly. Forces, 1909, were circa 30 men.

AURILLA CROWN MINING CO. **WASHINGTON.**

Mine office: Lucerne, Chelan Co., Wash. Charles Rubin, superintendent. Property has gold and copper ores, with water-power and a 2-stamp mill, employing a small force at last accounts.

AURORA GOLD & COPPER MINING CO. **COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. Organized circa June, 1909, under laws of Colorado, with capitalization $1,000,000. Property includes the Aurora mine, at Russell Gulch, and lands in Clear Creek County, Colorado.

SOCIÉTÉ DES MINES MÉTALIQUES DE L'AVEYRON. **FRANCE.**

Office: 16 Rue du Colysée, Paris, France. Mine office: Sauclières, Millau, Aveyron, France. M. Mougin, president. Property is lands carrying copper, silver-lead and zinc ores, in the communes of Sauclières and Saint Jean-du-Bruel, department of Aveyron.

AVINO MINES, LTD. **MEXICO.**

Office: 138 Salisbury House, London, E. C., Eng. Mine office: Avino, Gabriel, San Juan del Rio, Durango, Mex. R. H. Jeffery, general manager. Organized circa 1909, under laws of Great Britain, as a reconstruction of Avino Mines of Mexico, Ltd. The old company was not in the best of position financially, and apparently the reconstruction has inherited the monetary debility of the old company.

Lands, 250 acres and a 302-acre damsite, 10 miles from a railroad. Mine has an 800′ shaft and 600′ tunnel, with several large pits, one being nearly 400′ in width, and of considerably greater length. Property is said to show about 2,000,000 metric tons of low grade silicious argentiferous copper ore, average value of ore produced, July and August, 1907, being reported at 36s. per ton. Mine is claimed to have produced about $60,000,000 in the past, mainly in silver, but presumably this should be 60,000,000 pesos, equal to about $30,000,000. Property produces a little smelting ore, but ore yielded is mainly of concentrating grade.

Equipment includes a steam plant and a 300-h. p. electric plant, operated by a Crocker-Wheeler gas-engine. A large concentrator first built was found unsuitable, and was replaced by a hyposulphite lixiviation plant, which was claimed to save 85% of the silver and 30% of the gold values. Property was poorly handled, the former management spending too much money on surface, and not enough in the mine, in addition to making a serious mistake in the plan of ore treatment. The mine has an immense amount of ore of dangerously low average tenor, but there have been too many changes in local management and processes, by reason of which no management or process has been given a fair trial.

AZTEC MINES CO. **ARIZONA.**

Office: 413 Ft. Dearborn Bldg., Chicago, Ills. Mine office: Prescott, Yavapai Co., Ariz. Perry L. Turner, president; Emil Rautman, secretary, treasurer and general manager; preceding officers, Frank W. Thompson, John Wesley and

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James E. Walters, directors. Organized 1908, under laws of Arizona, with capitalization $3,500,000, shares $1 par.

Lands, 7 claims, area circa 100 acres, 5 miles west of Poland and 13 miles south of Prescott, near the Hassayampa River, well timbered and watered. Property is said to show 10 fissure veins, of 2′ to 15′ width, with the main shaft on a 15′ vein. Mine has about 1,800′ of shafts and tunnels, showing ore said to average $5 to $6 per ton in combined copper, gold and silver values.

The company claims to have a copper bonanza of inexhaustible and proven richness, an honest and efficient management, and to be certain to enrich every shareholder, and the management states, modestly, in its pronunciamento, that the property is destined to excel the Copper Queen or United Verde. One L. D. Finn was quoted, by the company, as guaranteeing, if given a 200-ton smelter, to pay 20% dividends in one year's time, and was further quoted as claiming that, with a 200-ton smelter, he would earn a profit of $1,600 per day, on ore averaging $17.50 per ton, and that if this smelter was increased to 500 tons capacity, he would guarantee to pay dividends of $3,500,000 per year, which shows that Mr. Finn, if correctly quoted, is a fool or a faker.

AZTEC MINES CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. H. Irving Jones, general manager. Property carries auriferous and argentiferous copper ores, and equipment includes steam and electric power, and an air-compressor.

AZTEC MINING CO. **MEXICO.**

Office: Guadalajara, Mex. Mine office: Ayutla, Autlán, Jalisco, Mex. Juan D. Isabel, president and general manager. Capitalization $500,000. Property includes El Zopilote and La Trinidad mines, at Ayutla, and the San Francisco mine, near Carrizo, the former carrying copper ores and the latter carrying silver-lead ore.

COMPAÑÍA RESTAURADORA DE BACA ORTIZ. **MEXICO.**

Mine office: Tepehuanes, Santiago Papisquiaro, Durango, Mex. Property is the Candelaria mine, carrying ores of gold, silver and copper.

MINES DE CUIVRE DE BAILOR. **HUNGARY.**

Office: 70 Rue de Namur, Brussels, Belgium. Baron d'Inkey de Pallin, director. Organized Feb. 14, 1907, under laws of Belgium, with capitalization f2,000,000, shares f100 par. Property is in Hungary.

BALAKLALA CENTRAL MINING & SMELTING CO. **CALIFORNIA.**

Office and mine: Coram, Shasta Co., Cal. Thos. J. Barbour, president; Jos. C. Montgomery, secretary. The Balaklala Consolidated Copper Co. owns one-third of the capital stock. Lands, 3 patented claims, area 30 acres, said to be situated in about the middle of the Balaklala holdings. Property has a 100′ tunnel, and probably will be operated in connection with the Balaklala mine.

BALFOUR PROSPECTING ASSOCIATION. **TASMANIA.**

Office: Melbourne, Australia. Mine office: Balfour, Tasmania. Property, formerly known as Chester's mine, is being developed by tunnel, and has a schistose ore channel of 145′ reported width, showing streaks and bands of copper ore ranging from a few inches to 4′ in width carrying bornite and chalcopyrite assaying up to 20% copper. Employed 6 men, April, 1909.

BALTIC MINING & SMELTING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Fred Johnson, president; Geo. E. Marlowe, secretary. Capitalization $150,000, shares 10 cents par. Lands, 13 claims, in Sanders County, Montana, developed by tunnels of 80′ and 100′, showing a vein of 6′ to 8′ estimated width, carrying auriferous and argentiferous copper ore, with quartzite gangue, giving assays of 7% copper and 3 to 4 oz. silver per ton, with a trace of gold. Equipment includes several mine buildings.

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BALTIMORE CONSOLIDATED MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Robt. Brown, president; C. C. Parker, vice-president; S. M. Simpson, secretary; John Enlund, treasurer. Organized December, 1908, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, just north of Big Hill, in the eastern section of the Tintic district, are being developed by shaft.

BAMAR COPPER CO. **MONTANA.**

Office and mine: 401 State Savings Bank Bldg., Butte, Mont. Dr. M. J. Scott, manager; P. J. Scott, superintendent. Organized July, 1909. Lands, 13 claims, area circa 250 acres, 3 claims, known as the Linda, Copper Queen and Copper King, being held under bond and lease, and 10 claims were bought from Butte & Buxton Copper Mining Co. for 150,000 shares. Lands are 15 miles southwest of Butte, near Buxton switch, on the Oregon Short Line railway, in the foothills of Fleecer Mountain, in the Summit Mountain district, carrying circa 6,000′ of the strike of a vein that was mined, circa 1890, by several shallow shafts, for silver-lead values. Country rock is granite, much similar to that at Butte, covered by a 1′ to 4′ wash, having a mineralized zone of about one-half mile width, carrying 4 veins, with a diorite dyke to the northward. Shallow pits and trenches show continuity of the veins, which are leached at surface, showing a little carbonate ore below commercial tenor.

Development is by several old and shallow shafts, and by a new 2-compartment upraise shaft on the Linda claim, planned to be sunk to depth of 500′, and by the Linda tunnel of circa 300′ length, latter showing a wide ledge carrying a mineralized streak along the footwall, showing mainly pyrite, with some argentiferous chalcopyrite and occasional carbonate stains, with a highly silicious gangue. Property has yielded ore assaying 14 to 23% copper and 24 oz. silver per ton, with small gold values, also galena assaying 11% lead, 24 oz. silver and $1 gold per ton.

Equipment includes a boiler, engine, hoist and air-compressor, adequate for sinking the shaft to 500′, and the improvements include buildings. Property considered promising.

BANNER CONSOLIDATED MINES CO. **COLORADO.**

Office: 107 Boston Bldg., Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. Fred S. Nye, superintendent. Mine carries gold and copper ores, and has steam and air power. Property was under development at last accounts.

BARNEY CANYON MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Frank W. Klett, Geo. Ewing, Valentine Williams, H. Percy Browne and M. C. Godbe, directors. Organized circa June, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, 13 claims, in the northern part of the Bingham district.

BATUC WEST COPPER EXTENSION SYNDICATE, LTD. **MEXICO.**

Office: 19a Coleman St., London, E. C., Eng. Mine office: Suaqui de Batuc, Ures, Sonora, Mex. F. Wadham, A. Baker and H. F. Wadham, directors; A. E. Barker, secretary. Organized June 11, 1908, under laws of Great Britain, with capitalization £25,000, shares £1 par; issued, £21,577. Property was acquired of British Mexican Copper Syndicate, Ltd., which is under practically the same management.

BEAVER-BUTTE COPPER CO. **UTAH.**

Office and mine: Beaver, Beaver Co., Utah. John M. Murdock, president; Albert F. Fillerup, vice-president; O. F. McShane, secretary and treasurer; preceding officers, John D. Pritchett and John E. Pritchett, directors. Organized circa June, 1909, under laws of Utah, with capitalization $50,000, shares 10 cents par. Lands are in the Newton district.

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BECHUANALAND COPPER, LTD. **BECHUANALAND.**

Office: Salisbury House, London Wall, London, E. C., Eng. Organized May 18, 1909, under laws of Great Britain, with capitalization £135,000, shares 10s. par, to adopt an agreement with the Bechuanaland Exploration Co., Ltd., regarding copper claims.

BELLBOY GOLD & COPPER MINING CO. **IDAHO.**

Office: Pocatello, Idaho. Mine office: Caribou, Bingham Co., Idaho. Wm. Stephenson, president. Organized circa February, 1909, under laws of Idaho, with capitalization 300,000 shares. Property is said to carry high grade copper ore and coarse gold.

BELMONT-BANNER MINING CO. **IDAHO.**

Office: Spokane, Wash. Mine office: Delta, Shoshone Co., Idaho. L. Waldo Murphy, president; D. R. Glasgow, secretary. Capitalization $1,000,000, shares $1 par. Lands, 3 claims, 1 fractional, near Delta, showing a vein of 3′ to 4′ surface width, in quartzite, carrying silver, lead and copper values. Mine has about 500′ of workings.

BENCREE GOLD & COPPER MINES, N. L. **AUSTRALIA.**

Mine office: Forest Reefs, N. S. W., Australia. B. J. Harris, mine manager. Development is by a 200′ shaft, and apparently the mine is being opened for gold rather than copper values.

BENOWRIE COPPER CO. **AUSTRALIA.**

Dead. Property was the Mary mine. Formerly at Olary, South Australia.

BENOWRIE COPPER MINE, LTD. **AUSTRALIA.**

Mine office: Olary, South Australia. Lands, 20 miles northeast of Olary, carry what apparently is a stratified bed between granite and clay-slate, showing mainly azurite and malachite, mixed with iron oxide and silica, and of low average grade, carrying from colors to 3 dwts. gold per long ton, best ore occurring in bunches. Mine has been worked occasionally since circa 1890, and production, 1895-1898, was 241 tons of ore shipped, averaging 12% copper, and production, 1899-1901, was 300 tons of ore, returning better than 9% copper. Development is by a large open cut, 50′ wide, 250′ long and 5′ to 30′ deep, with a number of shallow pits. Mine was a small producer at last accounts.

BENT MINE. **NEW MEXICO.**

Mine office: Orogrande, Otero Co., N. M. Lands, on Tularosa Creek, 5 miles below the Mescalero Indian Reservation, have been worked for several years, with small ore shipments to El Paso smelter. Equipment includes a small concentrator, planned to be enlarged. Employs about 50 men. Property considered promising.

BERNOUDY-TURKEY CREEK CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. J. H. P. Bond, president; R. D. Hall, vice-president; Norwood Oxford, secretary; Burrell Musgrave, treasurer; Chas. W. Lowell, manager; preceding officers, M. H. McLain and J. W. McElroy, directors. Organized circa 1909, with capitalization $2,000,000, as a consolidation of the Bernoudy, Bernoudy-Wright and Turkey Creek companies. Property has 60′ and 160′ tunnels, showing a low grade ore body carrying a high grade paystreak. Equipment includes two 35-h. p. boilers and a 5-drill air compressor. Management plans a 50-ton concentrator. Work was suspended circa Sept. 1, 1909.

BIG BUTTE MINING CO. **ARIZONA.**

Office: 503 Hall Bldg., Kansas City, Mo. Mine office: Wagoner, Yavapai Co., Ariz. Jos. F. Gaume, president; J. B. Hamner, vice-president. Lands are in the Walnut Grove district.

BIG COTTONWOOD CONSOLIDATED MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. W. L. Harwood, president; E. O. Lee, vice-president; Carl A. Badger, secretary

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and treasurer; preceding officers, B. L. Rich and Jennie C. Lee, directors. Organized circa August, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Property is in Big Cottonwood Cañon.

BIG DIPPER MINING & MILLING CO. **ONTARIO.**

Office: Peterborough, Ont. Mine office: Cloyne, Addington Co., Ont. J. A. Jamieson, superintendent. Lands show auriferous and argentiferous copper ores. Equipment includes a steam plant, and property was under development, with about force of about 20 men, at last accounts.

BIG FOUR GOLD & COPPER MINING CO. **COLORADO.**

Mine office: Leadville, Lake Co., Colo. K. L. Fahnestock, lessee.

BIG HORN MINING & DEVELOPMENT CO. **WYOMING.**

Mine office: Depass, Frémont Co., Wyo. Jas. Dickie, president; Walter Swanson, manager; preceding officers, J. A. Swanson, H. McCormack, Chas. Roach, John M. Hench and W. T. Wallace, directors. Organized circa May, 1909, with capitalization $1,500,000. Lands, in the Copper Mountain district, adjoin the Williams-Luman mine. Some high grade ore has been shipped to a Denver smelter, and is said to have yielded a profit, notwithstanding very high transportation charges.

BIG TEN COPPER MINING CO. **WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. John W. Cluff, president; Geo. O. Baker, vice-president; John Staburg, secretary and treasurer; Geo. Nelson, superintendent. Lands, 10 claims, adjoining the Tram group on the north and west, in the edge of the Rambler basin, developed by a 70′ tunnel.

BIG VEIN COPPER CO. **ARIZONA.**

Office: 1 West 34th St., New York, N. Y. Mine office: Tucson, Pima Co., Ariz. W. H. Sterling, president; Chas. O. DeLisle, vice-president; Samuel G. Meeteer, secretary and treasurer; preceding officers, Mortimer E. Newcomb, F. C. Whitney, Leon Stern and D. F. Glidden, directors. E. T. Jones, superintendent; Wm. A. Farish and J. D. Burgess, consulting engineers. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par, fully issued. Security Registrar & Transfer Co., registrar; Empire Trust Co., transfer agent. Shares are listed on the New York curb.

Lands, 12 claims, area 240 acres, known as the Alamo group, and two 40-acre millsites, adjoining the Pontotoc, in the foothills of the Santa Catalina Mountains, 7 miles north of Tucson. Mr. Farish says the property is located on a great mineralized porphyry dyke, ore occuring in the contact between limestone and schist, which, from surface indications, is 300′ to 800′ in width. The company claims that each of its 12 claims show ore in place, apparently all carrying the same mineralized dyke. Transportation is by a good wagon road to Tucson. The property has shallow shafts and tunnels aggregating about 300′ of workings, showing leached ore carrying stringers assaying 2 to 20% copper, with gold and silver values, and a 2-compartment shaft, started March 22, 1909, is planned to be sunk 800′, with crosscuts from bottom. Company stated in its prospectus that its mine is in the greatest mineral belt in the world, and is in a direct line north and south with such mines as the United Verde, Miami, Ray, Copper Queen and Shannon, which is an absolute misstatement of fact, evidencing gross ignorance or a deliberate intention to mislead.

BILL TAFT MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Geo. A. Taylor, president; Walter A. Harper, vice-president; Ralph A. Badger, secretary and treasurer; preceding officers, John R. Vance, Wilford Hays and D. W. Craig, directors. Organized July, 1909, under laws of Utah, with capitalization $10,000, shares 1 cent par. Property is in the North Tintic district.

BINGHAM MIDWAY MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake.

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Co., Utah. John McDonald, president; Jas. A. Smith, secretary and treasurer; preceding officers, Herman V. Carlson, Frank J. Mallett and Wm. A. Dalton, directors; Carl B. Ferlin, general manager. Lands, 593 acres, including 15 patented claims in the left-hand Kelsey fork of Settlement Cañon, Tooele County, Utah, adjoining the Bingham Metal properties. Lands show limestone and quartzite, with intrusive porphyry dykes, carrying 3 fissure veins. Development is by a 150′ tunnel, planned to cut the first vein at 400′ from the portal.

BISBEE COALITION MINING CO. **ARIZONA.**

Mine office: Bisbee, Cochise Co., Ariz. E. H. Clark, president and manager; S. S. Badger, consulting engineer. Capitalization $2,000,000, shares $2 par. Company absorbed the North Bisbee Development Co., circa 1909, for shares.

Lands are 42 contiguous claims, in Tombstone Cañon, 3 to 5 miles northwest of Bisbee, including the Eureka group of 13 claims, near the Modern mine, taken over from the Eureka Mining Co., and the North Bisbee group of 23 claims, taken over from the North Bisbee Development Co. Some work is said to have been done on the property by Mexicans, in early days. Development includes two 50′ shafts and a 360′ tunnel, showing ore giving assays up to 28% copper. Property idle, August, 1909, but resumption planned.

BLACK BEAR MINING CO. **COLORADO.**

Mine office: Telluride, San Miguel Co., Colo. Oscar Manttila, superintendent. Mine carries auriferous and argentiferous sulphides of lead, copper and zinc. Equipment includes an electric plant, 20-stamp mill and 75-ton concentrator. Employs circa 40 men.

BLACK JACK MINING CO. **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. H. M. Brooks, superintendent. Lands carry copper and silver ores. Has steam power.

BLACK KETTLE COPPER CO. **TEXAS.**

Office, Baltimore, Md. Mine office: Sierra Blanca, El Paso Co., Tex. Property is in the Quitman Mountains, south of Sierra Blanca. Exploratory work was begun circa September, 1909.

BLACK MOUNTAIN COPPER CO. **ARIZONA.**

Mine office: Junction, Yavapai Co., Ariz. F. A. Reisling, superintendent. Property was under development with a small force at last accounts.

BLACK RIVER COPPER CO. **ARIZONA.**

Mine office: Cherry, Yavapai Co., Ariz. G. M. Batty, manager. Is said to have secured high grade gold ore, at a depth of 70′, on the Pearl claim, July, 1909.

BLUE BELL MINING & SMELTING CO. **ARIZONA.**

Office and mine: Yucca, Mohave Co., Ariz. Thos. Lowell, president; J. H. Johnson, vice-president; E. T. Miner, secretary and treasurer. Property, on the Bill Williams Fork River, south of Yucca, slightly developed, shows considerable ore of good grade, estimated to average about 10% in copper tenor, with fair gold and silver values.

COMPAÑIA EXPLORADORA Y EXPLOTADORA DE LAS MINAS DE LA BOCA. **MEXICO**

Mine office: Ciudad La Victoria, Rio Grande, Coahuila, Mex. Antonio Quintana, president and general manager; C. Guerra Espinosa, secretary. Organized 1905, under laws of Mexico, with capitalization 30,000 pesos; issued, 18,750 pesos. Property is the Bonnita, Asturiana, Esperanza and Oviedo mines, area 101 hectares. Development is by a 44-meter shaft, and by tunnels of 26, 44, 58 and 100 meters, showing considerable ore, of which a portion is high grade. Mine produces about one carload bi-monthly of ore assaying circa 20%

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copper, 800 grams silver and 3 grams gold per metric ton. Property has a water power available, and management plans installing a concentrator.

BONANZA GREENWATER COPPER CO. **CALIFORNIA.**

Mine office: Greenwater, Inyo Co., Cal. Lands, 8 claims, in the Resting Springs district, 6 miles east of Willow Creek and about 10 miles west of the Tonopah & Tidewater railway. Development is by a 70′ tunnel. Property has a main vein of 12′ to 18′ estimated width, traceable about 3,000′, the outcrop carrying some cerussite, with gold and silver values. Ore lying next to the porphyry wall carries gold and lead values, and ore lying next to the limestone wall carries gold, silver, lead and copper values, mainly in lead, with fair quantities of copper, silver and gold.

BONANZA MINING & DEVELOPMENT CO. **CALIFORNIA.**

Office: Phoenix, Ariz. Mine office: Vontrigger, San Bernardino Co., Cal. A. Wm. Grant, director. Organized October, 1909, under laws of California, with capitalization $500,000.

BORNITE MINING & SMELTING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Newport, Stevens Co., Wash. Capitalization originally was $1,000,000, increased, 1908, to $2,000,000, shares $1 par. Lands, 180 acres, patented, 6 miles below Newport, on north bank of Pend d'Oreille River. Development includes a shallow shaft and an 800′ tunnel, said to show a 2′ vein of ore, carrying about 3 oz. silver per ton. Company plans building a quarter-mile flume, from the head of Coyote Creek, to secure power.

BOSTON & ALTA COPPER CO. **MONTANA.**

Office: Boston, Mass. Mine office: Corbin, Jefferson Co., Mont. Employs circa 30 men. John Joyce, president; Marcus L. Hewett, vice-president; Chas. H. Innes, secretary and treasurer. Organized circa July, 1909. Property apparently is the old Alta mine, having a new 2-compartment shaft, planned to be increased later to 3-compartments, and planned to be sunk 1,000′. Equipment includes two 75 h. p. boilers, a 14-drill Rand air-compressor and a 500′ Lidgerwood hoist. Electric power is to be taken from a commercial company for operating purposes. Improvements include necessary mine buildings. Whether this company or the Alta-Montana Copper Co. is the present owner of Alta mine has not been learned. Is not regarded favorably.

BOSTON-BISBEE MINING CO. **ARIZONA.**

Office: 91 City National Bank Bldg., Utica, N. Y. Mine office: Bisbee, Cochise Co., Ariz. Wm. J. Thistlethwaite, president and general manager; Milton R. Harlan, superintendent; Daniel F. Strobel, secretary; J. C. Breen, treasurer. Organized March, 1908, under laws of Arizona, with capitalization $5,000,000, shares $10 par; issued, $700,000. Utica Trust & Deposit Co., registrar. Company absorbed the Modern Copper Mining Co. Dec. 25, 1908.

Lands, 29 claims, 3 fractional, unpatented, area circa 550 acres, at the northwest end of Tombstone Cañon, in the Warren district, showing 5 fissure veins, carrying carbonate and sulphide ores, of which one vein, slightly developed, is claimed to give ore with average assay values of 7% copper, 10% lead, 14 oz. silver and 1 oz. gold per ton. Development includes shafts of 30′ and 100′ and a short tunnel, latter planned to strike a vein showing a gossan outcrop. Property is considered poorly located. In May, 1909, company planned resumption of work, by sinking the shaft 500′ deeper, but apparently nothing was done, and property idle at last accounts.

BOSTON-COURTLAND COPPER CO. **ARIZONA.**

Mine office: Courtland, Cochise Co., Ariz. Weldon C. Humphries, manager. Lands, near the railway station at Courtland, were prospected with Cyclone churn drills, previous to starting a 3-compartment shaft, on the Geronime claim, which was 50′ deep, late September, 1909.

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BOSTON & LAKE SUPERIOR MINERAL LAND CO. **MICHIGAN.**

Office: Leopold Bldg., Houghton, Mich. Fred W. Nichols, resident agent. Property is mineral land in the Lake Superior copper district.

BOSTON-MIAMI DEVELOPMENT CO. **ARIZONA.**

Mine office: Miami, Gila Co., Ariz. Fred W. Hoar, manager; C. A. Steelsmith, superintendent. Lands, 42 claims, adjoining the Live Oak and Keystone mines, held under a three-year $400,000 bond and lease. Property shows a considerable area of schist, granite and porphyry, similar to that of neighboring properties carrying porphyry ores, and is being tested by 2 Star drills, each good for 1,000′ holes. Property considered promising.

BOSTON-PARRY SOUND COPPER CO. **ONTARIO.**

Mine office: Parry Sound, Parry Sound district, Ont. Organized June, 1908, under laws of Maine, with capitalization $1,000,000, shares $1 par. Lands, 200 acres, in vicinity of the Willcox and McGowan mines. Presumably idle.

BOSTON & PIOCHE MINING CO. **NEVADA.**

Office: Newhouse Bldg., Salt Lake City, Utah. Mine office: Pioche, Lincoln Co., Nev. C. S. Miller, general manager. Organized February, 1907, as successor of Boston & Pioche Mining & Development Co. Lands, 10 claims, lying east of the Nevada-Utah, including the Fannie and Peavine mines, developed by shafts, both small producers in the past. Presumably idle.

BOUSE-PIOCHE GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Bouse, Yuma Co., Ariz. Property is the Old Maid mine, west of Bouse, from which first shipment, made March, 1909, assayed about $150 per ton in gold, in addition to fair copper values.

BOWEN COPPER CO. **ARIZONA.**

Mine office: Wendendale, Yuma Co., Ariz. Development is by a 300′ shaft, and equipment includes power drills. Company was shipping 1 to 2 carloads of good ore weekly, to El Paso smelter, circa May, 1909.

BOWYER GOLD & COPPER CO. **ARIZONA.**

Office: Quartzite, Ariz. Mine office: Bouse, Yuma Co., Ariz. W. L. McPeak, president; David Watson, vice-president; Jos. Bowyer, secretary and general manager; preceding officers, E. N. Jenkins and J. Delmar Bowyer, directors. Organized October, 1909, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Lands, 6 claims, known as the Swastika group, on the western slope of Dome Rock Mountains, about 10 miles south of Bouse. Property has a vein of 60′ estimated width, with schistose hanging and limestone footwall, carrying an iron gossan, opened for length of 600′ and giving ore, mainly oxidized, assaying up to 7% copper and $2 gold per ton. Management plans development by shaft.

BOYER-NEVADA COPPER CO. **NEVADA.**

Office: 508 Equitable Bldg., Denver, Colo. Mine office: Boyer, Churchill Co., Nev. Dr. Franklin R. Carpenter, president; H. R. Durkee, vice-president; Arthur Howe Carpenter, secretary and treasurer. Lands, 27 claims, having a 230′ tunnel. Property shows a leached zone carrying patches and streaks of oxidized ores said to give a general average assay of 12.68% copper, and balance of leached ore is said to assay 1.45 to 1.7% copper. The leached zone is succeeded by chalcopyrite, disseminated in grains through porphyry, and unaltered ores are claimed to average 3.5 to 5% copper, which seems high. The property is hoped to contain large deposits of porphyry ore, in a belt of 300′ to 1,000′ estimated width between walls of rhyolite and trachyte.

Company was said, May, 1909, to plan extensive diamond drilling and to erect a 3,000-ton mill and build a 40-mile railroad, to connect with the Southern Pacific. Presumably idle.

BRITISH MEXICAN COPPER SYNDICATE, LTD. **MEXICO.**

Office: 19a Coleman St., London, E. C., Eng. Mine office: Suaqui de

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Batuc, Ures, Sonora, Mex. J. C. Pavia, chairman; preceding officer, A. Baker, F. G. L. Wadham and Capt. M. W. Greite, directors; P. W. Jones, secretary. Organized Nov. 30, 1907, under laws of Great Britain, with capitalization £10,000, in 9,850 shares of £1 par and 3,000 founders shares of 1s par; issued, 4,023 ordinary shares and 2,761 founders shares. Company floated the Batuc West Copper Extension Syndicate, Ltd., and declared an interim dividend of 10% per annum, October, 1908.

BRITISH-YUKON COPPER & SILVER MINING CO. **COLUMBIA.**

Dead. Lands, 3 claims, on Taku Inlet, were sold December, 1908, by receiver, for $50. Formerly at Atlin, Atlin district, B. C.

BROOKLYN BRIDGE MINING & MILLING CO. **MONTANA.**

Mine office: Clancey, Jefferson Co., Mont. J. Krueger, president; W. C. Barden, vice-president; W. E. Dufresne, secretary and treasurer. Lands, 15 claims, 3 patented, at the head of Lump Gulch, about 6 miles from Clancey. Mine has about 2,000′ of development work, half of which is in shafts, deepest 435′. Equipment includes a 150-h. p. boiler, 1,000′ Lidgerwood hoist and Davis calyx drill.

BRUNDOLME MINING SYNDICATE, LTD. **ENGLAND.**

Office and mine: The Thorn, Threlkeld, Cumberland, Eng. W. H. Borlase, secretary; preceding officer, J. W. Pattinson, J. S. Quirk, W. H. Borlase and Dr. R. J. Hutchinson, J. P., directors. Organized Sept. 17, 1907, under laws of Great Britain, with capitalization £3,000, shares £1 par, in £1,000 preference and £2,000 ordinary shares; issued, £812 preference and £1,000 ordinary shares, fully paid. Property is lands carrying lead, zinc and copper. Presumably idle.

BRYAN MINING CO. **MONTANA.**

Office: Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. Harry T. Day, manager; James Burns, superintendent. Lands show auriferous and argentiferous copper ore, developed by 2 tunnels, lower, of 900′ length, showing gray copper ore.

BUCKENBAR COPPER MINING SYNDICATE. **AUSTRALIA.**

Dead. The property, one mile south of the Goodrich mine, had a 120′ shaft, and a little ore was sold to the Goodrich smelter. Formerly at Yeoval, N. S. W., Australia.

BUENAVISTA MINING CO. **MEXICO.**

Office: Pittsburg, Pa. Mine office: San Francisco del Mezquital, Durango, Mex. F. A. Ruttman, general manager. Property is La Buenavista copper mine and El Patrocinio silver-lead mine. Development is mainly by tunnel.

BULL CAMP MINING CO. **WYOMING.**

Mine office: Hazelton, Johnson, Co., Wyo. F. A. Sparhawk, superintendent. Lands show ores giving assay values in copper and gold. Equipment includes a small steam plant.

BULLION KING GOLD MINING CO. **COLORADO.**

Office: 19 Wabash Ave., Chicago, Ills. Mine office: Silverton, San Juan Co., Colo. Frank E. French, superintendent. Mine carries auriferous and argentiferous sulphides of lead, zinc and copper. Equipment includes an electric plant. Company employed circa 15 men at last accounts.

BURNT FOREST COPPER & SILVER MINING CO. **MONTANA.**

Mine office: Trout Creek, Sanders Co., Mont. J. L. Lee, Sr., president. The president and others were arrested, Sept. 21, 1909, for counterfeiting the United States silver coinage.

BUTCHER BOY MINING CO. **WASHINGTON.**

Mine office: Chesaw, Okanogan Co., Wash. Lands carry auriferous copper ores, slightly developed. Equipment includes a small steam plant.

BUTTE-ALEX SCOTT COPPER CO. **MONTANA.**

Office: Palladio Bldg., Duluth, Minn. Mine office: Butte, Silver Bow Co.,

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Mont. Hon. N. F. Hugo, managing director; preceding officer, J. G. Bennett, John B. Chapman, Wm. B. Chapman, W. K. McMillan, W. D. McKeefry, Thos. Furness, Thos. A. Merritt, W. J. Dawson and Reynolds Clough, directors. Organized February, 1909, under laws of Delaware, with capitalization $1,250,000, shares $10 par, as successor of Butte Montana Mining Co. Has outstanding 50,000 shares of full paid stock, and 50,000 shares of stock $2 paid in. Company gave 50,000 shares of full paid stock to Butte Montana Mining Co. for its property, and is said to have started with $100,000 cash. Company also paid outstanding debts of Butte Montana Mining Co., amounting to $15,000, and paid $13,000 for operating expenses of the old company from Jan. 1 to April 10, 1909, property having been taken over on latter date.

Lands include the Little Annie and Alex Scott claims. The Little Annie, area 20 acres, lying between the Goldsmith and Little Georgia claims, northwest of Walkerville, is a silver property having old workings, sunk many years ago, that include a 200′ incline shaft, with some drifting. The Little Annie is supposed to carry the northern branch of the Alice vein, which splits in going west, the Little Annie having the northern branch about 3,000′ west of the Alice company's westernmost claims. Idle some years and filled with water.

Principal property is the Alex. Scott, a fractional claim of 4.52 acres area, adjoining the West Colusa mine of the Boston & Montana on the north, in Meaderville. Title to the Alex. Scott is good, but there is some possibility of litigation over apexes of the veins. The Alex Scott carries about 500′ of the strike of 4 veins, developed by a shaft of circa 1,400′ depth, having two compartments to depth of 900′, and three compartments below. The 600′ level shows a vein carrying an 18″ paystreak of high grade ore, mainly chalcocite. A vein carrying bornite was cut on the 1,000′ level. Development work is under way on the 1,000′ and 1,200′ levels, with drifting east and west, showing considerable good ore. Some ore was shipped, 1908, by leasers, to the Pittsmont smelter, from the 600′ level, and was said to run 12 to 20% copper, with good gold and silver values. The Boston & Montana did some sinking, 1908, in the Alex Scott shaft, for the purpose of reaching the fire zone in the Leonard and Colusa mines.

Equipment includes a new Nordberg hoist, capable of raising 4-ton loads from a depth of 3,000′. A boiler-house and compressor house were erected, 1909, and the shaft has a 300-ton ore-bin.

The Little Annie is of problematical value, but the Alex Scott, though small, is a decidedly valuable claim, being located in the heart of the district, and surrounded on three sides by fine mines. The stock-market was unmercifully rigged, with results disastrous to the company and speculators, in April, 1909.

BUTTE-CARLISLE COPPER CO. **MONTANA.**

Office: 432 Manhattan Bldg., Duluth Minn. Mine office: Butte, Silver Bow Co., Mont. M. A. Ryan, president; Chas. Bergson, vice-president; Henry Kimpel, secretary; Edw. Lynch, treasurer; preceding officers and Fred C. Harris, directors. Organized 1908, with capitalization $1,100,000, shares $1 par. Lands are the Carlisle and Protection claims, in the North Butte district, near the Butte & Superior and Elm Orlu mines, and north of the Berlin claim of the North Butte. Property is said to carry 5 or 6 distinct veins. It was stated, October, 1908, that company would install a surface plant with intention of sinking 2,500′. Idle.

BUTTE-HOMESTAKE COPPER CO. **MONTANA.**

Office: Butte, Mont. Mine office: Homestake, Jefferson Co., Mont. Daniel Agoa, superintendent. Lands, 5 claims, patented, area 98 acres, well wooded and watered, 2 miles from the Northern Pacific railroad. Development is by a 185′ two-compartment shaft on the Last Chance claim, connecting with a 175′

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tunnel developing an 8′ vein giving ore assaying up to 6% copper and 38 oz. silver per ton. A small vein on the Mammoth claim has given ore assaying 20% copper, 125 oz. silver and $6 gold per ton. Property is said to have, on the dumps, 1,700 tons of low grade ore, worth about $6 per ton. Equipment includes two 80-h. p. boilers. Idle.

BUTTE & VERDE GOLD & COPPER CO. **ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Organized circa April, 1909, with capitalization $1,500,000, shares $1 par. Lands, 10 claims, near Allen Springs, having a 200′ tunnel, said to show a 4′ vein of sulphide copper ore.

BYRNE MINING & SMELTING CO. **WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. Property carries argentiferous copper ores, and has steam power. Was under development with a small force at last accounts.

CACTUS COPPER CO. **ARIZONA.**

Office: 708 Lonsdale Bldg., Duluth, Minn. Mine office: Miami, Gila Co., Ariz. Wm. A. Eaton, president; H. B. Fryberger, vice-president; A. O. Rabideau, secretary; Geo. H. Mance, treasurer; C. W. Pritchett, consulting engineer; T. W. Hamilton, superintendent; John L. McIver, foreman; W. H. Hamilton, master mechanic. Employs circa 75 men. Organized August, 1909, under laws of Minnesota, with capitalization $5,000,000, shares $5 par. Company was floated to take over the property of the Cactus Development Co., and it is probable that the 500,000 shares of the Cactus Development Co. will be retired by an exchange for an equal number of shares of the Cactus Copper Co., and that shareholders of the development company will be given prior rights to subscribe to the issues of treasury stock of the Cactus Copper Co., now planned to be put out, from time to time, as further funds are required for development and equipment.

Lands originally were 33 claims, area circa 500 acres, and now are 38 claims, area circa 750 acres, in process of patenting, on Lower Pinto Creek, in the western part of the Globe district, 4 to 5 miles southwest of Miami. Lands are in 2 principal groups, held under bonds and leases aggregating $415,000, of which $20,000 was paid on organization, leaving $395,000 due on bonds, payable in easy installments over a 7-year period, expiring 1916. The Pinto group, 9 claims, is held under bond from the Pinto Creek Copper Mining Co., and, in compliance with agreement, 51% of the stock of the Pinto Creek Copper Mining Co. was delivered, October, 1909, to the Cactus Development Co., in consideration of the sinking of the Hamilton shaft to a depth of 500′. Lands also include 14 claims, a 15-acre mill site and 100 acres of timber lands, formerly known as the McNelly-Crowley group, taken over from the Arizona National Copper Co., also various individual claims.

The property shows a formation markedly similar to that of the Miami, with an even better surface showing of iron stains. The property carries an area of highly altered schist, surrounded by areas of intrusive and extrusive igneous rocks, similar to the holdings of the Miami and Inspiration mines, 4 miles east, and the schistose areas of the Cactus and Miami district undoubtedly were continuous, at some ancient period, until divided by intrusions of igneous rocks and subsequent erosion. The schist is very old, extensively metamorphosed, and apparently is of sedimentary origin. The schist is fractured and crumpled, affording a basis of subsequent mineralization through forming innumerable cracks and crevices, there being an enormous area of coarsely brecciated schist, well suited for the circulation of mineral-bearing solutions and the deposition of ores. The property has 150 to 200 acres of schist area exposed, but the schist underlies a considerably larger area, the exposed area of schist carrying heavy iron blossoms, with occasional copper stains from disseminated

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carbonates. The schist formation apparently dips to the northeastward at about 30°.

Old workings, by former owners, consist of a number of short tunnels and a 300′ two-compartment shaft, sunk at the southern end of the property by the Arizona National, which was abandoned, because sunk on a fault-plane showing copper stains, not likely to prove workable, as the fault was of a comparatively late period, hence the old workings of the former owners were abandoned as worthless.

New work was started Nov. 30, 1908, on the Hamilton shaft, which is 530′ deep, vertical, with two-compartments, sunk near the southern limits of the schistose ore body, judging from surface indications. All work was done by hand until the installation of an air-compressor, August, 1909, and the shaft was sunk in remarkably short time. In the Hamilton shaft leaching was in evidence to a depth of about 210′, succeeded by carbonate ore, some of which may prove workable, though the lower grade carbonates will be lost in the process of wet concentration, necessary in treating low grade sulphide ore. Primary sulphides were encountered at depth of 275′, and to the depth of 385′ the shaft penetrated highly altered schist, showing copper all the way, with many seams of chalcocite up to an inch or more in thickness, following the dip of the schist. At 385′, the shaft entered a fault-zone, much crushed, having a strong seepage of water. Below this point the shaft shows little or no ore of commercial tenor, which was expected, as the shaft was sunk on what apparently was the southern boundary of the payable ore.

Laterals are being opened from the Hamilton shaft on the 300′, 400′ and 500′ levels, but it is difficult to term these either crosscuts or drifts, for the reason that the ore occurs in the country-rock itself, and presumably will be found to underly scores and possibly hundreds of acres. The openings to the northward, on the 3 levels of the Hamilton shaft, may be termed crosscuts at present, for the reason that they are driving toward and into the payable ore. Owing to the fault which throws the formation to the northeastward, the crosscuts must go increasing distances, with depth, to reach the sulphide ore body. The 300′ level of the Hamilton shaft is the first to be opened, the country-rock not carrying commercial values at a point where the level above would have to be opened. The eastern drift on the 300′ level passes through about 30′ of high grade carbonate ore, which could be smelted to advantage, though the mine, as a whole, is planned to work the disseminated sulphides, and wet concentration will not permit the saving of low grade oxidized ores, limiting production necessarily to sulphide ores, and to such of the higher grade oxidized ores as can be smelted direct, without concentration.

On Nov. 15, 1909, five crosscuts on the 300′ level were breasted in disseminated chalcocite of payable tenor, assaying up to 4% copper, though this probably is above the average that may be expected throughout the mine. At the same time 2 crosscuts on the 400′ level were breasted in similar disseminated sulphide ore, while the drifts on the 500′ level had not yet reached the sulphide zone. Development is by 6 drifts, at 200′ intervals, 3 on each side of the shaft, on all 3 levels. Ore development is to be in blocks of 200x200′ horizontally and 100′ in depth, giving block contents of 4,000,000 cubic feet.

The Pinto 2-compartment vertical shaft, 720′ west of the Hamilton, is bottomed at 560′ and is to be connected with the Hamilton shaft on the 300′ and 400′ levels of the latter, but as the collar is 141′ higher than that of the Hamilton shaft, the 400′ level on the Hamilton will connect with the Pinto shaft at depth of 541′. The Pinto shaft was sunk 194′ by hand drilling during August, 1909, miners doing their own timbering, with force of 15 men working 8-hour shifts, 5 men per shift, which is a record for Arizona. The Pinto shaft has no laterals driven as yet.

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Equipment includes three 100-h. p. boilers and a 12x14" double-drum second-motion Mine & Smelter Supply hoist at the Hamilton shaft, and a single drum hoist at the Pinto shaft, a steam-line running from the Hamilton to the Pinto shaft. Buildings include necessary mine structures and a number of dwellings and cabins for workmen. A 3-mile wagon road connects the property with the main road at the Live Oak mine.

It is planned to operate the mine on a modification of the caving and milling system. As developed the Cactus ores should run from 500,000 to 1,000,000 tons per acre of area, in the workable zone, and it is impossible to predict the area of workable ore, though the property has excellent prospects of finding ore under at least 150 acres, judging from surface conditions, with chance of finding payable ore in the schist where overlaid by other rocks. Assays secured have ranged from 0.2% copper, from dense country-rock, up to 40% from small streaks of rich ore. While some of the drift crosscuts on the 300' and 400' levels are breasted in 4% sulphide ore, it would be much safer to estimate the average tenor of ore to be developed as materially lower, and if the average is equal to that of the Miami, 2.75%, which seems reasonable to infer, the Cactus should make one of the largest copper mines of the world. As yet the mine has but little ore blocked out, but excellent progress has been made in a year, and the ore occurrence and system of mining are such that, beginning with 1910, ore should be blocked out rapidly. Management is excellent, and the property is one of very exceptional promise.

CALAVERAS COPPER CO. **CALIFORNIA.**

Office: care of Mines Vending Co., Postal Telegraph Bldg., Chicago, Ills. Mine office: Copperopolis, Calaveras Co., Cal. Organized circa September, 1909, under laws of Delaware, with capitalization $5,000,000, shares $1 par. Company is said to plan a 5-year bond issue of $450,000, at 6%.

Lands, 1,700 acres, including the Union, Keystone and Empire mines, also 2 claims adjoining the Alto, in Del Norte County, California. Property was bought, 1909, of Union Copper Mining Co. Mines, opened 1861, were considerable producers, paying fair dividends, circa 1861-1866. Formation is a black pyritous slate, in amphibolite schists, this belt running from Tuolumne County, on the south, through Calaveras into Amador County, on the north. The slate is 33' to 40' wide, with strike of 30° East of South, and dip of 30° East. Ore occurs as lenses of 15' average width, connected by stringers, main lense being 2' to 40' wide and 600' long. The alteration zone, circa 30' in depth only, carried rich oxides and carbonates, and some native copper, below which occurs chalcopyrite, carrying neither gold nor silver, and unusually free from arsenic, antimony, bismuth and other undesirable elements, blister copper therefrom making good wire-bars, without electrolytic refining. Product is classified as smelting ore of 10 to 11% copper tenor, and as leaching ore carrying 5 to 5.5% copper.

Main shaft, 60', is bottomed in a 15' lense of medium-grade ore, and the mine has a mile of openings in ore. Equipment includes a hoist and pumps, with necessary mine buildings. There is a 100-ton Orford smelter, installed 1889. Operations were confined, for many years, to producing cement copper by leaching the old dumps, which are extensive. The old workings were cleaned out and retimbered, a 90' steel gallows-frame built over the main shaft, and the smelter overhauled, 1905-1906. A survey has been made for a 12-mile railway, to connect with the Southern Pacific, at Milton. Mine was closed down, June, 1907, and remained idle till taken over by present company.

CALCITE COPPER CO. **ARIZONA.**

Mine office: Vicksburg, Yuma Co., Ariz.. Thomas H. Finnegan, manager. Organized circa 1908. Property is said to have been bonded for $300,000, April, 1909, to George Kislingbury and George A. Lonsbery, of Los Angeles.

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Lands, 14 claims, 2 miles from a railroad, 5 miles west of Vicksburg, in Desert Cañon, between Granite wash and the south end of the Harcuvar Mountains, in the northern part of Yuma County. Property is said to show a zone of quartz and iron sulphides 600′ wide and 6,000′ long, with a quartzite footwall and a porphyry hanging, ores of low average grade being reported as apparently occurring in quartz-schist underlying limestone that has been much eroded, sulphides being disseminated through the country-rock quite thoroughly. Seeley W. Mudd states that the interesting portion of the ground is a limestone country, more or less shaly in places, and highly stained on the surface, making it clear that at depth the limestone mass should be found very thoroughly impregnated with sulphides, disseminated in grains throughout the mass. This impregnation is very general, but is accompanied by little or no mineralization in large streaks or masses, and is unlike the usual limestone mineralization. The limestone mass is broken and twisted, and cut in places by igneous intrusives. Mr. Mudd states positively that the property is not a schist mineralization.

Development is by 2 pits and by shafts of 35′ and 150′, latter sunk for 80′ through calcite and iron sulphide carrying no copper values, succeeded, below 80′, by copper sulphide. A crosscut at the bottom is in sulphide ore. Property considered promising.

CALHOUN TUNNEL & MINING CO. **COLORADO.**

Office: 719 Equitable Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Herbert C. Eastman, manager. Property is developed by tunnel, showing auriferous and argentiferous copper ores. Equipment includes a small steam plant.

CALIFORNIA MINERAL LAND CO. **CALIFORNIA.**

Mine office: East Auburn, Placer Co., Cal. L. C. Trent, manager. Lands show auriferous and argentiferous copper ores, under development at last accounts.

CALIFORNIA MINING CO., S. A. **MEXICO.**

Mine office: León, Guanajuato, Mex. Organized Oct. 27, 1907, under laws of Mexico, with capitalization 25,000 pesos. Property is the California y Anexas mines, carrying copper and silver ores. Presumably idle.

CALIFORNIA & PARADISE MINING CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. Organized September, 1909, with capitalization $500,000, shares $5 par, to take over the Leadville mine.

CALLINGTON DEVELOPMENT SYNDICATE, LTD. **AUSTRALIA.**

Dead. Was organized July 3, 1907, under laws of Great Britain, and liquidated Aug. 8, 1908. Formerly at Callington, South Australia.

CALUMET-CORBIN MINING CO. **MONTANA.**

Office: First National Bank Bldg., Laurium, Mich. Mine office: Wickes, Jefferson Co., Mont. Employs about 50 men. Capt. James M. Wilcox, president; John A. Macauley, vice-president; M. E. O'Brien, secretary; J. Bruce Paton, treasurer; preceding officers, Frank Hildebrand, Frank B. Keese, W. J. Reynolds, C. E. L. Thomas, and Charles D. Hohl, directors; W. C. Hosking, superintendent. Organized December, 1908, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands were bought for $100,000, with a balance of $83,000 due in 6 equal installments, covering a period of 20 months from Oct. 1, 1909, vendors getting 25,000 shares for their option.

Lands, 16 acres, patented, known as the Minnesota mine, and a 10-acre millsite adjoining the mine, on Clancey Creek, which carries enough water to concentrate second-class ore. The Minnesota mine, worked at intervals since 1869, is said to have produced $270,000 worth of ore. The old workings of the Minnesota were 2 tunnels and a 275′ shaft, latter with levels at 75′, 175′ and 275′, with a 230′ winze. The old workings are caved and in bad shape. New

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development is by a 260′ two-compartment shaft, near the mouth of the lower tunnel, showing silver-lead ore at depth of 200′. Ore formerly mined carried mainly silver-lead values, with considerable gold and a little copper, occurring in a mineralized fissure up to 100′ in width, between granite and porphyry walls. A smelter test, September, 1909, gave returns of $22 per ton.

Equipment includes a 40-h. p. boiler and hoist good for 1,000′ depth. Buildings include a smithy and bunkhouse.

CALVERT GOLD & COPPER CO. **AUSTRALIA.**

Mine office: Millthorpe, N. S. W., Australia. John Mills, mine manager. Lands, 100 acres, near the Cadia mine, carrying a vein with northwest-southeast strike. Development is by 2 shafts, deepest 121′, on a vein of about 15′ width, carrying a 3′ paystreak assaying up to 16% copper, 10 oz. silver and $30 gold per long ton. A general sample of the ore at bottom of main shaft gave an assay of 12.1% copper, 5 oz. 4 dwts. silver and 1 oz. 5 dwts. gold per long ton. Several parcels of ore shipped returned about £20 per ton net. Equipment includes a hoist. Property considered promising.

NEGOCIACIÓN MINERA LA CAMPECHANA Ó POSITIVA y ANEXAS, S. A. **MEXICO.**

Mine office. León, Guanajuato, Mex. Organized Jan. 12, 1907, under laws of Mexico, with capitalization 300,000 pesos. Property is La Campechana y Anexas mines, carrying lead and copper ores.

COMPAÑÍA MINERA CAMPECHANA, TRIUMVIRATO y ANEXAS. **MEXICO.**

Mine office: León, Guanajuato, Mex. Lands, 17 kilometers northeast of León, carry low grade lead and copper ores, with fair silver values. Equipment includes a concentrator of 40 metric tons daily capacity, completed 1908, and concentrates are shipped to the San Luis Potosí smelter.

CANADA NICKEL CO. **ONTARIO.**

Dead. Lands sold, 1906, to Ontario Nickel Co. Formerly at Worthington, Algoma, Ont.

CANANEA QUEEN COPPER MINING CO. **MEXICO.**

Office: 919-607 South Main St., Los Angeles, Cal. Mine office: La Cananea, Arizpe, Sonora, Mex. Presumably idle.

JOAQUIN CANTÚ. **MEXICO.**

Office and mine: Mazapil, Zacatecas, Mex. Property is the Escalón mine, area 29 hectares, carrying ores of copper, lead, gold and silver.

CANYON SIDING MINING CO. **UTAH.**

Office: Payson, Utah. Mine office: Eureka, Juab Co., Utah. Henry Smith, president; O. H. Pulver, vice-president; J. S. Bills, Jr., secretary and treasurer; preceding officers, Marcellus Smith, J. S. Bills, Sr., George M. Sullivan and Eli Chase, directors. Organized circa May, 1909, under laws of Utah, with capitalization $50,000, shares 5 cents par.

DANIEL CARDONA. **MEXICO.**

Office and mine: Veta Grande, Zacatecas, Mex. Property is El Refugio mine, carrying lead, copper, gold and silver ores. Equipment includes a small mill.

CARRINGTON'S LION & 2 EAST GOLD & COPPER CO. **AUSTRALIA.**

Mine office: Charters Towers, Queensland, Australia. Development is by a 460′ shaft, showing a 30″ vein of ore carrying good average values in copper and gold. Property has a small smelter with one reverberatory furnace for matting. In November, 1908, mine shipped 8 tons 13 cwts. of copper matte to the Port Kembla electrolytic works, assaying 57.8% copper, 10 oz. 15 dwts. silver and 9 dwts. 16 grains gold per long ton.

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CARTER'S CONSOLIDATED, LTD. **AUSTRALIA.**

Mine office: Mt. Diamond, Northern Territory, South Australia. Lands include holdings at Pine Creek and Mt. Diamond. The Mt. Diamond mine has a 200′ vertical shaft, on a vein of 4′ to 5′ width, carrying chalcopyrite, said to assay 10 to 12% copper. Company is said to plan building a small smelter.

CASTAÑETA MINING CO. **ARIZONA.**

Mine office: Planet, Yuma Co., Ariz. Presumably idle.

CASTILLO y PEREZ. **MEXICO.**

Mine office: Matehuala, Catorce, San Luis Potosí, Mex. Properties are the Veta Grande and Colón mines, in El Fraile district, near Matehuala, said, 1908, to be producing about 400 metric tons weekly, of gold, silver and copper ore, shipped to smelters for reduction.

CASTLE COPPER CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Organized circa September, 1909. Lands, 11 claims, known as the Dunkirk or Mt. Tritle group, circa 12 miles south of Prescott, on the southern slope of Mt. Tritle, near the head of Slate Creek, in the Hassayampa district, formerly owned by Dunkirk Gold & Silver Mining Co., and later by Mt. Tritle Copper Co. Property is an old mine, once worked for gold, having tunnels of 150′, 160′, 170′ and 300′, driven at vertical intervals of 100′, showing auriferous and argentiferous copper and lead sulphides, carrying values in copper, gold, silver and lead in about the order named. A contract has been let for extending the lower tunnel 300′.

Equipment includes steam and gasoline power, an air-compressor and an electric light plant. A 30-ton mill has 4 Nissen stamps, 3 Wilfley tables, a 100-ton ore bin and a 10,000-gallon water tank. Property was said to be producing about 200 tons of ore monthly, at last accounts.

CASTLE DOME METALS CO. **NEW MEXICO.**

Office: Cincinnati, Ohio. Mine office: Deming, Luna Co., N. M. J. H. Allison, president; B. M. Ricketts, vice-president; Louis Fritz, treasurer; E. Hedburg, manager. Lands, 12 claims, slightly developed by tunnel, showing ore giving good assay values in copper and silver.

SOCIEDAD MINERA CATALANA-VALENCIANA. **SPAIN.**

Office: 4 Calle de Gerona, Barcelona, Spain. Mine office: Azuebar, Castellón de la Plana, Spain. Domingo H. Santías, general manager. Organized circa July, 1909, under laws of Spain, with capitalization 250,000 pesetas, shares 500 pesetas par. Property is the Maria and Virginia mines, carrying cinnabar and copper ores.

CAVERN GOLD MINING CO. **NEW MEXICO.**

Mine office: Kelly, Socorro Co., N. M. B. A. Statz, superintendent. Mine carries auriferous and argentiferous sulphides of copper, lead and zinc, ore values apparently being mainly in zinc. Improvements include a small concentrator.

CERRO AZUL MINING CO. **MEXICO.**

Mine office: Imuris, Magdalena, Sonora, Mex. Property is the Cerro Azul mine, carrying auriferous and argentiferous copper ore. Presumably idle.

CERRO DE PASCO COPPER CO. **PERÚ.**

Office: 5-15 Broad St., New York, N. Y. Mine office: Cerro de Pasco, Junín, Perú. Organized 1908, under laws of New Jersey, with capitalization $60,000,000, presumably as a holding company for the Cerro de Pasco Mining Co.

SOCIÉTÉ D'INDUSTRIE MINIÈRE DE CHAGALI-HÉLIAR. **RUSSIA.**

Office: 19 Rue Godot-de-Mauroi, Paris, France. Alfred Massenet, president. Organized July 12, 1900, under laws of France, with capitalization 1,600,000 francs, shares 100 francs par, increased, Oct. 19, 1909, to 2,600,000

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francs, shares 100 francs par. The management wishes to install a hydraulic power plant and smelter at the property, which is in the Russian Caucasus.

CHAMPION COPPER CO. **NEW MEXICO.**

Office: 22 Congress Sq., Boston, Mass. Mine office: Embudo, Rio Arriba Co., N. M. Samuel Littlefield, president; Arthur M. Gripps, vice-president; Thomas A. Maloney, treasurer. Organized under laws of Maine, with capitalization $2,000,000, shares $1 par. Federal Trust Co., Boston, transfer agent. Lands, 5 claims, patented, area 100 acres, also four 5-acre millsites and a 40-acre water-right, on Copper Hill, in the Copper Mountain district of Taos County, 9 miles east of Embudo, the nearest railroad station, and 25 miles northeast of Taos. Property is said to have 8 practically parallel veins, of 18" to 20' width, between a schist footwall and quartzite hanging wall, carrying cuprite, malachite, and chrysocolla, succeeded at depth by chalcocite and gray copper, ore all argentiferous and auriferous, with chalcopyrite beginning to show in lower workings, all with quartz gangue. Development includes a small amount of work in shallow shafts and surface-cuts on several claims, a 145' shaft sunk on a 4' vein in the Oxide mine, and a 300' tunnel, property as a whole having 1,800' of workings. Equipment includes a Leyner air-compressor, in the mill, which is 50x100' in size, with a 20x30' power-house adjoining. A 1,000' surface-tram leads from the mouth of the Champion tunnel to ore-bins. Improvements include a 15,300' gravity pipe-line, of 7" spiral steel-riveted pipe.

CHAMPION COPPER MINING CO. **NEW ZEALAND.**

Dead. Was succeeded, circa 1907, by Maoriland Copper Co., Ltd. Formerly at Nelson, N. Z.

CHICAGO & ARIZONA COPPER CO. **ARIZONA.**

Office and mine: Willcox, Cochise Co., Ariz. John H. Crowley, president; P. B. Soto, secretary. Lands, 9 claims, in the Dos Cabezos district, carrying auriferous and argentiferous copper ore. Company planned development, at last accounts.

CHIEF CONSOLIDATED MINING CO. **UTAH.**

Office: Houghton, Mich. Mine office: Eureka, Juab Co., Utah. Walter Fitch, president and general manager; Frederick W. Denton, first vice-president; John R. Van Evera, second vice-president; William P. Seager, secretary and treasurer; preceding officers, J. H. Rice, Murray M. Duncan and A. B. Miner, directors; Cecil A. Fitch, superintendent; Walter Fitch, Jr., engineer. Organized Feb. 16, 1909, under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $810,000, Houghton National Bank, registrar. Of the capitalization, $500,000 went to the American Mines Syndicate for lands, and 250,000 shares were issued at par. Shares are listed on the Boston Curb. Annual meeting, third Tuesday in February. Is controlled, through half ownership, by American Mines Syndicate, and controls, through majority stock ownership, the Eureka City Mining Co., organized to secure mineral rights under the townsite of Eureka. Is absorbing the Little Chief Mining Co. through exchange of one share of Chief Consolidated for 3 shares of Little Chief.

Lands, circa 400 acres, including 11 claims controlled directly, and through ownership of shares in Eureka City Mining Co. and Little Chief Mining Co. Four claims are patented, with no adverses on balance. Property includes old holdings of the Little Chief, 3 claims owned outright and 5 claims held under an $80,000 bond and lease, also the Granite claim, bought for $30,000, and an undivided half-interest in the American Star and Blackbird claims, bought for $20,000, the other half-interest in latter claims being owned by the Tintic Mines Co. Property is the largest in the Tintic district, and is well located, adjoining the Eagle & Blue Bell on the north and east.

The property carries about 4,000' of the strike of the Victoria ore channel,

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up to 400′ in width, this being the ore system of the Centennial-Eureka and Eagle & Blue Bell mines, two of the best properties of the Tintic camp. Country rock is limestone, and average strike of ore vein is practically north and south, with irregular dip. The company's lands also carry two other ore channels. Ore as developed has averaged about 25% lead, 50 oz. silver and $1 to $2 gold per ton, with very little copper, but latter probably will be encountered at greater depth.

Development is by a 1,670′ vertical shaft, with 2 compartments to the 1,200′ level, and 3 compartments below. The mine has drifts on the 800′ and 1,000′ levels, made by former owners, with workings on the 1,200′ and 1,400′ levels made under the new management. It is planned to sink this shaft to 1,800′, and drift from the bottom to the territory under the city of Eureka, controlled through the Eureka City Mining Co.

Equipment includes a 200-h. p. steam plant, with a geared double-cylinder hoist good for 1,700′ depth, and a 10-drill air-compressor. Buildings include a boiler and engine-house, assay office and sorting and shipping bins.

Ore was discovered March, 1909, and to Oct. 31, 1909, shipments were 450 tons, derived exclusively from development work. Of this production, 300 tons was silver-lead ore, yielding a profit, after deducting all expenses, of $9 per ton, balance of shipments consisting of silver ore that yielded a profit of $4,350 above all expenses. This showing by a purely developing proposition is most unusual, and highly satisfactory. Management is excellent and property considered exceptionally promising.

JUAN K. CHILD y CA. **BOLIVIA.**

Dead. Was succeeded, 1905, by J. K. Child & Co., Ltd. Formerly at Coro Coro, La Paz, Bolivia.

CHINESE MINING EXPLORATION CO. **CHINA.**

Mine and smelter office: Chang-Sha, Ho-Nan, China. Dr. S. T. Kong, general manager. Is owned and managed by the government, and smelting, at present, is on lead ore, but the property includes promising copper deposits, which it is planned to develop later.

CHINO COPPER CO. **NEW MEXICO.**

Office: 87 Milk St., Boston, Mass. Mine office: Santa Rita, Grant Co., N. M. Charles M. MacNeill, president; Daniel C. Jackling, general manager; A. Chester, Beatty, consulting engineer; preceding officers, Sherwood Aldrich, and Col. Charles Hayden, executive committee; preceding officers, Spencer Penrose, W. Hinkle Smith, J. G. Hopkins, Henry M. Whitney, Hon. Eugene N. Foss, Berthold Hochschild and Samuel Sloan, directors; E. L. Gruver, secretary; Keith Stewart, treasurer; Kurnal R. Babbitt, general counsel; John M. Sully, superintendent. Organized circa August, 1909, under laws of Maine, with capitalization $3,500,000, shares $5 par. Charter contains a provision that for 2 years company must not increase its capitalization, incur debts, issue bonds, nor have other liabilities in excess of $1,000,000. Company owns 75,000 shares of the capital stock of the Santa Rita Mining Co. Of the capitalization, 425,000 shares were outstanding and 275,000 shares in the treasury, September, 1909. Company began business with $250,000 in cash. Is closely connected, in management and ownership, with the Utah Copper Co., Ray Consolidated Copper Co. and Gila Copper Co.

Lands, 2,401 acres, including 96 patented claims, area 1,977 acres, and options on 422 acres adjoining, in the Central mining district. Property is the oldest copper mine in New Mexico, and one of the oldest in the United States, having been opened A. D. 1804, the Spaniards mining the rich streaks, and shipping ore by pack trains to Mexico. Mine was abandoned, circa 1820, owing to the Mexican revolution, and was reopened circa 1860.

The property occupies a basin at the foot of the Santa Rita Mountains,

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showing country rocks of two types, one being a quartz-diorite and the other andesite-porphyry. Diorite forms practically all of the rim of the basin on the east, north and west, dipping in a generally southeastern direction, under the extrusive flows which constitute the south and southeast rims. The sedimentaries consist of a quartzite bed overlying a series of impure limestones. The andesite-porphyry is a later intrusion than the diorite, cutting both diorite and the sedimentaries, and the ore bodies are associated with andesite-porphyry, both intrusives and sedimentaries having been much shattered, giving ideal conditions for secondary enrichment. The old workings, very irregular in character, have developed considerable high grade ore, and include No. 8 shaft, with two compartments, 214′ deep, carrying stopes on 8 drifts, No. 9, a two-compartment shaft, started 1906, also No. 10, started 1907. Plans of the present management are much more ambitious than those of the former owners, and call for the development of an enormous quantity of low grade country-rock ore, which apparently occurs in a crescent-shaped belt some 7,000′ in length, the property showing about 250 acres of lands that apparently should carry low grade ore bodies available for development. The property is being proven by 8 churn drills, boring holes at 100′ intervals, checkerboard fashion. The first 100 holes were drilled to an average depth of 263′, and, of this number, 79 holes penetrated ore, and 21 were drilled in ore below commercial tenor, ore being developed at an average depth of 167′. The property has been divided into 6 main ore zones, of which the Romero, Montoyo and Chino zones are expected to be mined opencast, by steam shovel, while the Hearst, Texas Flat and Whim Hill ore bodies are expected to be mined by the caving system. Exclusive of the Texas Flat section, where the ore lies very deep, early drilling showed a barren capping averaging 60′ in depth, succeeded by an average of 85′ of ore. The company is developing 1,000,000 to 1,500,000 tons of ore monthly, and has about 10,000,000 tons of ore proven, estimated to average 2.25 to 2.5% copper. The property shows a great variety of ores, ranging from native copper to low grade sulphides, latter being expected to develop the principal ore values, but, judging from past and present development, there should be a considerable amount of high grade ore, which will serve as a sweetener for the low grade disseminated ores, and the old dumps contain about 150,000 tons of ore, of about 2% estimated average copper tenor, heretofore unworkable, but which easily can be milled at a profit with a large modern concentrator specially planned for the treatment of low grade disseminated sulphides.

Equipment includes a 125-ton concentrator and sampling mill, built by lessees, and a test of the disseminated ore made by the present management gave a concentration of about 12½ into 1, with recovery of 60 to 70% of assay values, or 34 lbs. fine copper per ton, and, judging from tests in the experimental mill, a concentrator built especially to treat this ore should make an extraction of about 70%. Management is said to plan using the underflow of water along Lone Mountain draw for milling purposes. Estimated cost of finished copper is about 9 cents per lb. The property is exceptionally promising, and is in the hands of the capable men who have been the pioneers in the successful development of low grade country-rock copper mines.

CHRISMAN & GLOBE MINING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Isaac Chrisman, manager. Lands, 7 claims, located one-half mile northeast of the Arizona & Michigan and one-half mile east of the Superior & Globe properties.

CHRISTIANIA MINEKOMPANI. **NORWAY.**

Office: Christiania, Norway. Mine office: Skafsaasogn, Norway. Property is copper ore lands in Skafsaasogn and at Kviteseid. Presumably idle.

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COMPAÑÍA MINERA CINCO DE MAYO. **MEXICO.**

Mine office: Mapimí, Durango, Mex. Property includes the Parrandera and Mimbre mines, carrying copper ores.

CLARA BARTON MINE. **MONTANA.**

Mine office: Delpine, Meagher Co., Mont. S. Southworth, manager. The mine, at Spring Creek, 20 miles from the Chicago, Milwaukee & Puget Sound railroad, has a 400′ shaft, with stoping in progress on the 400′ level. At last accounts the mine was shipping chalcopyrite averaging about 20% copper, presumably after selection, 20 miles by wagon to the railway station, for transportation to the Butte Reduction Works.

CLARK COPPER CO. **MEXICO.**

Office: Grosse Bldg., Los Angeles, Cal. Mine office: Alamos, Sonora, Mex. J. Ross Clark, president; Lester F. Scott, secretary and manager. Was promoted by Patrick Clark, J. Ross Clark, H. L. Percy, F. M. Lyons, James P. Harvey and F. M. Lawrence. Organized circa 1906, to operate in the Greenwater district, and still holds the Morning Glory group, considered worthless, which showed a fine body of carbonate ore, running up to 25% in copper tenor, but which cut out on the 80′ level. Of the 800,000 shares originally issued, 600,000 shares were divided among the incorporators, and 200,000 shares were sold at 50 cents each, giving $100,000 raised through stock sales, which was divided between the promoters and the treasury, latter getting only $50,000. Company was reorganized, 1908, at which time, after a hot controversy between the promoters and shareholders, the incorporators paid $40,000 cash into the treasury, and returned 400,000 shares of promotion stock. Company then took an option on the Promotorio mine, from the Alamos Copper & Silver Co., and put some miners at work, to the great benefit of the market price of the shares, but option on Mexican lands was forfeited, Sept. 1, 1909. Present property apparently consists of $18,000 cash and 400,000 shares of treasury stock, and company is said to have turned its eyes longingly in the direction of California oil lands.

CLIFTON-MORENCI COPPER CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Morenci, Graham Co., Ariz. Willard J. Smith, president; F. H. Haller, vice-president; W. J. McCormick, secretary; Edward F. Cuddihy, treasurer; preceding officers, Theo. Dengler, R. D. Blackburn, George J. Maas, Martin Voetsch, M. J. Harrington, W. R. Vivian and E. McCormick, directors. Organized, 1909, under laws of Arizona, with capitalization $1,000,000, shares $5 par. Company gave 40,000 shares to apply on purchase price of the property, and offered, Nov. 22, 1909, 100,000 shares for public subscription at $1 per share. Lands, 150 acres, unpatented, held on bond and lease, in the Copper Mountain district, 2 miles from Metcalf, 4 miles from Morenci and 8 miles from Clifton. Development includes a 620′ tunnel, in ore for 350′, with winzes of 10′, 33′ and 119′, said to be bottomed in ore averaging 16.2% copper and 7.3 oz. silver per ton. From the bottom of the 119′ winze a 28′ crosscut to the hanging-wall showed an ore chute of 8′ estimated average width, carrying ore assaying 14% copper and 7 oz. silver per ton, balance of crosscut being in ledge matter assaying 0.5% to 1.25% copper. Company plans building a 4-mile aërial tram from the mines to Morenci, nearest railway being at Metcalf, 2 miles distant.

CLONCURRY SMELTING & RAILWAY CO., LTD. **AUSTRALIA.**

Office: 375 Collins St., Melbourne, Australia. Mine office: Cloncurry, Beaconsfield Co., Australia. Hon. William Knox, chairman; preceding officer, Hon. W. L. Baillieu and A. Robinson, directors; E. H. Shackell, secretary. Organized June, 1908, under laws of Victoria, with capitalization £200,000, shares £1 par; issued, £100,000. Is controlled, through ownership of 60% of issued stock by Mount Elliott, Ltd., and 40% by Hampden Cloncurry Copper

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Mines, Ltd. Present property is a railroad, under construction, from Mount Elliott to Cloncurry, via Hampden. A smelter is planned to be erected later.

CLONCURRY SURPRISE COPPER & GOLD MINING SYNDICATE. AUSTRALIA.

Office: Brisbane, Queensland, Australia. Mine office: Cloncurry, Beaconsfield Co., Queensland, Australia. Property was under exemption from labor conditions, August, 1909, and the British Wonder lease has been let on tribute.

COBAR-GLADSTONE MINING CO. AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. Main shaft is 195′ deep. Mine produced, late 1908, about 10 tons of high grade ore, assaying about 35% copper after dressing. Company has secured ore giving some colors of gold.

COBAR THARSIS CO., N. L. AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. Property, about one mile north of Cobar, apparently has the continuation of the ore body of the Fort Bourke mine of the Cobar Gold Mines, and the East Cobar lode. Property formerly was known as the Ivanhoe and also as the East Cobar Copper Mine Extended. Development is by a 350′ shaft, showing a little low grade silicious ore, below commercial tenor. Work was suspended November, 1906.

COBRALLA COPPER CO. ARIZONA.

Mine office: Salome, Yuma Co., Ariz. Col. J. W. Sharpe, manager; R. V. Smith, superintendent. Lands, known as the Ultimatum group, in Tank Pass, adjoining the Alvin Development Co., and several miles east of Yuma Copper Co., in the Harcuvar Mountains, 9 miles northwest of Salome, carry about 4,500′ of the strike of various ore bodies. Property has a series of diabase dykes cutting limestone, showing ore carrying chalcocite, bornite and chalcopyrite, with limestone and diabase gangue, values being mainly in bornite and chalcopyrite, averaging 3 to 5% copper, 5 to 6 oz. silver and $1 to $8 gold per ton, with occasional streaks and masses of high grade ore. Mine has a 100′ shaft and a 200′ tunnel. Property considered promising.

COMPAÑÍA MINERA EL COBRE. MEXICO.

Office: Calle de Santa Teresa 6, Mexico, D. F. Mine office: Jungpeo, Zitácuaro, Michoacán, Mex. Alfred Stoffel, president; M. Herrle, secretary; E. Albert Armour, treasurer. Organized March 7, 1907, under laws of Mexico, with capitalization 95,000 pesos. Property is El Cobre y Anexas mines, carrying gold, silver and copper ores.

COCKBURN MINE. SOUTH AUSTRALIA.

Mine office: Cockburn, South Australia. Lands, 2 miles west of the Mutooroo mine, have a nearly north and south vein, dipping vertically to the west, carrying chalcopyrite. Mine is being developed by shafts.

COEUR D'ALENE-MONTANA MINING CO. MONTANA.

Mine office: Trout Creek, Sanders Co., Mont. A. G. Somes, president. Capitalization $500,000, shares 50 cents par. Lands, 8 claims and a millsite, 2 miles southwest of the Northern Pacific railroad at Trout Creek, on the Idaho-Montana divide. Development is by a 900′ tunnel, showing a vein of 30′ estimated width, carrying assay values in copper, lead and silver. Equipment includes a 2-drill air-compressor.

COLCHESTER GOLD & COPPER MINING & MILLING CO. COLORADO.

Office: Colchester, Ills. Mine office: Salida, Chaffee Co., Colo. M. E. Foster, president; T. T. Foster, vice-president; George Sullivan, secretary; E. B. Wear, treasurer; Thomas Penrose, general manager; preceding officers are the directors. Organized May, 1908, under laws of Colorado, with capitalization $500,000, shares $1 par. Lands, 4 claims and a tunnelsite, unpatented, area 200 acres, on Cleora Mountain, northeast of Salida. Develop-

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ment includes a 40′ incline shaft and a 165′ vertical shaft left by former owners, also new tunnels of 55′ and 110′. Property shows ore giving assays of $10 to $63 per ton in gross values from copper, gold and silver.

COLE DEVELOPMENT CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. P. J. Cole, president; P. J. Cole, Jr., secretary and treasurer. Organized September, 1909, under laws of Arizona, with capitalization $300,000, shares $1 par. Lands, 17 claims, known as the Cole & Goodwin group, in a tract 4 claims wide and 6,000′ long, extending along Mineral creek, 3 miles from the Gibson mine, circa 12 miles southwest of Globe, the nearest available railroad point, and 10 miles northwest of Ray. Country rock is Pinal schist, carrying a fault known as the Cole & Goodwin that cuts the schist diagonally, and is traceable about 1½ miles. Mine has an old 320′ incline shaft, equal to 220′ vertical depth, showing one vein of high grade copper ore and several bodies of concentrating ore, high grade ore being bornite and chalcopyrite. Work of deepening the shaft was begun September, 1909, and shaft was 335′ deep Oct. 24, 1909. Ore is mainly chalcopyrite in the shaft, estimated to average 8 to 10% copper, and high grade ore was encountered at depth of 265′. Property also has several short tunnels, showing schist impregnated with pyritic sulphide ore, there being a 135′ crosscut tunnel about one-half mile from the shaft, and a 480′ crosscut tunnel 1,700′ west of the shaft, with portal 500′ vertically below the collar of the shaft. Equipment includes a 22-h. p. gasoline hoist.

COLLIER CREEK COPPER CO. **OREGON.**

Mine office: Gold Beach, Curry Co., Ore. Frank Berry, superintendent. Property, showing auriferous and argentiferous copper ore, was under development with a small force at last accounts.

COMPAÑÍA MINERA DE COLÓN y LIBERTAD, S. A. **MÉXICO.**

Office: Mexico, D. F. Mine office: Zacualpam, Sultepec, México, Mex. Organized Jan. 5, 1898, under laws of México, with capitalization 60,000 pesos. Property is the Cristobal Colón and La Libertad mines, having ores carrying copper and silver values.

COLORADO RIVER COPPER & GOLD MINING CO. **NEVADA.**

Mine office: Las Vegas, Lincoln Co., Nev. Development is by a shaft and 2 short tunnels, showing ore giving good assays in copper and gold.

COLUMBIA-BUTTE MINING & MILLING CO. **MONTANA.**

Mine office: Whitehall, Jefferson Co., Mont. H. T. Heyder, manager. Lands, 5 claims, about 5 miles from Whitehall. Some ore was shipped, 1908, to the Butte Reduction Works. Apparently company is somewhat uncertain regarding titles to some of its lands.

COLUMBUS COPPER MINING CO. **UTAH.**

Dead. Formerly at Bingham Canyon, Salt Lake Co., Utah.

COMBINATION GOLD & COPPER CO. **CALIFORNIA.**

Office: Carson City, Nev. Mine office: Ingot, Shasta Co., Cal. James T. Davis, managing director. Lands, 14 claims, unpatented, on Pitt river, circa 5 miles from Copper City, having about 50′ of tunnels. Presumably idle.

COMPAÑÍA MINERA LA CONCEPCIÓN y ANEXAS. **MEXICO.**

Office and mine: Catorce, San Luis Potosí, Mex. Organized under laws of Mexico, with capitalization 300,000 pesos, shares 100 pesos par. Property has ore carrying values in copper, lead and silver. Idle at last accounts.

CONCONULLY COPPER CO. **WASHINGTON.**

Mine office: Conconully, Okanogan Co., Wash. Lands, adjoining the Wellington mine, show a vein traceable for about one mile through the company's claims, giving ore assaying well in copper, lead and silver. Mine has a 200′ tunnel and December, 1908, management planned increasing working

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forces and getting out ore for immediate shipment to the Granby smelter, but apparently failed to make such shipments.

COMPAGNIE MINIÈRE DU CONGO FRANÇAIS. FRENCH CONGO.

Office: 182 Avenue de Saxe, Lyons, France. Mine office: Ramanga, French Congo. G. Linière, G. Planche, F. Planche and E. Rampon, directors; M. F. Bagneux, commissaire. Organized June 20, 1905, under laws of France, with capitalization 1,000,000 francs, shares 500 francs par.

Property, known as the Mindouli mine, is in the Bouenza district, in the Kouilou-Niari basin, circa 300 kilometers from the coast. Lands show cupriferous sandstone, overlying limestone, surface ores being mainly malachite, with some cuprite, both argentiferous. These deposits were worked by natives, in a primitive way, for centuries, and a considerable trade once existed in copper and copper utensils, but this became extinct with French occupation. Apparently the ore deposits are extensive, but it is doubtful if the mine is workable, under modern conditions, without railroad transportation, now lacking.

CONSOLIDATED EUREKA MINING & TUNNEL CO. COLORADO.

Mine office: Eureka, San Juan Co., Colo. L. F. Stead, superintendent. Mine carries copper and lead ores. Equipment includes a small Leyner air-compressor.

CONSOLIDATED GOLD & COPPER QUEEN MINING CO. WASHINGTON.

Office: 613 Pioneer Blk., Seattle, Wash. Mine office: Mayfield, Lewis Co., Wash. W. H. Springfield, president; George Estes, vice-president; J. S. McKenzie, treasurer. Capitalization $1,250,000, shares $2.50 par. Lands, 9 claims, having open cuts on a dyke of 40′ estimated width, showing ore giving average assays of about $8 per ton in gold.

CONSTITUTION MINE. CALIFORNIA.

Office and mine: Campo Seco, Calaveras Co., Cal. C. Borger, owner. Lands, 3 claims, also mineral rights to sundry adjoining property. Development is by a 400′ shaft, on the Constitution claim, showing patches of good ore, also a 45′ shaft showing a 4′ vein of ore similar to that of the Penn Chemical Company's mine, assaying 15% copper, with small values in silver and gold.

CONTINENTAL MINES, POWER & REDUCTION CO. COLORADO.

Office: P. O. Box 1374, Denver, Colo. Mine office: Yankee, Clear Creek Co., Colo. Henry I. Seeman, president and general manager; Frank R. Baker, vice-president; William H. Warinner, secretary. Organized Nov. 7, 1905, under laws of Colorado, with capitalization $5,000,000, shares $1 par; issued, $4,000,000. Company reported, Aug. 31, 1908, having $24,531.17 cash on hand, without accrued liabilities.

Lands, 171 claims, area upwards of 2,000 acres, partly patented, also about 100 acres in mill and smelter sites, in the Lincoln district. Country rocks are gneiss, schist and granite, with porphyry dykes, carrying fissure veins with quartzite gangue, property showing about 75 veins, with reported width of 3′ to 300′, said to be traceable 4 miles. Ores, which are sulphide, are reported by company to average 2 to 14% copper, 5 to 40% lead, 1 to 3% zinc, 1 to 3 oz. silver and $5 to $500 gold per ton. Development is by shafts of 200′, 235′ and 175′, with numerous shallow shafts, and by numerous tunnels of 100′ and upwards, three longest being 800′, 1,500′ and 2,200′, latter, known as the Seeman crosscut tunnel, 8x8′ in size, being planned to give a 5,000′ back. The mine has about 3 miles of workings, estimated to show 500,000 tons of ore blocked out.

Equipment includes a 25-h. p. hoist, 6-drill Sullivan air-compressor, air and electric drills. Buildings include a 30x50′ machine shop, hotel, 3 boarding houses and 12 dwellings. The mill, 50x150′, of wood, with iron roof and siding, of 60 tons daily capacity, has 12 quick-drop gravity stamps, one Blake crusher,

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9 Card, Wilfley and Bartlett tables and 2 sizers. Company employs circa 60 men, and plans enlarging the mill to 100 stamps.

CONTINENTAL-MORRIS MINING CO. **WYOMING.**

Office: Morris, Ills. Mine office: Encampment, Carbon Co., Wyo. G. A. Leach, secretary. Lands, 7 claims, 6 patented, area 125 acres, also a 20-acre millsite, in the Battle Lake district, formerly held by Continental Mining Co. Lands carry several fissure veins, of which two, opened by tunnels of 125′ and 820′, show a vein of 15′ estimated average width, said by former owners to give average assays of 13.5% copper, 4.3 oz. silver and $5 gold per ton, which figures are considered excessive. Mine is served by the Southern Wyoming tramway, the third power station of the line being located on the Continental property. Equipment includes a machinery outfit and several small mine buildings. Idle at last accounts.

COOTAMUNDRA MINE. **AUSTRALIA.**

Mine office: Cootamundra, Bland Co., N. S. W., Australia. Lands, formerly known as the Mount Felstead copper and silver mine, are 7 miles northwest of Cootamundra. Country rock is quartz-felsite, much crushed, carrying quartz veins with ferruginous jointings, with an ore body of 1′ to 6′ width, about a quarter of which is ore, including cuprite, melaconite, azurite, malachite and chalcopyrite, also lead carbonates and sulphides, and sphalerite. Ore is decidedly argentiferous, selected ore ranging about 50 oz. silver per long ton, with traces of gold. Development is by shafts of 25′, 52′ and 145′. Production, 1907, was 85 long tons of ore, shipped to Swansea for reduction, giving an estimated yield of circa 100,000 lbs. fine copper, with considerable silver values.

COPPER CHIEF EXTENSION MINING CO. **ARIZONA.**

Office: 237a Sumpter St., Brooklyn, N. Y. Mine office: Jerome, Yavapai Co., Ariz. R. A. Williams, president; W. P. Scott, secretary and treasurer. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 7 claims, area circa 140 acres, south and west of the Copper Chief and about 8 miles south of Jerome, showing small veins carrying ores assaying 2 to 10% copper, under development by shaft.

COPPER CREEK MINING CO., LTD. **TASMANIA.**

Mine office: Ulverstone, Tasmania. Lands, 40 acres, 12 miles from Ulverstone, near Gunn's Plains, on Walloa creek, a tributary of the Leven river. Property shows a series of parallel bands of cupriferous calcite, with slate gangue, occurring in slate, developed by tunnels of 60′ and 280′, with some opencuts, yielding samples that have assayed 25% copper and 9 oz. 6 dwts. silver per long ton. Water power is available from the creek.

COPPERFIELD CONSOLIDATED MINING CO. **COLORADO.**

Office: Majestic Bldg., Denver, Colo. Mine office: Copperfield, Frémont Co., Colo. J. B. Conger, president and manager. Organized 1909, as a merger of the Red Gulch Gold-Copper Mining & Milling Co., Frémont Copper Mines Co. and Queen Princess Copper Co., merger becoming effective Nov. 1, 1909.

Lands, in vicinity of Copperfield, 9 miles north of the nearest railway at Cotopaxi, include the Red Gulch group of 11 claims, also 83 acres in the Ilse district of Custer County, Colorado, and sundry claims in the Monarch district of Chaffee County, Colorado. The Red Gulch group has a 210′ shaft, developing silver-lead ore and shipped, 1907, some ore of good grade. The Queen Princess group, 14 claims, area 147 acres, in the Red Gulch district, shows a main ore body said to average 2.5% copper, and has secured ore assaying 40 to 60% in copper tenor, and former owners claimed that trial shipments returned 18% copper. Main vein was claimed by former owners to be 300′ wide. Development is by a 135′ shaft, with steam power and hoist. The Queen Princess vein now is said to average 200′ in width, carrying an average of 2.6% copper, with

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some high grade streaks up to 30% in tenor. The Copper Prince vein No. 1, from which several shipments were made, is claimed to be 146′ wide, with neither foot nor hanging wall located, and it is said that ore shipped from this vein never ran lower than 5.5% copper and 3.5 oz. silver in carload lots, and up to 31% copper and 12.5 oz. silver, from well-selected ores. In addition to the 3 companies merged, the Copperfield Consolidated took over the Copper Anchor, Glidden and Alerta groups of claims. The property as a whole shows 5 parallel veins, of exceptional width. The Red Gulch group has about 2,000′ of workings, the Frémont group about 2,000′, and the Queen Princess group about 1,000′, giving about a mile of workings. Company was said, November, 1909, to have contracted for a mining plant to include three 150-h. p. return tubular boilers and 2 Corliss engines, direct-connected to electric generators planned to operate the hoists, air-compressor and pumps.

COPPER GULCH MINING CO. **CALIFORNIA.**

Mine office: Cima, San Bernardino Co., Cal. Carl Wing, superintendent. Lands, in the Cape Cañon district, are developed by a 165′ shaft.

COPPER HILL MINING CO. **MONTANA.**

Mine office: Quartz, Missoula Co., Mont. P. L. Eberhardt, secretary. Organized circa March, 1909, with capitalization $250,000, shares 25 cents par. Lands, 12 claims, in Sunrise Gulch, on the Montana side of the Montana-Idaho divide, showing an outcrop of 25′ to 50′ width. Development is by a 75′ tunnel, showing ore said to average about 4% in copper tenor.

COPPER KING MINING CO. **YUKON.**

Mine office: Whitehorse, Yukon. Lands include the Copper King, Rabbit Foot, Anaconda, Spring Creek and miscellaneous claims, in the Wheaton district, near Whitehorse. The Copper King mine has several shallow shafts and opencuts, and a crosscut tunnel, in limestone, cutting ore 150′ from the portal. Property shows high grade ore, in small quantities, at numerous points. Equipment includes a hoist and air-compressor. Production, to end of 1906, shipped to British Columbia smelters, was circa 400 tons of ore, averaging about 15% copper and $1 to $2 combined gold and silver values per ton. No ore was shipped 1907, but several thousand tons were stocked. Company employed circa 30 men at last accounts. Property considered promising, but requires further development.

COPPER KING MINING & SMELTING CO. **NEVADA.**

Mine office: Luning, Esmeralda Co., Nev. Property includes the Mayflower group, said, August, 1909, to be under option to the Nevada-Pacific Copper Co.

COPPER PRINCE MINING CO. **IDAHO.**

Office: Jacobs Bldg., Fairmont, W. Va. Mine office: Wallace, Shoshone Co., Idaho. Lands, 12 claims, area 240 acres, near the main line of the Chicago, Milwaukee & Puget Sound railroad, showing a vein of 15′ to 20′ estimated width, traceable 6,600′, the entire length of the property, giving ores which have assayed 3 to 60% copper, with values in lead and silver, and a small amount of gold. Development is by tunnel, and a three-compartment shaft is planned. Company also plans erecting a $5,000 hotel and boarding house, building a one-mile flume and installing a 10-drill air-compressor.

COPPER QUEEN & CRESCENT MINING & SMELTING CO. **IDAHO.**

Mine office: Salmon City, Lemhi Co., Idaho. Emerson Hill, superintendent. Lands, known as the Queen of the Hills mine, 7 miles west of Salmon City, are developed by a 400′ tunnel, said to show a considerable ore body, apparently carrying values mainly in gold.

COPPER QUEEN DEVELOPMENT CO. **ARIZONA.**

Dead. Sold lands, 1909, to Nevada-Arizona Copper Co. Formerly at Hillside, Yavapai Co., Ariz.

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COPPER QUEEN, LTD. **CAPE COLONY.**

Office: 29 Goodman's Bldgs., Commissioner St., Johannesburg, Transvaal. Mine office: Hay, Griqualand West, Cape Colony. W. P. Taylor, W. Blelock and F. J. Quintin, directors. Organized circa October, 1908, under laws of Transvaal, with capitalization £4,000, shares £1 par. Property is a 2-year option on a 99-year mineral lease over the Nieuwvlei and Zwaartveld farms, with a total area of 6,170 morgen, northeast of Bultfontein and northwest of Prieska. Ore apparently is associated with diabase dykes cutting through the Griquatown beds, and property is said to show ore of 30 to 35% copper tenor, after dressing. Development at last accounts was confined to trenching, but management planned sinking a shaft.

COPPERSMITH MINING & MILLING CO. **MONTANA.**

Office: 107 Second St., Moscow, Idaho. Mine office: Lothrop, Missoula Co., Mont. F. W. E. Schmitz, president and general manager; Charles E. Merwin, secretary; Benton S. Merwin, assistant secretary; John Allen Black, mine superintendent. Organized January, 1909, with capitalization $3,000,000, shares $1 par.

Lands, 8 claims, unpatented, area 160 acres, in 2 groups, being the Coppersmith group of 6 claims and the Inverness group of 2 claims, also a water-right and millsite, about 6 miles up Petty creek from Lothrop. Property carries some good timber. The Coppersmith claim is said to have been first discovered and located by John C. Frémont, then a lieutenant in the regular army, previous to the American Civil War. Property shows 3 main veins, one, claimed to be over 100′ wide at outcrop and traceable 1,200′, giving ore assaying 2 to 15% copper. The Exty vein, 500′ from and parallel with the Coppersmith, is reported as 15′ wide, and the Inverness vein, about 4′ wide, in slate, is said to carry high grade copper ore with talcose gangue. Development is by various opencuts, prospect holes and 2 tunnels, lower reported by company, Sept. 8, 1909, to be 67′ long, in ore below commercial grade, but ore expected when tunnel gets under the iron capping, circa 300′ further.

COPPER WORLD MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Property was under development, with a small force, at last accounts.

CORBIN-CLANCEY CREEK MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Meyer Gensberger, manager; Capt. W. C. Hosking, superintendent. Organized circa June, 1909, under laws of Montana, with capitalization $100,000, shares $1 par. Lands, 2 claims, on Gregory Gulch, west of and adjoining the Calumet-Corbin. Development is by an old 700′ tunnel, and management plans driving a new tunnel on the Minnesota vein.

CORBIN COPPER CO. **MONTANA.**

Office: 60 Congress St., Boston, Mass. Mine office: Corbin, Jefferson Co., Mont. Employs circa 50 men. Stephen R. Dow, president; Richard M. Edwards, general manager; Alvin R. Bailey, secretary and treasurer; preceding officers, George E. Learnard, Noah W. Jordan and David E. Dow, directors; Quinn Crowley, superintendent. Organized January, 1909, under laws of Michigan, with capitalization $3,750,000, shares $25 par. Annual meeting, third Tuesday in April. On May 10, 1909, had 35,000 shares unissued, with about $25,000 cash in treasury.

Lands, 48 claims, partly fractional, area circa 900 acres, fairly timbered. Company began existence with 28 claims, area 568 acres, being the New York & Corbin group, with a townsite called Glenburg, to which various claims have been added since organization. Lands, in the Wickes district, are on both sides of Clancey Creek, for 2 miles, on the western side of a rhyolite hill, across from the Boston & Corbin and Alta, which are on the eastern side.

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Lands are reported to carry 10 different leads, including the north lead, outcropping for circa 3 miles on the company's property. Property shows a system of 5 parallel leads in a cross-section of 600′ to 800′, with practically east and west strike, estimated to average about 20′ each in width, crossed by a diagonal vein, with an intrusive rhyolite 1,000′ to 2,000′ wide.

Development includes a shallow shaft, left by former owners, but new work is by 5 tunnels. Main tunnel is planned to give a back of 1,723′. Tunnels are known as the Kathleen, Dewey, Bonanza, Rosalie and Anna. The Dewey tunnel, which cuts the vein diagonally, was 600′ long September, 1909, in a vein of about 12′ estimated average width, carrying copper ore of 5% estimated average tenor, with lead and silver values. The Bonanza tunnel is 210′ vertically below the Dewey, and the Rosalie tunnel is 610′ vertically below the Dewey. On the Bahkaama claim a 6′ fissure vein in granite was cut August, 1909, carrying a 6″ paystreak of high grade bornite and chalcopyrite, with balance of ore of concentrating grade. Work has been pushed systematically, and tunnels are being driven at the rate of about 200′ each per month. During the first 5 months of operation 3,042′ of development work was done, of which 2,430′ was in ore and 612′ was in crosscuts, and mine is being opened at rate of about a quarter-mile monthly.

Property has a good machinery equipment, with necessary mine buildings, and has developed ore of fair grade at a number of different points.

CORBIN HIDDEN TREASURE COPPER CO. **MONTANA.**

Dead: Was organized February, 1909, under laws of Minnesota, with capitalization $500,000, shares $5 par, by Thos. A. Merritt, Fred H. Merritt, Thos. Furness, Martin Rosendahl, J. L. Meixell and C. W. Andrus. Property, including lands of the Corbin-Wickes Copper Mining Co., was 7 claims, area 96 acres, and the Parks Ranch of 40 acres, held under a $146,000 bond and lease, which was thrown up shortly after organization. Formerly at Corbin, Jefferson Co., Mont.

CÓRDOBA COPPER CO., LTD. **SPAIN.**

Office: 5 Queen Street Place, London, E. C., Eng. Operating office: Manriques 9, Córdoba, Sevilla, Spain. Mine office: Estación de Cerro Muriano, Sevilla, Spain. W. Frecheville, chairman; Richard E. Carr, agent; preceding officers, Lord Vaux, J. E. Champney, J. Taylor, Edgar Taylor and G. Cornwallis West, directors; F. H. Williams, secretary; John Taylor & Sons, managers; W. H. Rundell, mine superintendent. Organized Aug. 5, 1908, under laws of Great Britain, with capitalization £200,000, shares 5s par; issued, 693,780 shares, fully paid. Company is an amalgamation of the Cerro Muriano Mines, Ltd., and the North Cerro Muriano Copper Mines, Ltd. Company gave Cerro Muriano shareholders 2 fully paid shares for one fully paid preference share, and one fully paid share for 10 fully paid ordinary shares, and the debenture of £18,000 held by North Cerro Muriano Copper Mines, Ltd. was canceled, and holders of option over preference shares at par received an option over 70,000 shares of the new company, at par, expiring April 4, 1910. Shareholders in North Cerro Muriano received 2 fully paid shares for every old share of 19s. paid, and 20,000 shares were allotted to the holders of 20,000 fully paid shares, the 116,000 shares held in reserve by Cerro Muriano being canceled.

Lands, 409 hectares, circa 10 miles from Córdoba in the districts of Córdoba and Obejo, mainly held under perpetual lease from the state, with various leasehold tracts. Mine is served by the Ferrocarril Andaluces. Property shows sundry old workings, dating from the Roman era, and these mines were worked by the ancients to a depth of at least 400′, notwithstanding their wetness. The property shows 6 large and several small fissure veins, in mica-schist, diorite and quartzite, carrying chalcopyrite and pyrite, with gangue

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of calcite, quartzite and country rock. Veins are reported to have widths of 12" to 40', with pro en lengths as follows: Calavera, 1,635'; Excelsior, 635'; Lorenzo, 4,575'; Isabel, 5,550'; Cerro Muriano, 8,500'. Some ore taken from old Roman workings assayed 28 to 34% copper. Main shafts are the Santa Victoria, bottomed in the footwall at 726', and the San Rafael, 917' deep and very wet, which intersected the vein at depth of 870'. The San Rafael shaft, 300 meters from the Santa Victoria, shows a vein of 5 to 13 meters width, with better portions worked out by the Romans in the upper part of the mine. The San Rafael shaft has a Hawthorne-Davey Cornish pump, with 54" high-pressure cylinder having a 96" stroke, and 94" low-pressure cylinder with a 16' stroke, calculated to operate to a depth of 1,580'. The San Guillermo shaft, 300 meters from the San Rafael, suspended sinking at 42' depth. Ore reserves were estimated, March, 1908, at 100,000 long tons of 2.7% copper tenor.

Equipment includes 3 hoists and a 10-drill Walker air-compressor, and there is a small smelter on the property. This property is one of the largest and most interesting of the old Hispano-Roman mines, and was famous, before the Christian era, for the high quality of copper and brass produced from its ores, but was entirely idle for nearly 2,000 years, until taken over, 1903, by the predecessors of the present company.

CORDOVA COPPER CO. **ALASKA.**

Mine office: Cordova, Alaska. C. Prelli, superintendent. Property, on Fleming Spit, about a mile from Cordova, is said to show a 10' vein, and a small shipment to the Tacoma smelter, early 1909, contained considerable native copper.

CORDOVA COPPER CO. **ARIZONA.**

Office: 403 Lonsdale Bldg., Duluth, Minn. Mine office: Globe, Gila Co., Ariz. Henry B. Hovland, president; R. B. Whitesides, vice-president; Harvey P. Smith, secretary; preceding officers, Louis Rouchleau and Hoval A. Smith, directors; Michael M. McCarthy, manager. Organized May, 1909, under laws of Arizona, with capitalization $3,000,000, shares $10 par, as successor of Globe Consolidated Copper Co., which is controlled through stock ownership. and will be liquidated. The Globe stock was retired by 100,000 shares of Cordova full paid stock, exchanged pari passu for full paid Globe shares, and 20,000 shares of Cordova $2 paid stock were given in exchange for 20,000 shares of $2 paid Globe Consolidated, the public being offered 105,000 shares, $2 paid, giving a total issue of 225,000 shares, leaving 75,000 shares in the treasury.

Lands include the former holdings of the Globe Consolidated Copper Co., described page 721, also the Eureka group, area circa 130 acres, and the mineral rights under the townsite of Cordova, now known as the Miami townsite. Total holdings are approximately 1,000 acres, including the Globe Consolidated lands.

The Eureka mine, at Miami, between the Miami, Inspiration and Live Oak mines, shows, in the old workings near surface, considerable chrysocolla of 5 to 10% copper tenor, and shipments were made, 1906-1907, under management of I. N. Kinsey, to the Old Dominion and Calumet & Arizona smelters, for fluxing purposes. Production, 1907, was 528,000 lbs. fine copper, and the Eureka is said to have produced about $400,000 worth of silicious ore in all.

New development on the Eureka by present owners consists of the 3-compartment Sullivan shaft, sunk on the Miami line, 475' deep, Oct. 15, 1909. This shaft encountered, at depth of 360', gray schist, showing some disseminated chalcocite, with considerable carbonates, with average assay tenor of 1.5 to 2% copper. Crosscutting was begun on the 475' level, October, 1909, in gray Pinal schist, carrying ore slightly below commercial tenor. Management is

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considered good, and property of promise, though results to date from both properties have been somewhat disappointing.

CORDOVA EXPLORATION CO., LTD. **SPAIN.**

Dead. Company floated the Cerro Muriano Mines, Ltd. Was liquidated Sept. 21, 1908. Formerly at Córdoba, Sevilla, Spain.

CORDOVA-TACOMA COPPER CO. **ALASKA.**

Office: Tacoma, Wash. Mine office: Cordova, Alaska. Henry Hewitt III, manager. Mine, near Cordova, is about 1,200′ above sea-level, with a water power available. Ore is chalcopyrite, estimated to average 20% copper. Company is said to plan installing a $75,000 plant, to operate on a new process, planned to turn out electrolytic copper from raw ore in the four operations of crushing, roasting, leaching and deposition.

CORMACK BROS. **MEXICO.**

Mine office: Etzatlán, Ahualulco, Jalisco, Mex. Edward Finley, superintendent. Property is a 25-ton custom smelter, treating mainly ore from the Magistral mines.

COMPAÑÍA MINERA RAMÓN CORONA. **MÉXICO.**

Office: San Pedro, Coah., Mex. Mine office: Naica, Camargo, Chihuahua, Mex. Francisco Madero, president; George Stinson, general manager. Property, adjoining the Naica mine, carries considerable bodies of lead, silver and copper ores, but apparently only silver-lead ore is being shipped.

CORRALES MINING & MILLING CO. **MEXICO.**

Mine office: Rodeo, San Juan del Rio, Durango, Mex. Mine carries auriferous copper ore. Equipment includes a small steam plant. Company employed about 40 men at last accounts.

COURTLAND MINING CO. **ARIZONA.**

Mine office: Courtland, Cochise Co., Ariz. John Dignan, manager. Organized circa February, 1909, to develop a group of claims in the Dragoon Mountains, near Courtland.

COWLEY COPPER DEVELOPMENT SYNDICATE, LTD. **AUSTRALIA.**

Office: 1 London Wall Bldgs., London, E. C., Eng. Mine office: Goulburn, N. S. W., Australia. Max Michaelis and L. Breitmeyer, directors; Hugo Sanzenbacher, secretary. Organized March 27, 1907, under laws of Great Britain, with capitalization £45,000, shares £1 par; issued, 15,000 shares, 10s. 6d. paid in.

CROWL CREEK SOUTH COPPER MINING CO., N. L. **AUSTRALIA.**

Office and mine: Shuttleton, Mouramba Co., N. S. W., Australia. Property, south of Shuttleton, has a 125′ shaft, showing slight copper carbonate stains, but without appearance of commercial ore or a defined ore body. Idle and apparently moribund.

CROWN COPPER CO. **ARIZONA.**

Mine office: Wendendale, Yuma Co., Ariz. Lands, circa 25 miles northwest of Wendendale, are developed by a shallow shaft and a 300′ tunnel.

CROWN GOLD & COPPER CO. **WASHINGTON.**

Mine office: Leavenworth, Chelan Co., Wash. Lands, 8 claims, at the head of Icicle Creek, about 35 miles north of Leavenworth, said to show a 75′ vein carrying ore giving high assay values in gold, silver and copper.

CRUSADER CONSOLIDATED MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. W. H. Tibbals, president; F. O. Frick, secretary and treasurer. Organized circa March, 1909, under laws of Utah, with capitalization $300,000, shares $1 par. Lands adjoin the Plutus, in the Tintic district.

CRYSTAL COPPER CO. **CALIFORNIA.**

Mine office: Ingot, Shasta Co., Cal. W. S. Tyler, president; J. C. Harrington, vice-president; J. L. Maginnis, secretary and treasurer. Lands, 23

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claims, unpatented, adjoining the Balaklala on the north, slightly developed by 300′ of tunnels. At last accounts company planned testing lands by diamond drill.

CSEGEZ CONSOLIDATED MINES CO., LTD. **HUNGARY.**

Office: 7 Union Court, London, E. C., Eng. Mine office: Csegez, Torda, Hungary. P. Klein, W. E. Thomson and E. Phillips, directors; H. Bawden, secretary. Organized Dec. 24, 1907, under laws of Great Britain, with capitalization £60,000, shares £1 par; issued, 45,007 shares, fully paid. Lands, 61 claims, in the Torda district. Company gave £45,000 in fully paid shares for its lands, and apparently is without capital, and the mine is idle.

CURROWONG COPPER CO. **AUSTRALIA.**

Dead. Was organized May, 1907, and took over the Currowong mine, but abandoned same January, 1908, finding no continuance of ore. Formerly at Goulburn, N. S. W., Australia.

CURROWONG MINE. **AUSTRALIA.**

Mine office: Goulburn, N. S. W., Australia. Mine, discovered 1862, was owned originally, 1865, by Currowong Copper Mining Co., reorganized, 1872, as Phoenix Copper Co., and property was held, 1896, by Currowong Copper & Gold Mining Co., Ltd. Was last owned by Currowong Copper Co., organized 1907, but which abandoned the mine January, 1908. Lands, 3 miles from Lake George and 22 miles from Goulburn, are 13 miles from the nearest railroad at Bangalore. Property has 2 veins, in slate and sandstone, associated with highly altered igneous rock, largely epidotal, and probably originally diorite. Vein is said to be 25′ wide at depth of 90′, and is developed by shafts of 66′, 76′, 77′ and 168′. One shaft, sunk in the gossan, gave an assay of 5 oz. silver and 11 to 14 dwts. gold per long ton. In 1868 the mine had a smelter with 6 small matting furnaces. Property has yielded considerable ore in the past, and, in 1866, shipped about 1,000 long tons of 14% ore to Sydney, paying a dividend of 6%, amounting to £6,000, but the mine proved unprofitable in the following year. Idle.

CUTTER COPPER CO. **NEW MEXICO.**

Mine office: Cutter, Sierra Co., N. M. Lands, 14 claims, including the Red Tiger claim, which has a 90′ shaft with a 110′ drift on a 3′ vein claimed to average 20% copper, with good gold and silver values.

DALY MINES CO. **ARIZONA.**

Office: 534 Byrne Bldg., Los Angeles, Cal. Mine office: Bouse, Yuma Co., Ariz. Carroll J. Daly, president; Henry J. Daly, vice-president; Joseph A. McBride, secretary and treasurer; preceding officers, E. C. Daly and John H. Clancy, directors; Angus R. Lindley, attorney; Dr. Ernest A. Haggott, consulting engineer. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par; issued, $100,000. Lands, 16 claims, known as the Vulcan group, in the Plomosa district, 8 miles south of Bouse. Property shows old workings, consisting of pits and shafts of 10′ to 35′ depth and various opencuts, showing oxidized surface ores assaying 2 to 10% copper and $1 to $3 per ton in combined gold and silver values. The Hat shaft, 75′ deep, is being sunk on the Hat claim, and a 2-compartment shaft is being sunk on the Vulcan No. 2 claim, 1,200′ east of the Hat, where there is a 100′ outcrop of iron gossan, traceable circa 900′, showing copper carbonates at several points in a leached zone markedly similar to the exposures on the Hat claim.

DAWSON MINING CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. H. S. Roper, superintendent. Property adjoins the Harris Copper Co., and was under development late 1908.

DECKER CANYON MINING CO. **UTAH.**

Mine office: Heber, Wasatch Co., Utah. Jesse Buckner, president; F. P. Hindmarsh, secretary and treasurer. Capitalization $50,000, shares 5 cents par.

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Lands, south of the Mountain Lake mine, about 3 miles from Heber, have a 75′ shaft and 1,100′ of tunnels, showing a little ore giving assay values in copper, lead, silver and gold.

DELMAS CONSOLIDATED COPPER CO. **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Bullion, Elko Co., Nev. P. D. Delmas, vice-president and general manager. Company succeeded the Delmas Copper Co., circa July, 1908. Lands, in Leigh Cañon, 6 miles from a railroad, are said to be extensive. Property shows a 30″ fissure vein of high grade argentiferous ore, and contact deposits in wollastonite, near granite, estimated at 20′ to 200′ in width. Development is by a 170′ tunnel, planned to give a back of 800′ at length of 1,600′. Mine is claimed to show 6′ of ore assaying up to 14% copper, 211 oz. silver and $9.60 gold per ton. Shipments of 20 carloads of ore previous to end of 1908 are said to have given average returns of 10.5% copper and 70 oz. silver per ton. Property considered promising.

DEMING SMELTER. **NEW MEXICO.**

Owned by National Mining & Smelting Co., at Deming, Luna Co., N. M.

DESERET VIEW MINING CO. **UTAH.**

Office: Ogden, Utah. Mine office: Lucin, Box Elder Co., Utah. C. A. Hickenlooper, president; N. J. Harris, vice-president; W. A. Hickenlooper, secretary; John Walker, treasurer. Organized September, 1908, under laws of Utah, with capitalization $25,000, shares 10 cents par.

DIANA GOLD & COPPER EXPLORATION CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Nicholas Schmittroth, president; Anna Schmittroth, vice-president; John Boehmer, secretary and treasurer; preceding officers, Hannah Boehmer, Frank B. Stephens, Vincent Schmittroth and Robt. E. Porter, directors. Property is in the Big Cottonwood district.

G. RUIZ DÍAZ. **PERÚ.**

Office and works: Cerro de Pasco, Junín, Perú. Property is two small matting furnaces, known as San Miguel, of 6 to 8 metric tons daily capacity and El Rayo, of 8 tons daily capacity.

DIXIE QUEEN COPPER MINING CO. **IDAHO.**

Mine office: Sand Point, Bonner Co., Idaho. Andrew Christensen, general manager; preceding officer, Wm. C. Ames, Chas. Edwards and Ignatz Weil, directors. Capitalization $500,000. Lands, 5 claims, in the Lakeview district.

DJEBEL CHOUICHIA MINE. **TUNIS.**

Mine office: Souk El Arba, Tunis. Property carries mainly malachite and azurite, with occasional chalcopyrite and tetrahedrite, in limestone near a contact with hematite. The antimony and arsenic in the tetrahedrite produce considerable speiss. The smelter has two 30-ton circular water-jacket blast-furnaces, using coke, costing f65 per ton delivered, to the extent of 13.5% of the copper ore charge. Silicious flux is used generally, but occasionally the mixture of oxidized ores and pyrites is smelted without flux. Product is speiss and copper matte of 35% to 50% copper tenor, sold mainly in Italy, for the manufacture of copper sulphate.

DOLD & VOELKER. **MEXICO.**

Mine office: Ayutla, Autlán, Jalisco, Mex. Property is the Guadalupe mine, from which small shipments of high grade copper ore with silver values have been made.

DONALD COPPER CO. **BRITISH COLUMBIA.**

Office: Spokane, Wash. Mine office: Midway, Boundary district, B. C. J. H. Tilsley, president; C. B. LeMaster, secretary; J. T. Van Haas, consulting engineer; J. D. Graham, superintendent. Lands, known as the Bruce group, 1 mile from a railway, with wagon road connecting, have about 400′ of tunnels, cutting a vein showing ore assaying 5 to 6% copper and $5 to $6 gold per ton, and a 10′ vein of ore is shown in an opencut.

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DONKEY MINE. **CALIFORNIA.**

Owned by Western Zinc Mining Co., at Ingot, Shasta Co., Cal.

DONNELLY MINING & REDUCTION CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. B. N. Ramsey, superintendent. Property carries auriferous and argentiferous lead and copper ores. Equipment includes water power and an air-compressor.

DOUGLAS-ARIZONA-SONORA DEVELOPMENT CO. **ARIZONA.**

Office: Douglas, Ariz. Mine office: Patagonia, Santa Cruz Co., Ariz. L. M. Raines, president; P. J. McIntyre, treasurer. Lands, known as the Silver Queen group, adjoin the World's Fair mine on the north, and are supposed to carry the extension of the World's Fair ore bodies. Property is said to show a series of ore bodies carrying high values in silver, with some lead and copper.

DULUTH-MOCTEZUMA MINING CO. **MEXICO.**

Office: 707 Lonsdale Bldg., Duluth, Minn. Mine office: Moctezuma, Sonora, Mex. Geo. H. Mance, president; Geo. H. Crosby, vice-president; Kenneth M. McLeod, secretary; Will C. Brown, treasurer; Chas. H. Jones, manager; A. F. Bennett, superintendent. Organized February, 1909, with capitalization $500,000, shares $10 par; issued, $300,000.

Lands, 370 acres, in 5 groups, including 4 idle properties, partly developed, and the Monte Cristo silver mine. Four groups are owned outright, and the Monte Cristo is held under a $200,000 bond and lease, on which $50,000 has been paid, bond running for 3 years, with provision that 25% of net smelter returns applies on purchase price.

The Azurite group, area 14 hectares, between the Promontorio copper mine and the Lampazos silver-lead mine, shows at surface a 10′ vein with a 2′ pay-streak carrying carbonate ore assaying upwards of 10% copper, with small gold and silver values.

The Caballo de Fierro copper group, area 20 hectares, in the Jariquipi Mountains, 16 miles east and south of Nacozari, shows a heavy outcrop of specular and magnetic iron, carrying considerable copper ore, chiefly sulphides, at surface.

La Concha copper group, area 22 hectares, 15 miles south of Nacozari and 6 miles west of the Southern Pacific line, now building, shows a fissure vein of 4′ to 10′ width, in porphyry, outcropping for 700′, carrying auriferous and argentiferous copper ore, and small shipments of high grade ore have been made by former owners in the past.

The Idaho group, area 26 hectares, and the Monstruo de Plomo group, area 29 hectares, are adjoining properties, 14 miles south of Moctezuma, carrying a contact ore body between limestone and porphyry, up to 7′ in width at surface, showing ore giving average assays of 14% lead and 7 oz. silver per ton.

The Monte Cristo mine, area circa 300 acres, 50 miles south of Nacozari, was opened October, 1903, and, operated in native fashion, yielded, above the 132′ level, upwards of 1,300,000 oz. of silver, the ore shipped under the former management giving smelter returns averaging about 500 oz. silver per metric ton. The vein, of 4′ to 5′ average width, dips at about 30°, with some faulting in the upper levels, but holds ore values unchanged from surface to the bottom of the present workings. There are about 2,000′ of old workings, including 3 incline shafts and a short tunnel, and present management started a 2-compartment shaft, January, 1909, this being vertical to the 162′ level, thence following the dip of the vein to the present depth of 262′, with richest ore showing in the bottom. The ore contains much tetrahedrite and argentiferous galena, and carries magnificent specimens of ruby silver, with considerable native silver, ranging in value up to 1,300 oz. silver per metric ton. Production under present management, to Nov. 15, 1909, was 3 carloads of ore, giving net smelter returns of better than $11,000 per carload, the last car returning

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upwards of $12,000, and the mine has in sight 7 to 10 carloads of similar ore.

The Southern Pacific railway extension, building from Nacozari south, should reach the Monte Cristo mine eventually, but, owing to the extremely high grade of ore produced, present transportation charges by pack train are not a serious adverse factor. Equipment includes a 40-h. p. boiler and hoist. Management is good, and property is exceptionally valuable, and is now earning at the rate of about 10% on the total capitalization, only 60% of which is issued.

DULUTH-PACIFIC COPPER CO. **WASHINGTON.**

Office: Duluth, Minn. Mine office: Chelan, Chelan Co., Wash. A. C. Ribenack, president; A. Keller, vice-president; Louis Hammel, treasurer; H. Heimann, secretary; preceding officers, W. L. Devine, A. H. Grieser and J. D. Campbell, directors; Arthur C. Fox, superintendent; Victor L. Rakowsky, consulting engineer. Organized 1909, under laws of Arizona, with 500,000 shares. Annual meeting, second Tuesday in June.

Lands, 12 claims, including the Copper Glance and Copper Goat groups, of 6 claims each, 1½ miles apart, well timbered and watered, 25 miles from a railroad, with good wagon roads 5 and 8 miles distant respectively, in the Mount Stewart district, Wenatchee Mountains. Lands carrying fissure veins in peridotite, and contact deposits between gabbro and peridotite, and are said to have an 18″ vein of chalcocite and bornite, averaging 35 to 40% copper, with gold and silver values. Development is by a crosscut tunnel. Equipment includes an air-compressor.

DULUTH & SONORA MINING CO. **MEXICO.**

Office: 606 Sellwood Bldg., Duluth, Minn. Mine office: La Cananea, Arizpe, Sonora, Mex. James W. Norton, president and treasurer; A. E. Purden, vice-president; Bernard Silberstein, second vice-president; Wm. B. Underhill, secretary. Organized December, 1908, under laws of Minnesota, with capitalization $3,000,000, shares $10 par. Absorbed the Calumet & Sonora Mining Co., giving latter corporation 120,000 shares for its properties, and also absorbed the South Cananea Copper Mining Co., S. A., which was the Mexican incorporation of the Pennsylvania & Cananea Copper Co., giving 120,000 shares to latter, leaving 60,000 shares in the treasury.

Lands are said to be circa 4,500 acres. Lands taken over from the South Cananea were 587 hectares, including the Collins group of 305 hectares, Arizpe group of 40 hectares, Homestead group of 60 hectares, Last Chance group of 22 hectares and Gladys group of 150 hectares, latter adjoining the Massey mine of the Greene Cananea and supposed to carry the extension of the Massey ore body of the latter, the bulk of the South Cananea lands being 3 to 4 miles south of the Oversight mine of the Greene Cananea. The Collins group has a 250′ shaft.

Lands taken over from the Calumet & Sonora Mining Co. include the Buena Vista group of 306 acres, Catalina group of 630 acres, on which the principal developments are located, and the Ronquillo-Duluth group of 210 acres. The Buena Vista group, near the Greene Cananea, has the 100′ Underhill shaft, 293′ Norton shaft, and a 552′ crosscut tunnel showing a vein of 57′ width, carrying sulphide ores with talcose gangue assaying 1.25 to 1.75% in copper tenor, which is below commercial grade. The Catalina has 2 old shafts, of circa 75′ depth each, and a new 205′ shaft, with about 900′ of workings, showing ore from surface of fair average grade. A 16-ton test shipment from the Catalina workings returned 3.64% copper, 53% lead, 113 oz. silver and $20 gold per ton.

The Catalina group has a 150-h. p. machinery plant. Property considered promising.

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DUNKIRK MINE. **ARIZONA.**

Owned by Castle Copper Co., at Prescott, Yavapai Co., Ariz.

DUQUESNE MINING CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. John F. Shaw, president and manager; Edw. S. Strawcutter, vice-president; T. A. Lukhart, secretary. Lands, 12 claims, in Gold Gulch, about 15 miles from Globe. Old work by former owners includes a 50′ shaft on the East End claim, showing ore assaying 5% copper, 3 oz. silver and $4 gold per ton, also 3 short tunnels, giving ore of good assay values in gold. Equipment includes necessary mine buildings. Management plans sinking a 500′ shaft and crosscutting from the bottom, and possibly sinking a second shaft.

DURANGO INVESTMENT & DEVELOPMENT CO. **MEXICO.**

Office: Callejón Santa Vera Cruz 20, México, D. F. Mine office: San Francisco del Mezquital, Durango, Mex. Sr. Lic. José Luis Requeña, president; M. Sanciprian, general manager; Francisco Sosa y Avila, consulting engineer. Organized under laws of United States, with capitalization $1,000,000, and is protocolized under laws of Mexico. Property is the Plateros and Carmelita mines, in the Mezquital district, and La Fé mine in El Oro district of Durango, all antiguas, carrying ores of gold, silver and copper. Main shaft, 90 meters. Properties are said to have produced 1,800,000 oz. silver in the past. The company has a concession for use of water from the Mezquital river, for power purposes.

COMPAÑÍA MINERA EL DURAZNITO. **MEXICO.**

Office: Apartado 102, Durango, Mex. Mine office: Tejamén, Durango, Mex. Edw. Williams, president; Alejandro Tagle, secretary; J. L. Asunsolo, treasurer; F. D. Davis, manager. Organized March, 1906, under laws of Mexico, with capitalization 60,000 pesos, shares 10 pesos par. Lands, 8 hectares, carrying 1 silver-lead and 1 silver-copper vein, former having ore said to average 10% lead and 6 kgs. silver per metric ton, and latter said to average 6 to 8% copper and 8 kgs. silver per ton. Development is by 2 shafts, of about 60 meters depth each, and a 180-meter tunnel.

D. & W. MINING CO. **CALIFORNIA.**

Office: Johnston Bldg., Los Angeles, Cal. Mine office: Parker, Yuma Co., Ariz. John W. Flink, president and general manager; Sylvester Marshall, vice-president; Jas. S. Roche, secretary. Lands are in the Whipple Mountain district of San Bernardino County, California, about 5 miles from the projected line of the California & Arizona railroad, 17 miles north of Parker and about 40 miles south of Needles. Property shows 2 parallel veins, one of 60′ estimated width, on which work was begun 1907. Development includes a 2-compartment 375′ shaft, showing ore that has given assays of 5 to 40% copper and $10 to $52.50 gold per ton, and a carload of ore, shipped February, 1909, returned circa 30% copper. Equipment includes an 18-h. p. gasoline hoist, 40-h. p. gasoline engine and an air-compressor.

EAGLE MINING & SMELTING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Mark Mitchell, manager. Lands, 6 claims, 3 miles from Chewelah, including the Eagle group of 4 claims, formerly owned by Eagle Consolidated Gold Mining & Milling Co., and later by Blue Star Mining Co. Mine has a 240′ two-compartment shaft, and an 800′ tunnel, showing a 4′ vein of silver-lead ore, said to parallel the copper vein of the United Copper Co. at a distance of 400′. Equipment includes a steam plant. Was developing with a small force at last accounts.

EAGLE MOUNTAIN COPPER CO. **ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Col. P. T. McGrath, general manager. Lands, 27 claims, known as the Copper Queen group, in the Riverside district,

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having small development and several mine buildings. Company was said, June, 1908, also to have an option on the Blackburn group.

EAGLE PEAK MINING CO. **WASHINGTON.**

Office: Longmire, Pierce Co., Wash. Lands, in the Tatoosh range, in the vicinity of Mt. Tacoma, are said to show bornite.

EAST COLUMBUS MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Tony Jacobson, president; A. O. Jacobson, vice-president; Valentine S. Snow, secretary. Organized December, 1908, under laws of Utah, with capitalization $500,000, shares $1 par. Company was promoted to take over the Silver King mine, at Alta.

EAST GRIQUALAND COPPER & NICKEL MINING CO., LTD. **CAPE COLONY.**

Office: 97 New Stock Exchange, Johannesburg, Transvaal. Mine office: Mt. Ayliff, Griqualand East, Cape Colony. Geo. Peel, chairman; preceding officer, Dr. Davie Thompson and Griff Evans, directors. Organized December, 1908, under laws of Transvaal, with capitalization £12,500, shares £1 par, of which £7,000 went to vendors and £1,500 remain unissued, for reserve, giving £4,000 for working capital.

Lands, 44 morgen, on the Insizwa range, near Mt. Ayliff, held on a 99-year lease, which carries a royalty of 2s. 6d. per long ton on ore, payable to the government, plus a royalty of 1% on the gross amount realized from ore. A parcel of ore, shipped circa May, 1909, to Great Britain, for treatment, carried copper, nickel and platinum. Some ore has been found assaying up to 2.25 oz. platinum per long ton, with small silver and cobalt values.

EAST TINTIC DEVELOPMENT CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Ralph Kellogg, manager. Lands, known as the Ralph group, carry the Mammoth limestone formation. Development is by a new 330′ shaft, with a crosscut on the 225′ level cutting a vein of 15′ estimated average width, showing ore carrying up to 60% lead, with some gold and a small quantity of silver, 4 carloads shipped therefrom, up to Sept. 18, 1909, having netted about $600 per car. Mine also shows a 5′ vein on the east drift of the 230′ level. Equipment includes a new power plant, installed 1909, and there are necessary mine buildings.

EAST TINTIC EL RAY MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Paul Brockman, president; E. Rideburg, vice-president; D. J. Bussard, secretary; S. W. Bussard, treasurer; preceding officers and A. Soderlund, directors. Organized April, 1909, under laws of Utah, with capitalization $50,000, shares 5 cents par. Lands, 6 claims, adjoining the East Tintic Gold King mine.

EAST TINTIC TERMINAL MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. John Bestelmeyer, president; Wilford F. Giles, vice-president; Royal T. Barney, secretary and treasurer; preceding officers, John M. Bestelmeyer, J. W. Beasley and Alfred L. Booth, directors. Organized circa May, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Property is in the northern part of the East Tintic section, near the East Tintic and Grutli mines.

ECLIPSE MINE. **AUSTRALIA.**

Mine office: Wertago, Yungnulgra Co., N. S. W., Australia. Lands, 80 acres, 60 miles from Wilcannia. Mine, discovered 1892, has a 4′ vein in mica-schist and slate, developed by a 140′ shaft, showing, on the 108′ level, a vein of 30″ maximum width, carrying sulphide ore of good grade. Production, 1905-1907, was 200 long tons of ore, of 25 to 30% copper tenor, and production, 1907, is estimated at 60,000 lbs. fine copper. Was working, with a very small force, at last accounts.

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COMPAÑIA MINERA y BENEFICIADORA EL EDEN. **MEXICO.**

Office: Segunda Calle de Mesones 22, Mexico, D. F. Mine office: El Eden, Zacatecas, Mex. Francisco Llamosa, president and general manager; Enrique Gutierrez, secretary; Luis Colina, superintendent. Organized 1905, and reorganized 1907, under laws of Mexico, with capitalization 600,000 pesos, shares 100 pesos par. Lands, 102 hectares. Mine has 8 shafts, deepest 210′, and 2 tunnels aggregating 1,120′ in length, with considerable underground workings, developing ores of gold, silver, copper, lead and zinc.

There is a mill with 40 stamps, 2 Krupp tube mills, 6 Wilfley tables and 6 Johnson tables, and it is planned installing a cyanide plant, to treat a large amount of tailings accumulated, the dump being estimated to average 400 to 500 grams silver and 3 to 5 grams gold per metric ton.

EDISON MINING & MILLING CO. **NEW MEXICO.**

Mine office: Red River, Taos Co., N. M. A. K. Long, superintendent. Property carries auriferous and argentiferous copper ores. Equipment includes a steam plant and 10-stamp mill.

EL AGUAJE MINING CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. Property is an antigua, on one of the smaller copper-silver veins south of the Pilares mine, and was being unwatered, July, 1909, with a view to sale.

EL CORRAL GOLD & COPPER CO. **MEXICO.**

Office: Rosario, Hidalgo, Chihuahua, Mex. Agusto Navarro, manager. Capitalization $50,000. Property is La Gran Bonanza mine, area 40 hectares, carrying copper, gold and silver values. Mine has about 600 meters of workings.

ELIZABETH COPPER MINING CO. **WASHINGTON.**

Mine office: North Yakima, Yakima Co., Wash. Property carries copper ore, and company is reported to have a 50-ton smelter, employing circa 25 men.

ELY STAR MINING CO. **NEVADA.**

Office: Columbus, Ga. Mine office: Cherry Creek, White Pine Co., Nev. J. F. Weathers, president; W. S. Anderson, vice-president; A. C. Chancellor, secretary and treasurer. Capitalization $1,000,000, shares $1 par. Lands, 3 claims, known as the Black Metal group, and a millsite, in Silver Cañon, about 5 miles north of Cherry Creek, developed by a 195′ shaft and a 675′ tunnel. Company claimed, 1907, to have 300 tons of ore on the dump, averaging about 70 oz. silver per ton.

EMERALD MINE. **AUSTRALIA.**

Mine office: Tamworth, N. S. W., Australia. Rev. Father Curran, general manager. Property, at Trough Gully, 15 miles from Tamworth, shows ore said to average about 7.5% copper, with a trace of gold. A small reverberatory furnace was built, 1908.

EMERALD MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. J. L. Yundt, general manager. Mine has an 1,100′ shaft, showing a narrow but rich vein.

EMPIRE COPPER CO. **NEW MEXICO.**

Mine office: Santa Rita, Grant Co., N. M. Geo. O. Hilzinger, president and treasurer; John Ashcroft, vice-president; F. C. Knolenberg, secretary. Organized circa July, 1909, to develop copper claims near Santa Rita.

EMPIRE COPPER SYNDICATE, LTD. **BRITISH COLUMBIA.**

Office: 20 Lawrence Lane, London, E. C., Eng. W. Jeaffreson Woods, chairman; preceding officer, A. du V. T. Green, R. S. Simpson and E. P. Landon, directors; G. Thompson, secretary. Organized July 4, 1906, under laws of Great Britain, with capitalization £2,000, shares £1 par; issued, £1,034. Property is an option on the Rainy Hollow copper claims, secured from the Consolidated Gold Trust, Ltd. Apparently no work has been done.

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EMPIRE GOLD-COPPER MINING CO. **ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. Lands are the Princess group, near Dragoon station, having an 80′ two-compartment shaft, bottomed in sulphide ore giving assays up to 40% copper, 6 to 7 oz. silver and $1 gold per ton.

ENTERPRISE DEVELOPMENT CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. T. H. Collins, president; Robt. Mitchell, vice-president; J. E. Morrison, secretary; Chas. McHenry, general manager. Organized June 7, 1907, under laws of Arizona, with capitalization $500,000, shares $5 par. Corporation presumably was organized to take over the South Cananea, as officers are closely connected with that property.

ENTERPRISE MINING CO. **COLORADO.**

Dead. Succeeded Enterprise Mill & Mining Co., and was merged, circa 1907, in Swarthmore Consolidated Mining Co. Formerly at El Dorado, Boulder Co., Colo.

ERIK MINING CO. **MEXICO.**

Mine office: La Cananea, Arizpe, Sonora, Mex. Wm. Bracken, president; F. C. Hilliard, vice-president; Geo. L. Grosvenor, secretary and treasurer; preceding officers, Edward Quirk and Verner de Guise, directors. Organized Jan. 29, 1909, under laws of Mexico. Property supposedly is claims in vicinity of La Cananea. Apparently no work has been done.

ESPERANZAS MINING CO. **MEXICO.**

Mine office: Estación Symon, San Juan de Guadalupe, Durango, Mex. Joseph Steel, general manager. Capitalization $200,000. Property includes the Montaña de Cobre, Esperanza and other claims. Presumably idle.

EUREKA CITY MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Walter Fitch, president. Organized 1909, with capitalization $1,000,000, shares $1 par. Is controlled by Chief Consolidated Mining Co., which took $510,000 of the capital stock, under agreement with the company to furnish funds for development work, as needed, in amount not to exceed $100,000. The Chief Consolidated turned over to the Eureka City Mining Co. its option on 3 claims covering part of the townsite of Eureka. Balance of shares are to be turned over, as necessary, to owners of real estate in the city of Eureka, in exchange for deeds covering their mineral rights, with the provision that no mining shall be done nearer surface than 700′. Stock is being given to owners of lots on the basis of about 1,000 shares per acre. The Chief Consolidated owned options on 3 claims, covering a large part of the townsite, which the government decided was not mineral land, though it certainly is. This tract is to be developed from the 1,800′ level of the Chief Consolidated, through a main drift to be driven northward. The plan followed harmonizes conflicting interests, and renders available for development a valuable property heretofore impossible to work. Management is excellent and property decidedly promising.

EUREKA COPPER MINING CO. **ALASKA.**

Office: Los Angeles, Cal. A. L. Bergen, president; Mrs. M. F. Roberts, secretary; E. L. Terry, director. Capitalization, 300,000 shares. Lands supposedly are in Alaska. The president and secretary were arrested, Oct. 2, 1909, on various charges of embezzlement, preferred by one Terry, a director, who alleges that Bergen held 190,000 shares of capital stock, and that his books indicated serious discrepancies in the accounts. The charge against Mrs. Roberts was that as secretary she entered the sale of $150 worth of stock at only $90, and retained $60 for her own use and benefit. The answer of the president was that he owns one-half of the capital stock, and that he had sold many shares of individual stock at reduced prices, claiming that the company owed him $2,500, and that his arrest was due to spitework. Apparently the

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president and secretary sold their own stock, at less than the price that company was endeavoring to sell stock. Is not regarded favorably.

EUREKA LILY MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Grant Snyder, president; Thos. Barrett, vice-president; R. S. Bowman, secretary and treasurer. Capitalization, $1,000,000, shares $1 par. Controls the Lily Mining Co. through ownership of about two-thirds of issued stock; also controls the Provo Mining Co., and has several other claims, on Mineral Mountain, adjoining the Iron King claim, said to carry good lead values, with considerable gold and silver, principal development being a 300′ shaft.

EUREKA MINES CO. **NEW MEXICO.**

Mine office: Orogrande, Otero Co., N. M. James H. Lancaster, president; Ira G. Ross, vice-president; Geo. E. Mitchell, treasurer; Herbert M. Mitchell, secretary; Fayette A. Jones, consulting engineer. Organized 1908, under laws of Arizona, with capitalization 5,000,000 shares, presumably $1 par, of which 1,000,000 shares are in 8% preferred stock. The corporation is a holding company, said to control the Boston-Jarilla Copper Co., Amarilla Mining Co., Eureka Placer Mining Co. and Mollie Gibson Mining Co., and also is said to own a third interest in 360 acres of placer ground in Humboldt County, California. Lands controlled in New Mexico are circa 240 acres of lode claims and 480 acres of placer claims, including the Harvey group of 60 acres, being half of what is known as Nanny Baird Hill, this property carrying gold. The Mollie Gibson group, of circa 100 acres area, has a number of shallow shafts, deepest 125′, claimed to show rich sulphide copper ore. The placer ground is claimed by the company to show, by hundreds of tests, an average of $2 gold per cubic yard, which statement is considered something less than plausible. M. C. Barnard, the former president, operated an alleged brokerage office, under the name of M. C. Barnard & Co., in Boston, and left assets estimated at $21,000, with liabilities of $252,141. Is not regarded favorably.

EUREKA MINING CO. **MEXICO.**

Mine office: Chalchihuites, Sombrerete, Zacatecas, Mex. J. M. Hardy, manager. Property includes the Eureka mine and the Libertad mill. Ores include silver-lead deposits of good average value, with several undeveloped copper veins, and numerous zinc outcroppings. There also is a large deposit of high grade iron ore, suitable for flux, and a little tin ore has been developed.

EUREKA MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Robt. A. Brown, manager. Shares are listed on the Salt Lake stock exchange. Lands are 8 claims, in the East Tintic district.

FAIRVIEW MINING CO. **CALIFORNIA.**

Mine office: Relief Hill, Nevada Co., Cal. C. M. Wilson, superintendent. Lands, 8 claims, area 160 acres, showing a schist hanging wall and serpentine footwall, with a vein up to 12′ in width, carrying an iron-stained schistose gossan. Development is by a 375′ tunnel on the vein, with about 170′ back, showing cuprite and chalcopyrite, with some gold, with gangue of quartzite and iron oxide, giving average assays of 1.1% copper, 16 cents silver and $4 gold per ton. Nearest railroad point is Nevada City, 21 miles southwest. An open-cut on the hill was worked for gold, by sluicing, some years ago.

FANNY FERN MINING CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. A. O. Egbert, superintendent. Property carries copper and silver-lead ores, and was under development with a small force at last accounts.

COMPAÑÍA MINERA FARELLON DE PÚQUIOS. **CHILE.**

Dead. Was succeeded by Compañía Minera de Púquios. Formerly at Rancagua, Atacama, Chile.

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COMPAÑÍA MINERA LA FÉ, CARIDAD Y ANEXAS. **MEXICO.**

Office: Mexico, D. F. Mine office: Guachinango, Mascota, Jalisco, Mex. Adolf Marx, president; Andres Goebel, treasurer; R. Aguirre, secretary; Richard Guenther, general manager. Organized under laws of Mexico, with capitalization 250,000 pesos. Ore carries values in copper, silver and gold, and small shipments of high grade ore have been made.

FEDERAL EXPLORATION CO. **CALIFORNIA.**

Office: 370 Bullitt Bldg., Philadelphia, Pa. Mine office: Ingot, Shasta Co., Cal. Lands are 4 claims in Township 33 North, Range 6 West, adjoining the Mammoth mine, showing a gossan outcrop, on which an incline shaft has been started. Presumably idle.

FEDERAL GOLD & COPPER MINING CO. **UTAH.**

Mine office: Frisco, Beaver Co., Utah. Lands, 9 claims, 4 patented, in the Beaver Lake district, about 3 miles from the San Pedro railroad and 8 miles from Frisco, having a 400′ shaft and 100′ drift showing no ore, though property is said to have shipped about 200 tons of rich ore under former ownership. Equipment includes several mine buildings. Idle at last accounts.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE DU FERROL. **SPAIN.**

Office: 13 Rue Auber, Paris, France. Mine office: Ferrol, Coruña, Spain. M. Biver, J. de Catelin, L. A. Claudot, P. Dubois, L. Jumentier, E. Maranzana and G. de Montrichard, directors; H. Dufresne and R. de Thezillar, commissaires. Organized Jan. 25, 1907, under laws of France, with capitalization f5,000,000, shares f100 par. Is said to plan reduction of capital to f3,000,000. Company was said, 1909, to have a deficit of f38,413. Property stands much in need of cheap transportation, now lacking.

FIFE MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Fife, Yale district, B. C. Chas. Dempster, general manager. Lands, 30 miles east of Phœnix, show a vein up to 30′ in width, carrying about 6′ of smelting ore, with balance of concentrating grade, developed by a glory-hole. Property shows considerable chalcopyrite carrying gold and silver values, which has been claimed to average 3 to 6% copper and $4 to $8 gold per ton. The average of 30 assays of ore from the dump gave 5.3% copper and $4.20 gold per ton. Equipment includes substantial mine buildings and an assay office. Some ore was shipped, 1909, to the Trail smelter, and company was endeavoring, September, 1909, to arrange with the Canadian Pacific for ore shipments. Property considered promising.

FINNISH FARMERS' MINING CO. **MICHIGAN.**

Mine office: Hancock, Houghton Co., Mich. Property is options on farming lands, between Salo and the upper ship canal, northwest of Hancock.

FLAGSTAFF MINES, LTD. **UTAH.**

Dead. Property held, 1908, by Flagstaff Copper Mining Co. Formerly at Alta, Salt Lake Co., Utah.

FLAGSTAFF MINING CO., LTD. **IDAHO.**

Mine office: Osburn, Shoshone Co., Idaho. F. T. Millichamp, president; F. Stanley Millichamp, secretary. Capitalization $1,000,000, shares $1 par. Lands, 4 claims, 3 miles from a railroad. Development includes a 25′ shaft and a 350′ tunnel. Traces of lead, copper, silver and gold have been encountered.

COMPAÑÍA MINERA EL FLOR DE NIEVE. **MEXICO.**

Mine office: Concepción del Oro, Mazapil, Zacatecas, Mex. Lands, 30 hectares, showing several cupriferous veins. Was developing, in a small way, at last accounts.

FLORENCE-RAE COPPER CO. **WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. Lands, on North Fork, above Galena, were under development with a small force late in 1909.

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FLORENCIA MINING CO. **MEXICO.**

Office: Chihuahua, Chih., Mex. Mine office: Ap. 24, Santa Eulalia, Iturbide, Chihuahua, Mex. R. J. de Morambert, president; S. G. Burn, general manager. Lands, 15 hectares, held under option from Enrique C. Creel, showing limestone cut by porphyry dikes, with metalliferous caves in lime, developed by an 125′ two-compartment shaft, planned to be sunk 1,000′.

FOREST HOME MINING CO. **CALIFORNIA.**

Office: Redlands, Cal. Mine office: Forest Home, Bernardino Co., Cal. W. H. Bradley, agent. Property, about one-half mile north of Forest Home, has four 75′ shafts, showing indications of copper. Presumably idle.

FOUR METALS SMELTER & MINING CO. **CALIFORNIA.**

Office: San José, Cal. Mine and works office: Keeler, Inyo Co., Cal. H. T. Welsh, president; A. R. Short, secretary. Lands, 35 claims, 8 miles from Keeler, carrying argentiferous ores of lead, copper and zinc. Has water power available, on Lone Pine Creek, and also has partly built an 8-mile aërial tram, from mine to smelter. The Swansea smelter was built, circa 1906, at Keeler, and removed later to Swansea, 3 miles north.

FREEHOLD COPPER PROPERTIES, LTD. **AUSTRALIA.**

Dead. Former office was 308 Winchester House, London, E. C., Eng. Officers were A. E. Barton, chairman; presiding officer, Chas. J. McMahon and L. Abrams, directors; H. A. McMahon, secretary; W. H. Corbould, manager. Was organized Jan. 14, 1908, under laws of Great Britain, with capitalization £12,000, shares £1 par, and took over, May, 1908, the Crowl Creek and Shuttleton mines from the Crowl Creek-Shuttleton Mining Co. Property was sold, July, 1908, to Nymagee Copper, Ltd. Formerly at Shuttleton, Mouramba Co., N. S. W., Australia.

FREMANTLE SMELTERS & MINES, LTD. **WESTERN AUSTRALIA.**

Works office: Fremantle, Western Australia. W. G. Sutherland, manager. Organized July, 1909, under laws of Great Britain. Property is the Fremantle smelter, at Robb's Anchorage, near Fremantle.

FRISCO CONSOLIDATED MINING CO. **UTAH.**

Office: 209 Dooly Blk., Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. D. P. Rohlfing, president and general manager. Organized with capitalization $1,500,000, shares $5 par, as a merger of the Frisco Contact Mining Co. and North Horn Silver & Copper Mining Co. Lands, 31 claims, area 580 acres, supposedly carrying the extension of the Horn Silver contact veins for 8,600′. Lands include properties formerly held by the Frisco Contact and North Horn Silver, also the Goodhope, Glorious and D. G. & J. groups.

The Frisco Contact property has a 550′ two-compartment shaft, and there also are three other shafts, and several tunnels, with about one-half mile of workings, showing 4 contact deposits between limestone and andesite, one being estimated to range up to 115′ in width, and to carry 15% copper, 45% lead, 3% zinc, 45 oz. silver and 80 cents gold per ton.

Equipment includes a steam plant, with hoists of 50 and 80 h. p., a 4-drill air-compressor, pumps and necessary mine buildings. The Horn Silver mine, adjoining, has been a very large producer, and the Frisco Consolidated property is considered promising, though as yet no important ore bodies have been developed.

FRONTENAC MINING CO., LTD. **COLORADO.**

Office: 846 Equitable Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Henry P. Lowe, general manager; F. C. Bowman, superintendent. Mine carries auriferous and argentiferous lead and copper ore. Machinery includes an electric plant, 25-stamp mill and 75-ton concentrator, employing circa 25 men.

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FRONTERIZA COPPER MINING CO. **MEXICO.**

Mine office: Ascensión, Galeana, Chihuahua, Mex. Property is La Fronteriza mine, carrying silver, copper and lead ores. Presumably idle.

GALLO HERMANOS. **PERÚ.**

Office and works: Cerro de Pasco, Junín, Perú. Property is El Carmen smelter, having a 6-ton matting furnace.

MÁXIMO GARCÍA. **MEXICO.**

Mine office: Zautla, San Juan de los Llanos, Puebla, Mex. Property includes Nueva Reserva, Sahara, San Luis and Ampliación de San Luis mines, carrying argentiferous copper ore, and was a small producer at last accounts.

GEM CONSOLIDATED MINING CO. **NEVADA.**

Mine office: Tenabo, Lander Co., Nev. Hyrum Tyree, president; W. L. Gallagher, secretary. Capitalization, $2,500,000. Company took over the property of the Reliance Mining & Milling Co. Lands, 19 claims, 2 fractional, area 355 acres. Principal development is on the Little Gem group, about one mile from Tenabo, showing a contact deposit between rhyolite and sedimentary rocks carrying auriferous and argentiferous copper carbonates and chalcopyrite, with quartz gangue. Development is by a 250′ incline shaft, sunk at an angle of 22°, showing an ore body ranging from a few inches to 5′ in width, giving assays up to 31.1% copper, 122 oz. silver and $9.60 gold per ton. In January, 1909, company planned transferring its holdings to the Tenabo Mining & Smelting Co., but suit was brought against the management by shareholders, and a receiver asked.

GLADYS PROPRIETARY GOLD MINES, LTD. **MEXICO.**

Office: 35 Albemarle St., London, W., Eng. Mine office: Vencedora, Hidalgo, Chihuahua, Mex. A. Spencer Cragoe, general manager. Organized July 4, 1900, under laws of Great Britain, with capitalization £800,000, shares 5s. par, fully issued. Company began work on the De Kaap goldfield, near Barberton, Transvaal, but in 1905 transferred operations to Chihuahua, purchasing El Bronce, El Campanito, La Margarita and La Polonia groups of claims, area 62 acres, at Beneficiadora. Lands show 8 ore bodies, reported as veins, but apparently contact deposits between limestone and porphyry, carrying chalcopyrite, galena and lead carbonates, all auriferous and argentiferous, with quartz gangue, with some silver chlorides and sulphides. Work was begun Jan. 1, 1906, and property has a 305′ shaft and two 300′ tunnels, with about 3,000′ of workings, developing a considerable tonnage of ore of low to medium grade. Equipment includes a 160-h. p. steam plant, and management plans a 200-ton mill. Employs circa 100 men.

GODIVA-SIOUX MOUNTAIN MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Lands, adjoining the Plutus mine, have a 500′ tunnel on the Smuggler claim. Idle several years, but resumption planned at last accounts.

GOLD BASIN MINING CO. **COLORADO.**

Mine office: Montrose, Montrose Co., Colo. Property carries auriferous and argentiferous copper ores. Equipment includes a steam plant and 100-ton cyanide plant, employing about 20 men.

GOLD CLIFF MINING CO. **WYOMING.**

Mine office: Sundance, Crook Co., Wyo. Wm. McMillan, general manager. Lands, 14 claims, in the Kirwin district, carrying several veins of ore giving good assays in copper, gold and silver. Development work was in progress, September, 1909.

GOLD & COPPER CROWN MINING CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. E. H. Norton, president; I. E. Walford, secretary; H. A. Norton, treasurer. Lands, 6 claims, in the Sunrise Mountains, 10 miles south of Needles, showing fissure veins with

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numerous outcrops. Development, at depth of 60' shows a wide vein, giving ore assaying up to 60% copper, with a mill test giving returns of 18.3% copper.

GOLD CROWN MINING CO., LTD. **MONTANA.**

Office: Wallace, Idaho. Mine office: St. Regis, Missoula Co., Mont. A. A. Mayo, president; L. P. Wolfe, secretary. Capitalization $1,000,000, shares $1 par. Lands, 5 claims, 7 miles from a railroad, showing a vein of 7' to 15' width, with quartzite footwall, carrying ore giving assay values in copper, silver and gold. Development is by 125' and 500' tunnels.

GOLDEN CURRY CONSOLIDATED MINING CO. **MONTANA.**

Mine office: Elkhorn, Jefferson Co., Mont. John Rothfus, superintendent. Mine carries auriferous copper ore, with values mainly in gold. Equipment includes a hydro-electric power installation, crushing rolls and a 100-ton cyanide plant.

GOLDEN SUN MINING & MILLING CO. **COLORADO.**

Office: 203 Kittredge Bldg., Denver, Colo. Mine office: Tolland, Gilpin Co., Colo. E. T. Butler, manager. Mine, under development, carries auriferous and argentiferous copper ore, equipment including a steam plant and an air-compressor.

GOLD HUNTER MINING CO. **IDAHO.**

Office: St. Paul, Minn. Mine office: Mullan, Shoshone Co., Idaho. Dennis Ryan, general manager. Mine, discovered 1885, has a 4,380' tunnel, cutting a silver-lead vein with a back of 1,400', and mine was reported, February, 1909, to have struck ore on a 30' vein at depth of 580'. Mine carries some copper ore, but values are mainly in silver and lead. Property has a 250-ton mill, and employs about 200 men normally. Some ore shipments were made, 1908, to the Salida smelter.

GOLD MINING CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. E. C. Condit, manager; Ira C. Scott, superintendent. Property includes the Mabel and Ariadne mines, carrying auriferous and argentiferous copper ores. Equipment includes a water power plant and a small Leyner air-compressor.

GOOD HOPE GOLD & COPPER MINING & DEVELOPMENT CO. **WASHINGTON.**

Office: Aurora, Ore. Mine office: Index, Snohomish Co., Wash. H. A. Snyder, president; Capt. J. F. Boon, vice-president; F. P. Hallinan, secretary and treasurer; preceding officers, H. L. Bent, Gustave Friewald and Fred R. Thompson, directors; Wm. J. Walters, general manager. Organized under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 14 claims, in process of patenting. Mine has 6 tunnels and several opencuts, showing ore assaying circa 2% coper and 12% lead, with fair gold and silver values.

GOONEY MANOR COPPER CO. **VIRGINIA.**

Office and mine: Front Royal, Warren Co., Va. Employs 4 men. Hugh E. Naylor, president and general manager; R. B. Murphy, vice-president; S. G. Walker, secretary; W. P. King, treasurer; A. J. Sager, superintendent and engineer. Organized July 12, 1909, under laws of Virginia, with capitalization $500,000, shares $100 par; issued, $30,100. Property apparently is held under a bond for $3,000, due July, 1911. Annual meeting, first Monday in July.

Lands, 84 acres, 5 miles south of Front Royal, reported to carry a fissure vein in porphyry, and contact deposits between limestone and porphyry, with generally northeast and southwest strike and dip of about 55°. Main ore body is reported to average 7' width, and to be traceable 800', carrying a little malachite near surface, with chalcopyrite at depth, giving returns, from a smelter test, of 5.08% copper and 1.36 oz. silver per ton. Ore bodies apparently are lenticular. Development is by a 45' opencut, and by shafts of 75' and 250' without laterals, estimated by company to show 100,000 tons of ore, which

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seems excessive. Equipment includes a 15-h. p. steam plant, with a 13-h. p. hoist good for 800′ depth, and a 1-drill Rand air-compressor. Buildings include a smithy, engine-house, tool-house and dwelling. Company plans developing the ore body for about 1,000′ in length, and installing a larger hoist and air-compressor.

GOWER MINES SYNDICATE, LTD. **COLORADO.**

Office: 155 Fenchurch St., London, E. C., Eng. Mine office: Blackhawk, Gilpin Co., Colo. Dr. J. H. Gower, chairman; preceding officer, W. M. Strachan, Fitz-Herbert Wright, A. Montague Haines and John P. Reid, directors; W. F. Coote, secretary; Thos. Dunstone, mine manager. Organized Jan. 19, 1898, under laws of Great Britain, with capitalization £15,000, shares £1 par, fully issued and fully paid. Lands carry auriferous and argentiferous lead and copper ores. Equipment includes a steam plant.

GRAND DOMINION COPPER CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Minersville, Beaver Co., Utah. D. C. Reese, president and general manager. Lands, 80 acres, having a 275′ tunnel with a 250′ back, showing ore assaying up to 26% copper, 10 oz. silver and $6 gold per ton, from an 18″ vein.

GRAND EASTERN MINING CO. **UTAH.**

Office and mine: Eureka, Juab Co., Utah. E. R. Higginson, president; C. E. Berry, secretary and treasurer; preceding officers, A. F. Baxter, W. E. Sainsbury and John A. Allen, directors. Organized circa March, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands are 11 claims.

GRAND ISLAND MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Organized circa October, 1908. Lands, adjoining the Copper Chief on the south, showed good ore, in comparatively shallow workings, when taken over. Development is by a 100′ two-compartment shaft, planned to be sunk to 200′, showing a 3′ vein carrying sulphide ore assaying up to 22% copper. Equipment includes a steam hoist.

GRANT MINE. **NEW YORK.**

Letter returned unclaimed from former mine office, Carmel, Putnam Co., N. Y. Ores are decidedly complex, consisting of sulphides and arsenides, carrying copper, quicksilver, gold and iron. The crude ore is estimated to have a gross value of about $25 per ton, but, on account of its refractory nature, has no present commercial value, and cannot be utilized without special treatment. Idle some years.

GREAT BENOWRIE COPPER & SILVER MINING CO. SOUTH AUSTRALIA.

Dead. Property was 1,800 acres of leasehold crown lands, 16 miles from railroad at Mingary, said to carry 10 veins with east and west strike, averaging about 5′ width, developed by a shaft of 100′ showing ore that was dressed up to about 20% copper tenor. Company was liquidated circa 1899. Formerly at Mingary, South Australia.

GREAT BRAS D'OR GOLD MINING CO. **NOVA SCOTIA.**

Office: 616 Old South Bldg., Boston, Mass. Mine office: Goldbrook, Cape Breton Co., N. S. Theodor Kuntzen, manager. Mine carries auriferous copper ore, with values mainly in gold. Equipment includes a steam plant and an air-compressor, with a 10-stamp mill and 40-ton concentrator. Property employs about 35 men.

GREAT COPPER FLAT MINING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Lands are in the Draper district, near the mouth of Little Cottonwood Cañon. Company planned, July, 1909, merging in the Verna Mining Co. Presumably idle.

GREAT COPPER KING MINING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Lands, 10 claims, including 4

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claims, 1 fractional, held under bond and lease, in the Draper district, near the mouth of Little Cottonwood Cañon, 7 miles from Alta and 16 miles from Sandy. Property has a 330′ tunnel. Company planned, July, 1909, merging in the Verna Mining Co.

GREAT EASTERN MINING & MANUFACTURING CO. NEWFOUNDLAND.

Mine office: Twillingate, Nfld. Property is on Burnt Island, Twillingate Harbor, opposite the Great Northern Copper Co.

GREAT NORTHERN COPPER SMELTING CO. AUSTRALIA.

Works office: Newcastle, N. S. W., Australia. Property is a smelter, turning out blister copper of about 98.5% average tenor, with varying quantities of gold and silver.

GREAT WESTERN COPPER MINING CO. AUSTRALIA.

Dead. Company was organized November, 1872, and worked various properties near Lewis Ponds and Byng, and, in 1875, was working the Williams lode at Icely, 30″ wide at surface, 5′ wide at 125′ depth and 3′ wide at 270′ depth. Company had a small smelter in connection with the Icely mine, treating ore from its various properties. From the Williams lode 4,000 tons of ore mined returned 560 long tons of copper, and 1,000 tons of ore from the Icely lode returned 100 long tons of copper. Miscellaneous lodes yielded 100 tons of ore returning 12 tons copper, and at Lewis Ponds Creek the company worked 8 lodes, of 3′ average width, which yielded 4,000 tons of ore that returned 640 long tons of copper. Formerly at Lewis Ponds, N. S. W., Australia.

GREEN RIVER COPPER CO. ARIZONA.

Mine office: Superior, Pinal Co., Ariz. Hon. G. Irvin, president; M. J. Dougherty, secretary. Lands, 14 claims, near the Lake Superior & Arizona, showing oxidized ores and chalcocite giving assays up to 23% copper. Presumably idle.

GREY EAGLE GOLD MINING CO. BRITISH COLUMBIA.

Dead. Was merged, March 29, 1901, in Granby Consolidated Mining, Smelting & Power Co., Ltd. Formerly at Phoenix, Boundary district, B. C.

GREY ROCK MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. C. C. Griggs, president; Ralph Badger, secretary; Geo. Udall, managing director; preceding officers, R. T. Badger and Frank Birch, directors. Organized 1909, presumably under laws of Utah. Lands, 12 claims, adjoining the Montana mine, having a shallow shaft, planned to be sunk 200′.

GRIZZLY RIDGE MINING CO. CALIFORNIA.

Office and mine: North Columbia, Nevada Co., Cal. Company reports ore assaying 1.25% copper, 17 oz. silver and $40 gold per ton.

GRUTLI MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. John Bestelmeyer, president and manager; H. W. Horne, secretary. Organized circa March, 1909, under laws of Utah. Lands, 7 claims, adjoining the East Tintic Consolidated on the north. Management plans developing by a 250′ shaft and crosscutting from bottom.

COMPAÑÍA MINERA DE LA GUADALUPITA. MÉXICO.

Mine office: Santa Engracia, Ciudad Victoria, Tamaulipas, Mex. Organized under laws of México, with capitalization 25,000 pesos. Property is the Guadalupita mine, 14 miles from Santa Engracia, claimed to show ore averaging better than 30% in copper. Presumably idle.

GUANAJUATO-JALISCO DEVELOPMENT CO. MEXICO.

Office: 82 Wall St., New York, N. Y. Operating office: Guanajuato, Jalisco, Mex. Mine office: Autlán, Jalisco, Mex. Jas. C. Hinchliffe, president; Dwight Furness, general manager. Organized circa 1908, with capitalization $4,000,000, in $1,000,000 preferred and $3,000,000 common stock. Company

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is said to plan operating through subsidiary corporations, and controls the Mexican Investment & Development Co., owning the Agua Blanca mine. Property includes the Calabaza mine, at Etzatlán, Jalisco, and the Dolores, Cabrestante, San Antonio de las Minas, San Gregorio and Sevillana mines, all in the state of Guanajuato, with a 40-ton mill on the Dolores property.

GUERNICA SILVER & COPPER MINES (BOLIVIA), LTD. **BOLIVIA.**

Office: 4 Great George St., Westminster, London, S. W., Eng. Property supposedly is in Bolivia.

HALL MINES, LTD. **BRITISH COLUMBIA.**

Dead. Was succeeded, June 6, 1900, by Hall Mining Co., Ltd. Formerly at Nelson, Kootenay district, B. C.

HAMBURG-AMERICAN COPPER MINING & MILLING CO. **IDAHO.**

Office: Kellogg, Idaho. Mine office: Wardner, Shoshone Co., Idaho. Wm. Schaefer, president; Louis Lincoln, vice-president; Louis Walden, secretary and treasurer; preceding officers, W. W. Papesh, Paul Jacobs and Frederick Bell, directors. Organized November, 1908, under laws of Idaho, with capitalization $1,500,000, shares $1 par. Lands, 8 claims, on the Little North Fork, on which development was begun early 1909.

HANNIBAL CONSOLIDATED MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Silver City, Juab Co., Utah. John Bestelmeyer, president; John M. Bestelmeyer, vice-president; H. C. Hicks, secretary and treasurer. Organized circa September, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par.

HARDSHELL-FLUX MINING & DEVELOPING CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Patagonia, Santa Cruz Co., Ariz. Ben Heney, president; R. R. Richardson, vice-president; W. E. Francis, secretary and treasurer; Frederic John Siebert, consulting engineer; Francis J. Heney, counsel; J. C. Hartness, general manager. Lands, circa 30 claims, in the Palmetto district, on the southerly slope of the Patagonia Mountains, 6 to 9 miles from Patagonia, including the Flux, Hardshell and Three R mines, formerly held by Col. Wm. C. Greene, who was unable to meet the final payment. Property as a whole has about 800′ of workings. The Three R mine has tunnels aggregating about 400′ length, showing a large body of disseminated chalcopyrite, estimated to average 3 to 4% in copper tenor. Ore values, as a whole, are mainly in silver, with some lead, copper and gold.

HECKLA COPPER SYNDICATE. **AUSTRALIA.**

Mine office: Irvinebank, Queensland, Australia. Wm. Swan, manager. Property, showing copper ore, was undergoing development, with a small force, at last accounts.

HECLA CONSOLIDATED MINES CO. **WYOMING.**

Office: 1624 Curtis St., Denver, Colo. Mine office: Hecla, Laramie Co., Wyo. Henry Schwartz, president; A. E. Keller, secretary; Eli Miller, treasurer; preceding officers, Henry Hirsch and Wm. L. Wilson, directors. Organized circa 1909, under laws of Wyoming, with capitalization $1,000,000, shares $1 par, as a merger of the Hecla Mining Co., Amalgamated Copper Mining & Extraction Co. and Kopper Krown Mining Co.

The Hecla group, 13 claims, 2 patented, and a 35-acre townsite, is in the Silver Crown district, 4 miles from Granite Cañon, on the Union Pacific railroad and 7 miles from the Cheyenne Northern line. This group is claimed to show 16 fissure veins, of 8′ average width, in schist and granite, of which 3, of 7′ average claimed width, are claimed to be under development, and are claimed to carry oxidized and sulphide ores claimed to give average assays of 5% copper, 3 oz. silver and $12 gold per ton, in addition to which they are claimed to carry estimated values of $10 to $12 per ton in nickel, platinum and uranium, which values apparently are something more than doubtful. Development, at last accounts, was by a 40′ tunnel and 14 pits and shafts, of 10′ to 140′

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depth. The Hecla group made an ore shipment, previous to September, 1909, to the Boston & Colorado smelter, but the president reports company unable to continue production owing to lack of capital, but management hopes to have plenty of money soon.

The Teddy Roosevelt-Good Hope group, formerly held by the Amalgamated Copper Mining & Extraction Co., is either 10 claims, area 200 acres, or 11 claims, area 220 acres, in the Silver Crown district, 2 miles from the Union Pacific railway and 23 miles from Cheyenne, said to have about 700′ of workings, said to show ore giving fair assays in copper.

The Kopper Krown group, circa 2 miles southwest of Hecla and 22 miles west of Cheyenne, apparently is 7 claims, area 140 acres, and not 154 acres, as claimed by company, having 413′ of workings, claimed to show 10,000 tons of sulphide ore blocked out for stoping.

The Hecla mill, 80x100′ in size, has 15 stamps, a 50-ton concentrating plant and a leaching plant. The Ohly process was installed by the present management under a former organization, in an attempt to save the rare metals, but was not a success. Ore, which is mainly low in grade, is only in part adapted to concentration, and the mill requires overhauling and adaptation to the ore.

The management of the Hecla Mining Co. and the preceding corporations, which also had Mr. Schwartz as president and general manager, peddled "guaranteed" stock, claiming that 5% interest was guaranteed for 3 years on the stock investment by United States government bonds, but nobody seems to have seen the bonds. The old Kopper Krown Mining Co. advertised that it planned building a smelter, and was ready to ship on a moment's notice, but seems to have failed to receive the notice. Prospectus of the present company states that it is "one of the most substantial, conservative and successful mining organizations in the entire west," which is a rather remarkable claim, considering the history made in the past. Because of the bad record of preceding companies merged in this corporation, and operated formerly under the same management, this company is regarded with much suspicion.

HEFFERN MINING CO. **ARIZONA.**

Mine office: Courtland, Cochise Co., Ariz. Albert Heffern, president. Lands, 200 claims, in the Swissheim Mountains, circa 25 miles south of Courtland and 20 miles north of Douglas. Property shows auriferous and argentiferous chalcopyrite, with occasional bornite, having quartz gangue, and carries some native gold. Development is by a 475′ two-compartment shaft. Equipment includes a 45-h. p. boiler and hoist. Employs circa 50 men, and is developing systematically, with fair prospects.

HENDERSON'S TRANSVAAL ESTATES. **TRANSVAAL.**

Mine office: Berkenrode, Zoutpansberg, Transvaal. Property is in the vicinity of the Messina mine, and development on a copper deposit was begun circa July, 1909.

HENRIETTA MINING & MILLING CO. **COLORADO.**

Office: Ernest & Cranmer Bldg., Denver, Colo. Mine office: Silverton, San Juan Co., Colo. E. C. Drew, president; Geo. H. Craft, secretary and general manager. Circa September, 1909, company bought, at sheriff's sale, the property of the San Juan Smelting & Refining Co.

Lands, circa 40 claims, 10 patented, including a millsite 1 mile below the Henrietta mine, in Prospect Basin, on the western side of Red Mountain, and in Picayune Gulch on Treasury Mountain, with some claims on Eureka Mountain, and 3 claims in Cinnamon Gulch, on the line of the Silverton, Gladstone & Northern railroad, 7 to 10 miles from Silverton. Part of the holdings were held under bond and lease by the Ross Mining & Milling Co. Principal property is the Henrietta mine, carrying auriferous and argentiferous copper ore, opened by a long crosscut tunnel, estimated, by the San Juan Smelting & Refining Co.,

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to show circa 400,000 tons of ore of about $15 average value blocked out for extraction, which figures were much exaggerated. The Henrietta is said to show occasional chutes of high grade smelting ores, up to 20 to 30% in copper tenor, with smelting ore averaging about 7% and milling ore about 3.5% in copper tenor. Mine has 6,250′ of workings, including 4 tunnels, and management plans extending tunnel No. 10, the lowest, now 600′ long, to intersect the Henrietta vein at a distance of 1,200′ from the portal, with a back of about 1,200′. No. 7 tunnel is about 2,200′ long. Property was idle for some years before purchase by present company.

Equipment includes gasoline and electric plants, latter taking current from the Animas Power Co. A Trenton Iron Works aërial tram extends from the railway siding to the portal of No. 7 tunnel.

HERCULES MINING CO. **BRITISH COLUMBIA.**

Mine office: Jedway, Queen Charlotte Island, B. C. Lands are in the vicinity of Awaya, Ikeda & Co., on Moresby Island. Presumably idle.

HERMIDALE COPPER CO. **AUSTRALIA.**

Mine office: Hermidale, N. S. W., Australia. Organized circa August, 1908, under laws of New South Wales, with capitalization £2,625, shares 1s. 6d. par. Company planned beginning prospecting, circa September, 1908.

HESS-FARRIS MINERAL EXPLORATION CO. **MEXICO.**

Mine office: Chalchihuites, Sombrerete, Zacatecas, Mex. C. A. Phelps, superintendent. Property carries ores of copper and lead, and was working with a small force at last accounts.

HIDALGO PLACER MINING CO. **MEXICO.**

Office: Washington, D. C. Mine office: Hidalgo del Parral, Chihuahua, Mex. Gen. L. T. Michener, president; J. Williams, superintendent. Property is copper claims on the Conchos river, about 70 miles from Parral, said to show ore assaying up to 28% copper, at depth of 100′.

HIGH GRADE SILVER & COPPER CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. F. T. Hertzell, president and general manager; L. E. Hertzell, vice-president; W. W. Dickson, secretary and treasurer. Organized circa August, 1909. Property has a 110′ shaft, planned to be deepened.

HILDEBRAND & CO. **MEXICO.**

Office: Durango, Mex. Mine office: Bacis, San Dimas, Durango, Mex. Property is the Trinidad mine, at El Cobre, in the vicinity of Bacis, carrying auriferous and argentiferous copper ore. Property has a 20-ton smelter, and matte is produced and shipped in small quantities.

HILLSIDE CONSOLIDATED MINING CO. **ARIZONA.**

Office: Indianpolis, Ind. Mine office: Cherry, Yavapai Co., Ariz. John H. Tribby, Chas. W. Cheney and Chas. W. Green, directors. Organized circa September, 1909, under laws of Arizona, with capitalization $1,000,000, shares $1 par. According to articles of association, 999,500 shares were to go to Tribby and his associates, in payment for the property, leaving $500 in stock as the company's sole financial resources. Apparently company is a consolidation of the Great Hillside Mining Co., Anabelle Mining Co. and Golden Idol Mining Co. Lands, 19 claims in the Cherry Creek district. Presumably idle.

HOLMWOOD COPPER CO. **AUSTRALIA.**

Mine office. Cowra, Bathurst Co., N. S. W., Australia. Lands, one-half mile from a railway at Holmwood Station, and 5 miles northeast of Cowra, in the parish of Coota, show 4 copper veins in porphyry, with a 92′ shaft sunk vertically in the country rock to intercept the underlay. A vein of 12″ to 18″ width contained bunches of ore assaying 8.22% copper, 3 dwts. 6 grains silver and 3 dwts. 6 grains gold per long ton. Production is reported at 60 long tons of ore. Idle and apparently moribund.

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HOMANZAN MINE. **JAPAN.**

Mine office: Adakaya-mura, Yatsuka-gori, Izumo, Japan. Tojiuro Hori, owner and manager. The mine carries copper without appreciable gold or silver values. Equipment includes a 300-h. p. steam installation, and the mine employs about 600 hands. Production, 1907, was 699,531 lbs. fine copper.

HOPPER MINES CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Cherry, Yavapai Co., Ariz. H. M. Stevens, president; S. S. Lindsay, vice-president; W. N. Ogden, secretary; Isaac D. L. Williams, treasurer. Organized under laws of Arizona, with capitalization $750,000, shares $1 par. Lands, 4 claims, area 65 acres, in the Ash Creek district, about 14 miles east of Cherry, with wagon road connecting. Property shows veins of 30" and 5', said to average $15 to $18 per ton in combined copper, silver and gold values, with values apparently mainly in gold and silver. Mine was idle several years until work was resumed by present owner, circa February, 1909, when a contract was let for a 150' shaft, to be sunk at an incline of 45°, planned to connect with old workings, where there is said to be a considerable amount of ore ready for stoping.

HOPE MINING CO. **MONTANA.**

Office: Security Bldg., St. Louis, Mo. Mine office: Philipsburg, Granite Co., Mont. Paul A. Fusz, general manager; John R. Lucas, superintendent. Property carries argentiferous copper ore, with values mainly in gold. Equipment includes a steam plant, 10-stamp mill and 5-ton chlorination plant.

HORSESHOE BASIN MINING & DEVELOPMENT CO. **WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. Lands, 5 claims, near Lake Chelan. Company is driving a tunnel, jointly with the Cascade Gold & Copper Mining Co., which should cut the main vein at about 1,100' from the portal. At distance of 830' tunnel cut an 18' blind vein with a 4" stringer carrying ore assaying $27.75 per ton in combined copper, silver and gold values.

HORST-POWELL COPPER MINING CO. **IDAHO**

Office and mine: Kingston, Shoshone Co., Idaho. E. E. Horst, president; Mark Mendenhall, secretary. Capitalization $600,000 shares, $1 par. Lands, 8 claims, 2 patented, and a millsite, on the Little North Fork river. Development is by a blind shaft from a tunnel, showing a vein of 12' estimated width at surface, with slate footwall and quartzite hanging-wall, carrying copper, gold and silver. Company was said, late 1908, to have struck a 4' vein assaying 19 to 25% copper. Equipment includes a power hoist and necessary mine buildings. Employs 6 men.

AKTIESELSKABET HOVIN KOBBERMINER. **NORWAY.**

Office and mine: Hovin, Norway. Property includes small copper mines at Hovin and Gransherred, Norway. Presumably idle.

HOWARD MINING, MILLING & DEVELOPING CO. **COLORADO.**

Mine office: Salida, Chaffee Co., Colo. Property, immediately contiguous to Salida, has several shallow shafts, deepest 50'.

HUMBOLDT SMELTER MINES. **ARIZONA.**

Office: Boston, Mass. Mine office: Humboldt, Yavapai Co., Ariz. Richard J. Burton, president. Organized circa December, 1908, with capitalization $750,000, shares $5 par. Lands, 4 claims, area 80 acres, also a millsite and a water right. Presumably idle.

IDAHO LEAD-SILVER MINING CO. **IDAHO.**

Mine office: Osburn, Shoshone Co., Idaho. E. W. Conrad, general manager. Lands carry argentiferous lead and copper sulphides. Equipment includes a gasoline engine and air-compressor. Was under development with a small force at last accounts.

IMPERIAL COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Property, slightly developed,

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shows stringers of copper ore, apparently improving with depth, and continuous development is planned. Equipment includes a small power plant.

INDEPENDENCIA MINING & MILLING CO. **MEXICO.**

Dead. Was reorganized as Mascota Copper Co. Formerly at Ameca, Jalisco, Mex.

INDIANA MINING CO. **CALIFORNIA.**

Office: 40 Currier Bldg., Los Angeles, Cal. Mine office: Needles, San Bernardino Co., Cal. Presumably idle.

INDIANA MINING CO. **MICHIGAN.**

Office: 60 Congress St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Rockland, Ontonagon Co., Mich. Stephen R. Dow, president; Alvin R. Bailey, secretary and treasurer; Richard M. Edwards, superintendent. Organized circa August, 1909, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,000,000; paid in, $8 per share. Company gave 60,000 shares to owners of lands for its property, and offered 36,000 shares, August, 1909, for public subscription, and is supposed to have started business with $128,000 cash.

Lands, 1,200 acres, bought 1909, from Indiana Copper Co., northeast of the Lake Copper Co. and north of the North Lake, in Sections 21, 27 and 28, T. 50 N., R. 37 W. Property was worked on a small scale, previous to burning of mill, in 1864, but old workings are inaccessible, and no work was done on the southeastern part of the tract, in the horizon of the Lake amygdaloidal bed, which is supposed to be carried by the Indiana. Diamond drilling was begun, August, 1909, the overburden proving comparatively light, and first hole was drilled to the Eastern sandstone. Property considered promising.

INDIAN CHIEF CONSOLIDATED MINING CO. **UTAH.**

Mine office: Newhouse, Beaver Co., Utah. Andrew Cochrane, president; Jas. P. Quinn, secretary and treasurer; preceding officers, Wm. Gray and Louis Cochrane, directors. Organized January, 1909, under laws of Utah, with capitalization $150,000, shares 10 cents par.

INDICATOR MINING CO. **WYOMING.**

Office: Encampment, Carbon Co., Wyo. Property, on French Creek, is idle, excepting for annual assessment work.

INGLENOOK MINING CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. F. J. Price, president; L. S. Bowman, vice-president; C. C. Frost, secretary and treasurer. Organized circa 1903, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, about 320 acres, 35 miles from a railroad, on the Verde River, in the Square Peak district of the Black Hills, including both gold and copper claims, with more promising values on the latter. The gold mine has a 275′ tunnel and the copper mine has a 150′ shaft and tunnel. Company has secured ore assaying 30 to 40% copper, with some gold and silver.

INLAND COPPER CO. **ARIZONA.**

Office: Commerce Bldg., Kansas City, Mo. Mine office: Planet, Yuma Co., Ariz. Lands, circa 40 claims, including 2 groups of about 15 claims each, in the Bill Williams range, near the Bill Williams Fork River, with a millsite, smeltersite and water rights.

INLAND COPPER CO. **IDAHO.**

Mine office: Troy, Latah Co., Idaho. Lands, 8 claims, east of Troy, having about 1,000′ of tunnels, showing, at depth of 160′, a 20′ vein, mainly oxidized, with streaks of rich ore assaying up to 27% copper.

INTERNATIONAL CONSOLIDATED COPPER CO. **MEXICO.**

Office: Liberal, Kans. Mine office: Hermosillo, Sonora, Mex. Geo. M. Kerr, president; O. C. Armstrong, secretary and treasurer. Organized circa 1907, under laws of Arizona, with capitalization $1,000,000, and is protocolized under

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laws of Mexico. Lands, 36 hectares, circa 60 miles northwest of Hermosillo. Presumably idle.

INTERNATIONAL CONSOLIDATED MINING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. F. C. Jenkins, manager. Organized 1909, under laws of Utah, with capitalization $1,000,000. Lands, 11 claims, in Big Cottonwood Cañon, about 5 miles from Alta, having a 100′ tunnel showing a streak of rich sulphide ore.

INTERNATIONAL SMELTING & REFINING CO. NEW JERSEY & UTAH.

Office: 42 Broadway, New York, N. Y. Smelter office: Tooele, Tooele Co., Utah. Refinery office: Perth Amboy, Middlesex Co., N. J. John D. Ryan, president; Dennis Sheedy, vice-president; J. W. Allen, secretary and treasurer; preceding officers, Urban H. Broughton, Charles F. Brooker, Thos. F. Cole, Adolph Lewisohn, E. C. Converse, Thos. Morrison, Chester A. Congdon, Chas. H. Sabin, Wm. D. Thornton and Chas. F. King, directors; E. P. Matthewson, consulting metallurgical engineer; Chas. H. Repath, engineer; Edw. Scallon, assistant engineer. Organized Dec. 21, 1908, under laws of New Jersey, with capitalization $50,000,000, shares $100 par; issued, $10,000,000. Is controlled by the Cole-Ryan interests, and is closely affiliated with the Amalgamated Copper Co. Guaranty Trust Co., New York, transfer agent; Bankers Trust Co., New York, registrar. Shares are listed on the Boston stock exchange. First quarterly dividend, 1½%, was paid Nov. 1, 1909, and company is stated, in the press, to be earning at the rate of 10 to 12% per annum.

The New Jersey charter is very broad, permitting the company to engage in the mining, milling, smelting and refining of all metals, and provides furthermore that the company may acquire the stocks, bonds and securities of other corporations, and guarantee dividends, interest, etc., of securities in other companies, and may buy and utilize standing timber, lumber, water powers, canals, railroads, etc. The charter allows the directors to execute mortgages without any action on the part of shareholders, and the board of directors must consist of 3 members, or multiples of 3, one-third of the board retiring annually.

Company's balance sheet, as of May 31, 1909, gave total assets of $10,070,600, of which $3,154,000 was cash in banks, and $6,119,500 was stock in other companies and plants under construction. Cash on hand, as per balance sheet of Aug. 24, 1909, was $2,968,298, with a surplus, after provision for payment of dividend, of $19,151.

Property at present consists of a smeltersite and smelter under construction in Tooele County, Utah, and the Raritan copper refinery at Perth Amboy, latter bought for $6,500,000, partly in cash and partly in shares, of the United Metals Selling Co. The earning capacity of the Raritan works is estimated at about $1,000,000 yearly. Company also controls the Tooele Valley Railroad Co.

In addition to the smeltersite, in Pine Cañon, on the Tooele side of the Oquirrh Mountains, the company controls the townsite of Tooele, 4 miles from the smeltersite, but apparently will handle same through the Tooele Improvement Co., selling property outright. The company has taken the wise precaution of securing smoke easements, and also obtained the services of an expert veterinarian and a botanist, who carefully studied the conditions of vegetation and animal life in Pine Cañon. Six months after the smelter is in operation, these authorities will return to the valley and compare conditions with those existing previously, to determine whether or not any injury has been done to stock and vegetation, in order that the company may not be mulcted by farmers and ranchers for mythical damages done to their crops and live stock.

The smeltersite is at the mouth of Pine Cañon, 4 miles east of Tooele, and just over the divide from Bingham Canyon. Construction work was begun early 1909, foundation work requiring the extraction of more than 100,000 cubic yards of earth and rock. Buildings are of steel construction throughout, requiring,

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for the completed plant, about 7,000 tons of structural steel, and the finished works will cost about $2,500,000. The general plan followed is much similar to that of the Washoe works, though on a materially smaller scale, and the works are planned on the unit system, so that they can be enlarged, when required, at minimum expenditures of time, labor and money. The works were planned to have an initial capacity of 2,000 to 2,500 tons daily, but apparently will start with a capacity of about 1,250 tons per diem only. Much of the material from the old Utah Consolidated smelter was used in constructing the new plant. The completed works will include a sampling-mill, power-house, calcining building with 32 McDougall roasters, blast-furnace building, reverberatory furnace building, machine-shop, smithy, etc., with a 350′ brick smoke-stack on a concrete foundation. It is planned to blow in the smelter circa Feb. 1, 1910, and the company has a 10-year smelting contract for handling the ore of the Utah Consolidated, effective March 1, 1910.

Ore will be brought from the Utah Consolidated at Bingham Canyon by a high-line aërial tram, but the matter of boring a 3½-mile tunnel through the mountain is being given tentative consideration.

Company controls the Tooele Valley Railroad Co., having a 7-mile line connecting with the San Pedro, Los Angeles & Salt Lake railroad, and survey has been made for an 18-mile line to connect with the same railroad near Garfield, giving a maximum grade of 1½%.

The Raritan works, on New York harbor, completed 1899, and since enlarged, is one of the largest and most modern copper refining plants in the world, including a smelter and a mammoth electrolytic refinery. The smelter has 2 furnace buildings, with two 100-ton furnaces casting anodes in iron moulds on a mechanical conveyor, and two 150-ton casting furnaces for wire-bars and anodes.

The electrolytic refinery includes 2 tankhouses and a power house, connected by 3′ concrete tunnels, power consumption being about 3,000 kilowatts, the works having a capacity of about 1,000,000 lbs. finished copper daily. No. 1 is the old and No. 2 the new tankhouse, latter completed circa 1907. No. 1 tankhouse has 1,600 tanks, each holding 21 anodes and 21 cathodes, of size 24x36″, using a current of 5,000 amperes, with a cross-sectional area of only 5 square inches in the busbars.

No. 2 tankhouse is 150x184′ in size, having concrete foundations, with steel frame and brick walls, special acid-proof Berlin brick being used for the basement floor. Permanent equipment includes 1,870,000 lbs. of lead, of which 1,500,000 lbs. are in tank linings, and 881,000 pounds of copper divided as follows: copper cathode rods, 186,000 lbs.; stripping plates, 122,000 lbs.; busbars and connections, 170,000 lbs.; leads, etc., 100,000 lbs.; lead anode rods, 300,000 lbs. No. 2 tankhouse has 3 bays, running lengthwise, with two 10-ton 3-motor Whiting cranes in each bay, equipped with special devices for handling an entire tankful of anodes or cathodes at one load. No. 2 tankhouse has 3 electric circuits, running lengthwise, one in each bay, each circuit of 396 tanks being handled from the powerhouse by an electric generator. Current is 7,500 amperes, giving a current density of 20 amperes per square foot. Main conductor has a cross-sectional area of 12¾″. There are 1,188 depositing tanks, arranged in 108 nests of 11 cells each, electrode arrangement being on the Walker system, tanks being lined with 6-lb. lead, containing 4% antimony. There also are special tanks for rinsing the cathodes, after removal from depositing tanks, and tanks for scrubbing slimes from scrap anodes, latter amounting to about 13% by weight. The works have special shears for trimming cathode loops, and a Morrow loop machine for attaching copper lugs to the cathode starting-sheets. Anodes are 28x36″ and cathodes are 30x37″, each tank having 24 anodes and 25 cathodes, spaced on 4⅝″ centers, cathodes re-

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maining in tanks 14 days and anodes 28 days. In No. 1 tankhouse the anodes require 35 days for corrosion.

The general direction of the electrolytic circuit is lengthwise, but circulation of the electrolyte is crosswise, and, for circulation purposes, No. 2 tankhouse is divided into 6 units, of 198 tanks each, the circulation rate being about 4 gallons of electrolyte per tank per minute, solution entering bottoms of tanks and overflowing from tops. Adjoining the tankhouse is the pump-house, having hard-lead centrifugal pumps for circulation of the electrolyte, pumps having no stuffing-boxes or wearing parts coming into contact with the electrolyte, the shaft-bearings being placed above the level of the inflowing solution. These pumps are giving excellent service. Slimes are screened and washed through launders to a sump, and pumped thence to receiving tanks in the silver refinery. The works employ about 1,000 men, when operated to full capacity.

The International has been credited with purchasing or intending to purchase a number of smelting plants that were not taken over. The management is in strong hands, which is necessary in the case of a corporation designed to compete, on its own ground, with so powerful a concern as the American Smelting & Refining Co.

INTERSTATE MINING & MILLING CO. **IDAHO.**

Office: Minneapolis, Minn. Mine office: Wallace, Shoshone Co., Idaho. Oscar D. Wallace, manager. Lands, circa 9 miles from Wallace, on Nine Mile Creek, lie between the Hercules and the Callahan mines, to the northwest of Sunset Peak. Former work included about one-half mile of tunnel, crosscuts and drifts, with a 50′ winze, showing several promising leads in Burke quartzite, carrying small quantities of argentiferous galena, bornite and chalcopyrite. New work is by No. 2 tunnel, located several hundred feet vertically below the portal of No. 1. Lands are magnificently timbered, carrying some of the finest standing pine, spruce, larch and fir on the American continent. Improvements include a number of substantial mine buildings. Management is good and property considered promising.

INYO NEVADA MINING CO. **CALIFORNIA.**

Office: Nixon Block, Goldfield, Nev. Mine office: Big Pine, Inyo Co., Cal. V. J. Luther, president; J. W. Shireman, vice-president; O. W. Baldwin, secretary; Jos. Crowther, treasurer; Edw. Watson, assistant secretary. Capitalization $1,000,000, shares $1 par. Lands, 7 claims, east of Big Pine, 6 carrying gold ores, having a 55′ shaft, and 6 veins are said to have been shown by trenching. The copper claim has a 43′ shaft, showing at bottom ore giving assays of 12% copper and 3 oz. silver, with a trace of gold.

IONE COAL & IRON CO. **CALIFORNIA.**

Office: Crocker Bldg., San Francisco, Cal. Mine office: Ione, Amador Co., Cal. I. W. Tantau, superintendent. Lands, 1 patented claim, on Irish Hill, about 3 miles north of Ione. Property is an old mine, having a vein of about 4′ width, between amphibolite schist hanging wall and aluminous shale footwall, developed by 5 shafts, deepest 300′, showing chalcopyrite and cupriferous pyrite, slightly auriferous and argentiferous. Has a steam hoist.

IRENE MINING, SMELTING & PROSPECTING CO. **MEXICO.**

Office: 403 South Flores St., San Antonio, Tex. Mine office: Calle Aldama 11, Saltillo, Coahuila, Mex. Harry S. Jones, president; T. T. Jacobson, vice president; T. Holt, secretary; J. J. Coffman, treasurer; Francisco Farias, superintendent. Organized 1906, under laws of Arizona, with capitalization $500,000, shares $10 par. Property is the Josefina mine, carrying cuprite, melaconite, chalcopyrite and tetrahedrite, all more or less argentiferous. Mine has been much troubled by water, and a drainage tunnel was being driven, at last accounts. Employs circa 30 men.

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SALVADOR IRIZAR. **MEXICO.**

Office and mine: Charcas, Moctezuma, San Luis Potosí, Mex. Property is the Cerro del Cobre mine, carrying auriferous and argentiferous copper ore, under development by a shaft planned to cut the vein at depth.

IRON HEEL MINING CO. **UTAH.**

Office: Salt Lake City. Mine office: Eureka, Juab Co., Utah. J. A. Snyder, president; R. N. Corey, secretary and treasurer. Organized circa November 1909, under laws of Utah, with capitalization $25,000, shares 5 cents par.

IRON KING CONSOLIDATED MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Col. C. E. Loose, general manager. Mine has a 600′ shaft, and a 1,000′ tunnel planned to cut the vein at about 3,000′ from the portal, which possibly may be driven to an eventual length of 6,000′.

IRON MOUNTAIN MINING CO. **BRITISH COLUMBIA.**

Mine office: Jedway, Queen Charlotte Island, B. C. Property is on Moresby Island of the Queen Charlotte group, in the vicinity of the mine of Awaya, Ikeda & Co.

IRON SPRINGS MINING CO. **IDAHO.**

Dead. Lands sold, 1908, to Keystone Mining Co., for $10,000. Formerly at Weiser, Washington Co., Idaho.

ISLAND COPPER CO. **MICHIGAN.**

Office: Lyceum Bldg., Duluth, Minn. Operating office: Leopold Bldg., Houghton, Mich. Thos. F. Cole, president; Geo. C. Stone, vice-president; Fred W. Nichols, secretary; preceding officers, Geo. G. Barnum, F. W. Heimick, Ward Ames, Sr., Oscar J. Larson, Henry Nolte and G. A. Tomlinson, directors; Edw. J. Maney, treasurer. Organized March 16, 1909, under laws of Michigan, with capitalization $1,000,000, shares $25 par; issued, $475,000, shares $6 paid.

Lands, circa 84,000 acres, including former holdings, 83,720 acres, of the Isle Royale Land Corporation, Ltd., and lands of the Island Mining Co., all on the island of Isle Royale, county of Isle Royale, Michigan. Holdings comprise the major portion of the area of this, the largest freshwater island of the globe. Considerable mining, of a rather desultory nature, has been done upon these lands at various periods in the past, and a limited production of copper secured therefrom. The Island Mining Co. and its predecessors did rather extensive work on a conglomerate bed of the Keweenawan copper bearing belt, sinking 3 shafts, one of which was said to be 1,000′ deep, with a fair showing at the bottom of the mine, but work was suspended on this property in 1873. No exploratory or development work has been done on the island since 1892. Property is idle, but is considered of great potential value.

IVA GRACE MINING CO. **IDAHO.**

Mine office: Silver City, Owyhee Co., Idaho. Marcus White, superintendent. Property carries argentiferous copper ores. Equipment includes a small steam plant and a 5-stamp mill.

IWAYA MINE. **JAPAN.**

Mine office: Itsuke-mura, Kuma-gori, Higo, Japan. Kichibei Noda, owner and manager. Equipment includes a 75-h. p. steam installation. Forces were 169 hands in 1907, with production, that year, of 252,971 lbs. fine copper.

JALISCO BLANCA COPPER CO. **MEXICO.**

Mine office: Caborca, Altar, Sonora, Mex. Property is about 9 miles west of Caborca, and, in February, 1909, it was said that an extensive machinery equipment was to be installed.

JAY GOULD MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. F. C. Bailey, superintendent. Property is a copper prospect, under development with force of about 10 men at last accounts.

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JERSEY BELL COPPER MINING CO. **NEW MEXICO.**

Office: 147 Nassau St., New York, N. Y. Mine office: Silver City, Grant Co., N. M. John D. Fisher, president; E. D. Middlekauff, vice-president and treasurer; R. J. Curry, secretary; J. T. Janes, mine superintendent; W. P. Sellers, foreman. Organized Aug. 19, 1908, under laws of Arizona, with capitalization $1,000,000. Annual meeting, second Tuesday in June.

Lands, 9 claims, area 140 acres, in the Pinos Altos district, showing a vein of 30′ estimated width, traceable 3,000′, carrying chalcocite, bornite, chalcopyrite and tetrahedrite, estimated by company to average $37 to $40 per ton in value. Development is by 4 shafts, of 30′ to 90′ depth.

COMPAÑÍA MINERA DE JIMOLES. **MEXICO.**

Mine office: Torreón, Viesca, Coahuila, Mex. Property includes La Reforma y Anexas claims, carrying auriferous and argentiferous copper ores.

JOHN WOOD MINING CO. **MONTANA.**

Mine office: Clinton, Missoula Co., Mont. John Wood, superintendent. Property shows a 10′ vein on the North Point claim, in which copper ore of good average assay value was opened, circa April, 1909.

JOWELL GOLD & COPPER MINING CO. **NEW MEXICO.**

Mine office: Sylvanite, Grant Co., N. M. Property, slightly developed, has shown fair assay values in gold and silver.

JULIA COPPER MINING SYNDICATE, LTD. **SPAIN.**

Office: Queen Anne's Chambers, London, S. W., Eng. Mine office: La Fregeneda, Salamanca, Spain. Maj.-Gen. E. H. Stewart, C. M. G., chairman; preceding officer, W. T. Raymond and B. H. Rolfe, directors; W. J. Kingsford, secretary; T. H. Bower, consulting engineer; J. E. Taylor, mine manager. Organized June 29, 1908, under laws of Great Britain, with capitalization £10,000, shares £1 par, in £5,000 of 6% participating preference shares and £5,000 ordinary shares, fully issued, £7,500 fully paid and £2,500 partly paid. Lands, 340 acres, known as the Julia mine, on which development work is in progress.

KANGIARA MINES, LTD. **AUSTRALIA.**

Mine office: Yass, N. S. W., Australia. Organized 1908, under laws of Australia, with capitalization £50,000, shares 10s. par. Lands, about 20 miles from Yass, have a 5′ vein, developed by shaft, carrying ore ranging in tenor from 5 to 8% copper, 5 to 30% lead, 10 to 20 oz. silver and 5 to 12 dwts. gold per long ton. Production formerly was shipped abroad for treatment, but first consignment, 50 tons of ore, was sent to the new works at Port Kembla, late 1908, and the company was said, August, 1909, to plan building a small smelter on the coast. Property considered of exceptional promise.

KARATOYA MINING CO. **JAPAN.**

Mine office: Okura-mura, Mogami-gori, Uzen, Japan. Property, having no power installation, employs an average of about 100 hands. Production, 1907, was 40,741 lbs. fine copper, 4,570,868 lbs. of copper ore and 2,240 metric tons of zinc ore, of the total value of 27,703 yen.

KELLOGG CONSOLIDATED MINING & MILLING CO., LTD. **IDAHO.**

Office and mine: Kellogg, Shoshone Co., Idaho. J. H. Carroll, president; A. P. Hutton, secretary. Capitalization $1,000,000, shares $1 par. Lands, 3 claims, near Kellogg, showing a 4′ vein in quartzite, developed by a 55′ shaft, carrying ore assaying about 2.5% copper, with traces of gold and silver.

KENYON MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. J. E. Galigher, president; H. B. Blades, vice-president; Valentine S. Snow, secretary and treasurer; preceding officers, Arthur E. Law, P. J. Fennell, Harry F. Hart and E. J. Howell, directors. Organized circa May, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Property is the eastern part of the Tintic district.

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KEYSTONE COPPER CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. W. W. Miller, president and general manager. Lands, 16 claims, southwest of the United, developed by a 65′ shaft in limestone, showing 10″ of chalcocite assaying up to 35.5% copper, with indications of good sulphide ore bodies at depth. Management plans sinking shaft to 200′.

KEYSTONE MINING CO. **IDAHO.**

Office: Cannonsburg, Pa. Mine office: Weiser, Washington Co., Idaho. Wm. Caldwell, secretary and treasury. Lands were bought for $10,000, October, 1908, of the bankrupt Iron Springs Mining Co.

KINCORA MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Newhouse, Beaver Co., Utah. Ray Van Cott, president; A. H. Crabble, vice-president; F. B. Waddell, treasurer. Organized March, 1909, under laws of Utah, with capitalization $500,000, shares $1 par. Lands, 8 claims, near the Newhouse mines, 6 miles from a railroad, developed by a 200′ tunnel.

KIRKEBY MINES. **NORWAY.**

Office: Carl Johansgade 23-IV, Christiania, Norway. Mine office: Hakedal, Christiania, Norway. Olaf Sandaas, manager. Lands, about 10 kilometers from Hakedal, show numerous parallel veins, with cross fissures, carrying chalcopyrite, galena, sphalerite and pyrite, with quartz gangue.

KITSUNEZUKA MINE. **JAPAN.**

Mine office: Ota-mura, Mine-gori, Nagato, Japan. Masashi Kuwabara, manager. Equipment includes a 40-h. p. steam plant. Employs an average of 250 hands. Production, 1907, was 111,129 lbs. fine copper.

KITTIMAC MINES CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. John T. Joyce, manager. Mine has gold-copper ores. Equipment includes steam power and a 10-stamp mill. Employs about 25 men.

KNIGHT'S ISLAND COPPER MINING CO. **ALASKA.**

Office and mine: Valdez, Alaska. S. A. Hempel, president. Lands, 150 acres, in process of patenting, on Dryer Bay, Knight's Island. Property has a good surface showing, and has shown ore assaying up to 20% copper. Equipment includes a 200-h. p. hydraulic plant, furnishing power for air-compressors.

KNOB HILL GOLD MINING CO., LTD. **BRITISH COLUMBIA.**

Dead. Was merged, March 29, 1901, in Granby Consolidated Mining, Smelting & Power Co., Ltd. Formerly at Phoenix, Boundary district, B. C.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE DE KUPFERBERG. **GERMANY.**

Office: Brussels, Belgium. Mine office: Kupferberg, Bavaria, Germany. Chas. Leys, comissaire. Organized June 15, 1904, under laws of Belgium, with capitalization f6,000,000, shares f500 par. Property is a small copper mine, formerly owned by Gewerkschaft Kupferberg. Presumably idle.

KYSHTIM CORPORATION, LTD. **RUSSIA.**

Office: 5 Fenchurch St., London, E. C., Eng. Mine office: Kyshtim, Perm, Russia. C. F. H. Leslie, chairman; S. J. Blumlein, managing director; preceding officer, Baron Vladimir Meller-Zakomelsky, D. J. Morgan, T. B. Reynolds, S. Polak, A. J. H. Smith, F. Stobart and L. Urquhart, directors; J. Owler, secretary. Organized Oct. 29, 1908, under laws of Great Britain, with capitalization £1,000,000, shares £1 par, fully issued and fully paid. Property is the entire share capital, consisting of 34,440 shares, of 200 roubles par, of the Kyshtim Mining Works, a corporation organized under the laws of Russia, in 1900, of which Mr. Urquhart is managing director. Property was taken over subject to a first mortgage of £600,000. A 50% share interest in the Kyshtim Corporation, Ltd., is owned by the Anglo-Siberian Co., Ltd. Debentures, £300,000 au-

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thorized, at 6%; issued, £250,000. Debentures are convertible into fully paid shares, at 50% premium, until Nov. 1, 1911, and are redeemable on or before May 1, 1927, by means of a redemption fund, to be created by applying £17,500 yearly, beginning on or before May 1, 1912, in redeeming debentures, by drawings, at £105, or by purchase in the open market below that price, the company retaining the right, on giving 3 months' notice, to redeem all or any of the debentures at £105.

Lands, 2,198 square miles, or 1,406,700 acres, including iron mines, iron smelters and works, gold mines, copper mines and a copper smelter, the mineral lands covering circa 189,000 acres, with 367,200 acres of arable and grazing lands, and 850,500 acres of forest lands. Under the provision of the Russian law, about 100,000 acres of the arable lands must be sold to peasant proprietors.

The company's copper and gold mines, in the Soimonovsk valley, about 30 miles from Kyshtim, include a number of copper mines, of which the Koniukhoff, Smirnoff, Tissoff and Karabash are the principal properties. The Koniukhoff mine is the richest in tenor of its copper ores, which also carry good gold and silver values. Ore reserves of the Koniukhoff are estimated at 550,000 long tons, carrying 18,000 long tons fine copper, or a trifle better than 3.25% in average copper tenor. The old workings have caved badly, and are being replaced by the Leslie vertical shaft, which was 300′ deep, early 1909. A borehole on the Smirnoff mine, drilled 1909, shows about 10′ of medium grade copper ore at depth of 440′. The Tissoff mine developed some new ore of promise during 1909.

The smelter, known as the Verch Kyshtim Works, is antiquated, with small furnaces, but is being rebuilt, and an extensive electrolytic refinery added, latter planned to refine the blister copper from practically the entire district of Perm.

In addition to its copper mines and works, the company has 3 iron works on different parts of the estate, the plant at Kyshtim making bar iron, that at Niazepetrovsk making sheet iron, and that at Kasli, about 15 miles north of Kyshtim, making castings.

Transportation facilities not being satisfactory, the company plans the construction of a 30-mile railroad from Kyshtim to the mines.

Average cost of producing electrolytic copper is estimated by H. H. Knox at only £32 per long ton, or 7 cents per pound, which seems a very low figure, and Mr. Knox estimates that for an expenditure of £103,000, the production should be increased to nearly 4,500 tons of finished copper yearly. Production of the Verch Kyshtim works, for first 9 months of 1907, was 27,251 poods, equal to 984,088 lbs. fine copper, and production, 1908, is estimated at 1,250,000 lbs. fine copper. Reports regarding this property, from the district itself, are decidedly conflicting, as to methods employed and results secured, and the ability of the company to make copper for 7 cents per pound remains to be demonstrated.

LA CORONADO DEVELOPMENT CO. **ARIZONA.**

Office: Phoenix, Ariz. Mine office: Florence, Pinal Co., Ariz. B. Reed, superintendent. Lands, 18 miles northeast of Florence, have a 100′ shaft, and a tunnel showing a 3′ vein of ore giving assays of 23% copper, 15 oz. silver and $8.41 gold per ton.

LADOGA LAKE MINING & SMELTING CO., LTD. **FINLAND.**

Office: Finsbury House, Blomfield St. London, E. C., Eng. Mine office: Pitkäranta, Viborg, Finland. Col. R. G. Sharaman Crawford, chairman; C. McCully, managing director; J. Sargent, secretary. Organized March 2, 1908, under laws of Great Britain, with capitalization £200,000, shares £1 par; issued, £111,000, of which £100,000 vendors' shares are fully paid, and 11,000 shares are 1s. paid.

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Lands, circa 10,000 acres, mainly well wooded, near Lake Ladoga, carrying iron and copper ores. Mine, known as the Pitkäranta, opened circa 1820, was worked steadily until 1903, making an average annual production of about 750,000 lbs. fine copper during the last decade of operation, and was under the ownership of the Russian Imperial Bank, which is practically the Russian government, from 1894 until taken over, 1908, by present company.

The property carries several ore bodies, but the one developed is a 15′ bed of "skarn," which is a granular mixture of augite, garnet and other ferro-magnesian silicates, impregnated with chalcopyrite, in veinlets. This ore body, which dips to the south, at 40° to 50°, has been opened at intervals for a length of about 1½ miles. To the eastward the ore occurs as bunches, up to several pounds in weight, and at this end of the workings the ore body is separated into 5 sections, the footwall bed, of about 70′ width, carrying finely disseminated chalcopyrite in "skarn," overlaid by a 2′ to 3′ layer of barren material, followed in turn by 3′ of barren schist, succeeded by a cupriferous bed, of about 20″ thickness, carrying somewhat argentiferous copper sulphides. The company's lands also carry iron ore and are said to have indications of tin.

The mine has a small smelter, and the company owns 3 steamers, known as the Vulcan, Ludwig and Niemelin, and 10 barges. Property considered valuable.

LA FORTUNA MINING CO. **MEXICO.**

Office: 315 Colorado Bldg., Washington, D. C. Mine office: Apartado 21, Ocotlán, Oaxaca, Mex. C. E. Miller, president; Wm. H. Brown, first vice-president; E. D. Stinson, second vice-president; Amos Tyree, secretary; Ambrose Timberlake, treasurer; Wm. Nelson Brown, superintendent. Organized 1906, under laws of South Dakota, with capitalization $250,000, shares $10 par. Lands, 30 hectares, known as the Treadwell group, about 3 miles from Ocotlán and one-half mile from the Oaxaca-Taviche branch of the Mexican Southern railway. Property shows a well defined fissure vein of 2′ to 12′ width, standing nearly vertically, cutting bedded andesite tuffs, and is greatly leached and oxidized to depth of 300′. Development is by a 400′ vertical shaft, with 600′ of workings, and by two 100′ prospect shafts and 4 tunnels of 700′ aggregate length. Workings show argentiferous chalcopyrite with quartz gangue, estimated by company to average 4.5% copper and 200 grams silver per metric ton. Some ore has been shipped returning 14% copper and 600 grams silver per metric ton. Company has been operating since 1906. Equipment includes a 40-h. p. boiler, hoist and a small air-compressor for hammer drills. Property considered promising.

LA GRACIA GOLD & COPPER CO. **ARIZONA.**

Mine office: Dewey, Yavapai Co., Ariz. Maj. T. C. Jordan, manager. Lands, known as the Red Bluff group, held under bond, show ore giving assays up to 20% copper, circa 15% nickel and 8% cobalt, with considerable antimony and arsenic. The ore is refractory and will require special treatment. Company planned sending a carload of ore, late 1909, to New Jersey works for a thorough metallurgical test.

LAKE SUPERIOR & SONORA DEVELOPMENT CO. **MEXICO.**

Office: Duluth, Minn. Mine office: Altar, Sonora, Mex. Employs circa 50 men. C. S. Carpenter, president; Jas. Moran, vice-president; Odin Halden, secretary and treasurer; A. M. Hamfield, general manager; preceding officers, E. C. Alsted and Jas. Smith, directors. Organized 1909, with capitalization $500,000, shares $10 par. Lands are variously reported as 200 acres and as circa 1,000 acres. Property includes La Reina de Cobre mine, area circa 200 acres, about 7 miles east of El Plomo mine, in the foothills of the San Manuel Mountains, 30 miles northwest of Altar. Property is said to carry 6 well defined

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fissure veins, in porphyry, giving ore assaying 16% copper and 20 oz. silver per ton, and shows 2 principal veins, of which one has an iron gossan. Work done includes considerable trenching, and 2 shallow shafts. Improvements include necessary mine buildings.

LAMPA MINING CO., LTD. **PERÚ.**

Office: 80 Drury Bldgs., Liverpool, Eng. Mine office: Santa Lucia, Lampa, Puno, Perú. J. Lionel Barber, chairman; preceding officer, L. G. Beaumont, H. P. Gamon and G. M. Hampshire, directors; Thos. S. Hancox and R. D. Barber, consulting engineers. Organized June 30, 1906, under laws of Great Britain, with capitalization £35,000, shares £1 par; issued, £23,280. Debentures, £10,000 authorized; £5,130 issued. Accounts submitted Sept. 28, 1908, showed a loss of £3,256, with debit balance of £4,490. Lands, 17 hectares, known as the Santa Catalina, Rubi and other copper claims, also a power site known as Trapiche, and the water power of Toropujani, near Santa Lucia.

LANCELOT TIN MINES, LTD. **AUSTRALIA.**

Office: 1 Bucklersbury, London, E. C., Eng. Mine office: Herberton, Cardwell Co., Queensland, Australia. A. Jackson, managing director. Organized March 19, 1909, under laws of Great Britain, with capitalization £17,500, shares £1 par, as a reconstruction of Lancelot Freehold Tin & Copper Mines, Ltd., which was a reconstruction, 1903, of the Lancelot Tin Mining Co., Ltd. Lands, 60 acres freehold and 160 acres leasehold, carrying ores of copper, tin, bismuth and wolfram, opened by a 327′ main shaft and a 150′ tunnel. Equipment includes a small concentrator. Property has been a small producer of tin and bismuth only, the copper ores being practically undeveloped.

LAS BOLAS MINING & SMELTING CO. **MEXICO.**

Office: St. Paul, Minn. Mine office: Guachinango, Mascota, Jalisco, Mex. Presumably idle.

LAST CHANCE MINING CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. W. P. Worthen, general manager. Lands, 1 patented claim, adjoining the American Copper Co., in the Big Cottonwood district. Shaft, at depth of 70′, is said to show a 6″ lead of silver-lead ore. Management planned, 1909, installing a hoist and other equipment.

LA VENTURA MINING & MILLING CO. **MEXICO.**

Mine office: Ocotlán, Oaxaca, Mex. Geo. I. Bentley, manager. Mine carries auriferous and argentiferous copper ore, and property has a small steam plant.

LENA GOLD & COPPER MINING CO. **NEVADA.**

Office: Dover, Del. Mine office: Searchlight, Lincoln Co., Nev. Hon. J. Frank Allee, president. Property shows auriferous chrysocolla.

LEON MINING CO. **MEXICO.**

Office: 100 Broadway, New York, N. Y. Mine office: Minas de San Pedro, Galeana, Chihuahua, Mex. Geo. A. Laird, manager; Pedro Catlin, mine superintendent. Mine carries auriferous and argentiferous lead and copper ores. Equipment includes a steam plant and air-compressor. Employs circa 75 men.

LEONORA MINING & MILLING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. W. W. Horne, secretary. Mine has a 30′ tunnel, and was under development with a small force at last accounts.

LE ROI COPPER CO. **ARIZONA.**

Mine office: Kingman, Mohave Co., Ariz. Maj. W. A. Mensch, manager. Lands, slightly developed, are in the Enterprise camp.

LEVIATHAN GOLD MINING CO. **MONTANA.**

Mine office: Pony, Madison Co., Mont. Chas. E. Morris, general manager. Property carries auriferous and argentiferous copper ores, with values mainly

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in gold. Equipment includes a hydro-electric power plant and air-compressor, and property has a 100-ton concentrator.

LIBERAL MINING CO. **UTAH.**

Dead. Was merged, 1903, in Butler-Liberal Consolidated Mining Co. Formerly at Bingham Canyon, Salt Lake Co., Utah.

LILY GROUP MINING CO. **BRITISH COLUMBIA.**

Mine office: Jedway, Queen Charlotte Island, B. C. Property, on Moresby Island of the Queen Charlotte group, is in the vicinity of Awaya, Ikeda & Co. Presumably idle.

LILY MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Is controlled through ownership of two-thirds of stock issue, secured 1908, by Eureka Lily Mining Co.

LIMIT LODE MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Chas. S. Jones, president; W. J. Thomas, secretary and treasurer. Organized November, 1908, under laws of Utah, with capitalization $100,000, shares 10 cents par. Property is in the West Mountain district. Presumably idle.

LITTLE BUTTE CONSOLIDATED MINES CO. **ARIZONA.**

Office: Phoenix, Ariz. Mine office: Bouse, Yuma Co., Ariz. Employs about 50 men. John W. Sharpe, president and general manager; David Shear, vice-president; Homer B. King, secretary and treasurer; preceding officers, Geo. M. Halm and C. B. King, directors; Percy W. Sharpe, general manager; J. C. Denton, superintendent. Organized June 16, 1909, with capitalization $3,000,000, shares $1 par, as a reconstruction of the Little Butte Consolidated Mines Co., which was organized February, 1909, with capitalization $2,000,000, shares $1 par.

Lands, in the Plomosa district, circa 4 miles northwest of Bouse, include the Manipulator group of 9 claims, Sidetrack group of 6 claims, and an interest in the Otis group of 20 claims, lying between the other holdings. Property shows a vein of 6′ to 14′ reported width at surface, said to be wider at depth, carrying considerable high grade ore, mainly chalcocite. The 272′ two-compartment main shaft, on the Manipulator claim, has levels at 50′ and 120′, and there is a shallow incline shaft on the Little Butte claim. Equipment includes a 60-h. p. hoist at the Little Butte shaft, which is to be deepened to 500′, and an old hoist at the new 2-compartment shaft being sunk 300′ east of the incline shaft. Improvements include an assay office and 50-ton ore-bin, with a 2,000′ spur to the Arizona & California railway. Shipments, circa May, 1909, to El Paso smelter, returned 13% copper and $9.70 gold per ton. Property considered promising.

LITTLE CHIEF MINING & MILLING CO. **UTAH.**

Office and mine: Eureka, Juab Co., Utah. Jas. P. Driscoll, secretary. Is controlled, through ownership of majority of stock, by Chief Consolidated Mining Co., and is being absorbed by latter, through exchange of 1 share of Chief Consolidated for 3 shares of Little Chief, and is to be liquidated.

LITTLE MINT MINING CO. **MONTANA.**

Office: Wallace, Idaho. Mine office: Carter, Missoula Co., Mont. L. J. St. Jean, president; J. E. Gyde, secretary. Capitalization $1,500,000, shares $1 par. Lands, 11 claims, 2½ miles from a railroad, showing 2 veins, of 25′ to 30′ estimated average width on surface, carrying copper, silver and gold values, associated with spathic iron. Has about 1,000′ of workings, with necessary mine buildings, and, to end of 1908, had shipped 2 carloads of ore, returning about $30 per ton.

LITTLE WONDER COPPER MINING CO. **AUSTRALIA.**

Mine office: Walcha, N. S. W., Australia. R. Rose, manager. Property was developing, with a small force, at last accounts.

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LIVE OAK DEVELOPMENT CO. **ARIZONA.**

Office: Lonsdale Bldg., Duluth, Minn. Mine office: Globe, Gila Co., Ariz. Employs about 30 men. Organized circa March, 1909, under laws of Arizona, with capitalization $500,000, shares $5 par; issued, 35,000 shares, $2 paid in at organization, with a $1 assessment levied July, 1909, making stock $3 paid in. Was promoted by H. B. Hovland, David S. Fairchild, W. H. Barrows, Jr. and Hoval A. Smith.

Lands, 14 claims, area circa 200 acres, lying south and west of and adjacent to the Keystone mine, held under bond and lease from the Live Oak Copper Mining & Smelting Co. Lands show Pinal schist and quartz-porphyry, carrying 8 lenticular contact deposits, of which 3, under development by former owners, averaged about 10′ width by 700′ in proven length, and are of 300′ estimated average depth. There are surface exposures of large bodies of silicious ore, rising vertically for 20′ to 100′ in height, covering an area of approximately 30 acres. Ores include chrysocolla and dioptase, both silicates, in the upper zone, succeeded by chalcocite and chalcopyrite, estimated by former owners to give average returns of 10% copper, which estimate seems high.

Mine, opened 1897, has an incline shaft of 100′ at the portal of a tunnel, and a 300′ vertical shaft, planned to be sunk to 500′ to intersect the ore bodies found in the Silicate tunnel. This shaft is bottomed in copper silicates and sulphides, latter predominating. There also are tunnels of 60′, 125′, 175′, 185′, 725′ and 1,059′. The 725′ Silicate tunnel, from which former shipments were made to the extent of about $500,000 worth of chrysocolla, is in silicate ore for the entire distance. The Sulphide tunnel, of 1,059′ length, is driven from a point about 1,250′ southeast of the vertical shaft, and shows country-rock sulphide mineralization, estimated to be of about Miami average.

Equipment includes a 200-h. p. hoist, good for 1,500′ depth, and an 8-drill Sullivan air-compressor. Fuel is crude petroleum. Improvements include ore-bins and 12 buildings.

Production has been as follows: 587,961 lbs. fine copper in 1905; 1,714,074 lbs. in 1906; 588,347 lbs. in 1907. Property considered valuable.

LIVERPOOL MINING CO. **MONTANA.**

Mine office: Clancey, Jefferson Co., Mont. John Hamilton, superintendent. Property shows auriferous and argentiferous copper and zinc sulphides. Equipment includes a steam plant and an air-compressor. Was under development with a small force at last accounts.

CARLOS LOHMANN. **PERÚ.**

Mine office: Quequeña, Arequipa, Perú. Lands, 70 hectares, including Tres Cerros and Cerro Verde mines. Los Tres Cerros mine, in the district of Quequeña, 27 kilometers from Arequipa, produces sulphide ores said to average 12% copper, 6 oz. silver and 3 to 4 grams gold per metric ton, employing about 40 men. El Cerro Verde mine, in the district of Uchumayo, 4 hours from Arequipa, is producing copper ores that include cuprite and chalcopyrite, and the property is said to show large bodies of ore of good average copper tenor.

LOMBARDY MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Kellogg, Shoshone Co., Idaho. Peter Albinola, president; Herman J. Rossi, secretary. Capitalization $1,000,000, shares $1 par. Lands, 1 claim, 2 miles from a railroad, showing veins of 23′ and 27′ estimated average width at surface, between a slate hanging wall and quartzite footwall, carrying copper, lead, silver and gold values. Development includes shafts of 27′ and 32′, with about a quarter-mile of workings.

LONDON GOLD & COPPER MINING & MILLING CO. **COLORADO.**

Mine office: Ward, Boulder Co., Colo. Organized circa 1909, under laws of Kansas. Property includes the London and London Extension groups, near

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Gold Lake, which are developing by tunnel, and some ore has been shipped from surface workings.

LONDON METAL BANKING CO., LTD. **AUSTRALIA.**

Office: 18 Fenchurch St., London, E. C., Eng. Mine office: Gulf Creek, via Barraba, N. S. W., Australia. Hector Stewart, general manager; W. A. Waite, mine superintendent; Robt. Schloesser, consulting engineer. Lands, 150 acres, held under a 20-year lease, in the Barraba district, showing schist and quartzite of early Silurian age, altered through basic intrusions, and indurated clay-slate of Carboniferous age, with dykes of serpentine. Property shows 3 parallel veins, all under development, of 2′, 6′ and 38′ estimated average width, traceable 350′, originally carrying melaconite, azurite and malachite, which have been worked out, and carrying, at depth, chalcopyrite in a matrix of 50% pyrite, 15% silica, 5% lime and 7% alumina. Development is by shafts of 160′ and 370′, with 6,400′ of workings, estimated to show 66,000 long tons of ore blocked out for stoping.

Equipment includes a 25-h. p. steam plant, with 10-h. p. hoist, good for 500′. The smelter, connected by a half-mile ground-tram with the mine, is of 30 tons daily capacity, having two 15-ton reverberatory furnaces, turning out matte of 35% copper tenor. Equipment includes a small sawmill. Mine is served by the Sydney to Barraba railroad, 22 miles distant. Production, 1901, was 560 long tons fine copper, from 9,400 tons of ore smelted, and in 1906 was circa 70 tons fine copper, made from 2,400 long tons of ore smelted. Was prospecting and developing at last accounts.

LORETTA MINING CO. **CALIFORNIA.**

Big Pine, Inyo Co., Cal. Wm. Eva, manager. Is controlled, through stock ownership, by Chas. M. Schwab and the Gail Borden Estate. Mine has a 400′ shaft, showing a 40′ vein said to average 4% copper. Improvements include a smithy and several small mine buildings.

LOS BRONCES MINING CO. **MEXICO.**

Office: Phoenix, Ariz. Mine office: Santa Bárbara, Hidalgo, Chihuahua, Mex. B. W. McCausland, president; R. D. McCausland, secretary and manager; Roy Chapman, mine superintendent. Lands, 24 hectares, including Los Bronces, La Esperanza and Kruger mines, carrying copper, lead, silver and gold values, developed by a 300′ main shaft, planned to be sunk to 500′. Has a 25-h. p. steam hoist.

LOST GULCH UNITED MINES CO. **ARIZONA.**

Office: 333 Monadnock Bldg., Chicago, Ills. Mine office: Black Warrior, Gila Co., Ariz. Employs circa 20 men. Jerry T. Harrington, president and general manager; Will A. Childs, vice-president; W. Espy Curtis, treasurer; Neil McMillan, secretary; preceding officers and Hon. Beecher Powell, directors. Capitalization $2,000,000, shares $1 par. Lands, 280 acres, in 3 contiguous groups, about 20 miles northwest of Black Warrior. The Badger and Kellner groups carry principally gold values, and the Cedar Tree group carries gold, silver, lead and copper values. Property is said to show several veins of 7′ to 12′ width, and was said, August, 1908, to have secured ore assaying up to 9% copper and $100 gold per ton. Development is by a 700′ tunnel, on an ore body said to show high grade gold values at surface. Equipment includes two 80-h. p. water-tube boilers and a 150-h. p. Corliss engine. A small stamp-mill, left by former owners, was dismantled, and company is said to be building a new 10-stamp mill. A test shipment of 12 tons, circa September, 1909, to El Paso smelter, netted $211.10.

LOST PACKER MINING & SMELTING CO. **IDAHO.**

Office: 1204-37 Wall St., New York, N. Y. Mine office: Ivers, Custer Co., Idaho. John T. Clarke, treasurer and managing director. Organized 1907, under laws of Wyoming, with capitalization $3,000,000, shares $5 par, as a hold-

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ing company to gradually acquire the outstanding stock of the Lost Packer Mining Co. Company also plans acquiring stocks in other mining companies.

LOUISIANA & ARIZONA MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Organized November, 1908. Lands, 20 miles south of Jerome, include the Grand Island mine, said to give a good surface showing.

LUCANIA TUNNEL & MINES CO. **COLORADO.**

Office: 205 Colburn Bldg., Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. John McColl, superintendent. Mine carries auriferous and argentiferous lead and copper sulphides, and equipment includes a small steam plant and air-compressor. Was under development with a small force at last accounts.

COMPAÑÍA MINERA LA LUZ. **MEXICO.**

Mine office: Cuatro Ciénegas, Monclova, Coahuila, Mex. Lands, 29 hectares. Property is a small producer, and, at last accounts, was yielding about 300 metric tons yearly of auriferous copper ore.

MACK MINING CO. **MEXICO.**

Mine office: Sahuaripa, Sonora, Mex. W. B. Morley, manager. Property, at Guadalupe, about 3 miles from La Bufa mine, carrying auriferous and argentiferous copper ore, was undergoing development at last accounts. Company also has mineral lands in the state of Chihuahua.

J. J. MACTEAGUE. **MEXICO.**

Office and mine: Estación Symon, San Juan de Guadalupe, Durango, Mex. Property is La Felicidad mine, near the Mexican Central railway, carrying slightly argentiferous copper ore. Employed about 25 men at last accounts.

MAGISTRAL-AMECA COPPER CO. **MEXICO.**

Office: Los Angeles, Cal. Mine office: Etzatlán, Ahualulco, Jalisco, Mex. H. L. Percy, president and treasurer; Jas. P. Harvey, vice-president and general manager; G. C. B. Robinson, secretary; preceding officers and Fred M. Lyons, directors. Capitalization, $1,500,000. Lands include the Magistral mine, 10 miles from Ameca, said to have been bought for 100,000 pesos. Property carries ore said to run 5 to 9% copper, and is claimed to have 100,000 tons of ore in sight. Company was said, October, 1909, to plan a 100-ton Elmore flotation process mill, at cost of $50,000, instead of installing a reverberatory furnace, as planned previously. Management also is said to plan building a 10-mile standard-gauge railway to Ameca. Company was promoted by Patrick Clark, who apparently is now out of it.

MAK COPPER MINING CO. **WYOMING.**

Mine office: Thermopolis, Frémont Co., Wyo. Organized 1908, with capitalization $100,000. Lands are at the head of Mud Creek, 18 miles from Thermopolis. A carload of ore from surface workings, shipped 1908, returned $43 per ton in gold and copper values.

MANGAS DEVELOPMENT CO. **NEW MEXICO.**

Office: 29 Hall Bldg., Houghton, Mich. Mine office: Tyrone, Grant Co., N. M. Employs 25 men. Hon. Norman W. Haire, president; Joseph E. Saint, vice-president; Lloyd S. Linton, secretary; Jos. W. Selden, treasurer; preceding officers and Geo. Kaseman, directors; Harold A. Linke, mine superintendent. Organized Oct. 2, 1909, under laws of New Mexico, with capitalization $500,000, shares $5 par; issued, $325,000, in 15,000 full paid shares and 50,000 shares $2.50 paid. The 15,000 full paid shares were given in part payment for the property, and the company has 35,000 shares unissued. First National Bank, Calumet, registrar.

Lands, 53 claims, partly patented, area approximately 1,000 acres, partly owned in fee and partly held under option, 12 miles from nearest railroad station at Silver City, in the Burro Mountains, near the Chemung and Savanna

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mines. Property includes the Porterfield group of 17 claims, area 340 acres, the Porterfield-Robinson group, Thompson group, Jackson group, Malachite group, Lee group and 5 claims formerly held by the Azure Mining Co.

The properties show iron blossoms, carrying small quantities of copper carbonates, and surface indications are almost identical with those at the Burro Mountain and Chemung mines, where enormous bodies of low grade disseminated chalcocite have been opened at depths of 400′ to 600′. Property was examined and reported upon favorably by J. Morgan Clements, who recommended churn drilling, and boring was begun 1909, holes being put down, checkerboard fashion, at 200′ intervals.

A railway to the district is now being constructed from Whitewater, on the Santa Fé line, a distance of 14 miles. Management is good, and property is considered decidedly promising, having an excellent chance of developing a large country-rock mine of sulphide ore.

MANHATTAN COPPER & GOLD MINING CO. **NEVADA.**

Dead. Was absorbed June 10, 1907, by Nevada-Utah Mines & Smelter Corporation. Formerly at Pioche, Lincoln Co., Nev.

MANVEL MINING CO. **CALIFORNIA.**

Mine office: Manvel, San Bernardino Co., Cal. Victor Marsh, manager. Property has a 150′ shaft, on a vein reported to carry 10% copper. Presumably idle.

MAREQUITA DEVELOPMENT CO. **MEXICO.**

Office: La Cananea, Sonora, Mex. Mine office: Moctezuma, Sonora, Mex. Company is said to be allied to the Moctezuma-Arizpe Mining Co., and lands are directly south of latter. Transportation is by a good wagon road to La Cananea. Sundry ore shipments, circa 1908, to La Cananea smelter, returned about $25 per ton. Presumably idle.

MARTIN MINING & POWER CO. **COLORADO.**

Office: 318 Boston Bldg., Denver, Colo. Mine office: Eureka, San Juan Co., Colo. Samuel G. Martin, general manager. Property is the Tom Moore group, formerly held by Tom Moore Consolidated Mining Co. and later by Tom Moore Gold Mining Co., latter organized circa 1907. At last accounts Dennis Ryan of St. Paul was suing Mr. Martin for an accounting. Property carries auriferous and argentiferous sulphides of lead, copper and zinc. Equipment includes a hydro-electric plant and a Leyner air-compressor.

MARY VERNA MINING & MILLING CO. **COLORADO.**

Mine office: Frisco, Summit Co., Colo. H. T. McAllister, general manager. Property carries auriferous and argentiferous copper and lead ores. Equipment includes a small steam plant and a Leyner air-compressor. Was under development with a small force at last accounts.

W. M. MATHEWS. **MEXICO.**

Office and mine: Etzatlán, Ahualulco, Jalisco, Mex. Lands, 220 hectares, including the Cinco Minas, Casa Blanca, Palos Verdes, Palos Quemado and Tremillo groups, and a number of miscellaneous claims. Development is by shafts and tunnels, and mines are limited producers of ores carrying gold, silver, copper and lead values.

MAYFLOWER MINING CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Mine shipped some ore, 1906. Presumably idle.

McCOY MINING CO. **NORTH CAROLINA.**

Office: Oklahoma City, Okla. Mine office: Otto, Macon Co., N. C. Property originally was held under lease by an English syndicate that begun exploitation about the outbreak of the American Civil War. Lands, 2½ miles from Otto and 9 miles south of Franklin, include several adjacent tracts, with 3 shallow shafts, opened on a vein for a distance of about 500′, showing sul-

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phide ore estimated to average something under 1% copper, with small gold and silver values. Diamond drill borings were begun, January, 1909.

C. B. McKAY. **MEXICO.**

Office and mine: Zacatecas, Zacatecas, Mex. Property is the Cerro Blanco mine, near the Negociación Minera del Magistral, S. A., developed by a 200′ shaft, showing copper ore.

McKINLEY MINING CO. **WASHINGTON.**

Office: Orient, Wash. Mine office: Rockcut, Stevens Co., Wash. G. F. Wickstrom, president; J. H. Pelkey, superintendent. Lands, 9 claims, well timbered, in the Pierre Lake district, 3½ miles north of Rockcut. Development is by an 82′ shaft, on a vein of 10′ estimated average width, that ranges up to 30′ in width, showing auriferous and argentiferous cuprite, bornite and chalcopyrite, said to assay $10 to $15 per ton in combined copper, gold and silver values, and there is another vein of 8′ width. Improvements include 6 small mine buildings.

MEADOW CREEK COPPER & MOLYBDENITE CO. **WASHINGTON.**

Office: Bellingham, Wash. Mine office: Keller, Ferry Co., Wash. J. E. Jennot, manager. Lands, on Meadow Creek, about 5 miles northwest of Keller, are developed by tunnel. Property shows 4 veins, of which 1, claimed to be 45′ wide, is said to be fairly mineralized with copper, lead, molybdenum, silver and gold, estimated to average $20 per ton in gross values.

MEAL TICKET MINING CO. **BRITISH COLUMBIA.**

Mine office: Jedway, Queen Charlotte Island, B. C. Property, on Moresby Island of the Queen Charlotte group, presumably is idle.

MEDFORD COPPER CO. **OREGON.**

Office: Medford, Ore. Mine office: Galice, Josephine Co., Ore. Lands, on the Upper Applegate river, in the Blue Ledge district, have a vein of 7′ to 10′ width, with tunnels of 80′ and 400′, showing sulphide ore assaying 4 to 5% copper, 5 oz. silver and $2.80 gold per ton.

MELBOURNE & GREAT NORTHERN SMELTING CO., LTD. **AUSTRALIA.**

Works office: Waratah, Newcastle, N. S. W., Australia. Works, on Tighe's Hill, Newcastle, are favorably situated for the receipt of ore by sea and rail, and the smelter does a general custom business.

COMPAÑÍA MINERA METAL DE COBRE. **MEXICO.**

Office: La Cananea, Senora, Mex. Mine office: San Antonio de la Huerta, Ures, Sonora, Mex. F. L. Harrington, president; Geo. E. Burton, vice-president; A. F. Gressler, secretary; J. E. Morrison, treasurer; R. L. Hogue, general manager; preceding officers are the directors. Organized circa October, 1909, under laws of Mexico, as the holding company of the Rio Yaqui Co.

COMPAÑÍA MINERA MEXICANA, S. A. **MEXICO.**

Mine office: San Andres, Iturbide, Chihuahua, Mex. M. Barregan, president; L. Barregan, secretary. Property is La Felicidad mine, area 24 hectares, carrying copper ore, slightly developed by a shallow shaft. Presumably idle.

MEXICAN MINING CO. **MEXICO.**

Office: Long Beach, Cal. Mine office: Alamos, Sonora, Mex. C. C. Clute, president; J. B. Randall, vice-president; J. T. Newell, secretary and treasurer; Wm. Hitchcock, manager. Organized under laws of California, with capitalization $300,000. Lands, 10 hectares, said to show a considerable body of auriferous and argentiferous copper ore, and company claims to have 50,000 tons of low to medium grade ore on the dump.

MILITARY MINING & MILLING CO., LTD. **IDAHO.**

Office and mine: Burke, Shoshone Co., Idaho. Fred Bergen, president; L. H. Hays, secretary. Capitalization $1,000,000, shares $1 par. Lands, 2

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claims, near Burke, showing a 5′ vein said to be traceable 2,000′, carrying copper with quartz and quartzite gangue, developed by a 57′ shaft.

MILL CAÑON COPPER CO. **NEW MEXICO.**

Mine office: Kelly, Socorro Co., N. M. Geo. Keith, manager. Property is the Wheel of Fortune group, 12 miles south of Kelly.

MINARET MINING CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. W. P. Belding, superintendent. Property, in the western part of the Moctezuma district, shows considerable concentrating ore of 4% estimated average copper tenor, and shipped, December, 1908, a carload of ore to the Copper Queen smelter returning 25% copper. Employed about 40 men at last accounts.

MINERAL DEVELOPMENT CO. **ONTARIO.**

Mine office: Worthington, Algoma, Ont. F. C. Hirsch, manager. Property is the Worthington mine, carrying copper and nickel ores. Equipment includes steam power and an air-compressor.

MINERAL MOUNTAIN MINING CO. **MONTANA.**

Mine office: Canyon Ferry, Lewis & Clark Co., Mont. Lands, in the Canyon Creek district, show a vein of 5′ estimated width, carrying an 18″ pay streak that has yielded ore assaying 29.5% copper, 5 oz. silver and 80 cents gold per ton. Management plans a new 400′ tunnel, to develop ore at greater depth. Is operating with a small force.

MINERAL MOUNTAIN MINING CO. **UTAH.**

Mine office: Lucin, Box Elder Co., Utah. Benj. M. Roberts, president; Lamar Nelson, secretary and treasurer. Organized circa March, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par.

MINERAL RIDGE MINING & MILLING CO. **IDAHO.**

Office and mine: Coeur d'Alene, Kootenai Co., Idaho. Capitalization $1,000,000. Lands, 5 claims and a 5-acre millsite, area 105 acres, on Beauty Bay, Lake Coeur d'Alene. Property is said to show a vein of 40′ to 50′ width, carrying ore assaying well in copper and silver, with small quantities of lead.

MINES FINANCE CO. **CALIFORNIA.**

Office: London, Eng. Mine office: Happy Camp, Siskiyou Co., Cal. Lands, 75 miles from nearest railroad, are extensive, and are well timbered, with a water power available on the Klamath River, in the vicinity. One group of 12 claims, under development, shows various veins ranging from narrow streaks to ore bodies of good width, and surface ores have given assays of 4 to 20% copper, with some gold.

MINNEAPOLIS-CORBIN COPPER CO. **MONTANA.**

Office: 10 South 4th St., Minneapolis, Minn. Mine office: Corbin, Jefferson Co., Mont. Phillip B. Winston, president; Geo. A. Lammers, vice-president; Albert H. Hall, secretary; Thos. F. McCue, treasurer; preceding officers and John McCarthy, directors; H. M. Brooks, superintendent; Harry Bush, engineer. Organized May 17, 1909, under laws of Montana, with capitalization $500,000, shares $1 par; issued, $25,000. Cash on hand was reported, Nov. 4, 1909, as $18,000.

Lands, 7 claims, area 140 acres, in process of patenting, near the Alta and Boston & Corbin mines, and company is said also to have a $50,000 bond and lease on the Copper King claim. Property is said to carry 9 large fissure veins, principal being the Moonlight, estimated at more than 100′ in width, with 2 veins on the Anaconda claim said to be 15′ and 50′ in width, respectively. Company reports 5 ore bodies, of which 2, of 20′ to 40′ estimated average width, are said to be traceable 1,200′, and to carry an average of 4% copper, 10 oz. silver and 80 cents gold per ton. Minerals carried include native copper, chalcocite, bornite, covellite and chalcopyrite. Company has secured assays up to 40% copper, 86 oz. silver and $4 gold per ton, from rich selected

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ore. Development is by No. 1 incline shaft, 175′ deep, and No. 2 vertical shaft, 250′ deep, with 380′ of workings. Stringers of rich ore have been encountered in the vertical shaft from a depth of 30′ to the bottom, which shows streaks of chalcocite, and the entire vein at the bottom is estimated to average about 4% copper, 8 to 10 oz. silver and 80 cents to $1.40 gold per ton. Company plans installing a mining plant, to be operated by commercial electric current.

MINNESOTA-ARIZONA COPPER CO. **ARIZONA.**

Office: Willmar, Minn. Mine office: Copper Creek, Graham Co., Ariz. J. Emil Nelson, president; Frank J. Sibley, vice-president and general manager; Martin E. Tew, second vice-president; R. W. Stanford, secretary; Walter De La Hunt, treasurer; R. Roy Sibley, superintendent; preceding officers and Emanuel Osterholm, directors; C. S. Gelser, engineer. Organized Apr. 29, 1908, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Company is closely affiliated with the Copper Creek Mining Co.

Lands, 9 claims, unpatented, area 173 acres, area being subject to change in consideration of a pending deal, in the Bunker Hill district of Pinal County, Arizona, adjoining the lands of the Copper Creek Mining Co. Property is in 2 groups, and the Silver Reef claim, in the southern group of 4 claims, is said to show a very rich vein of cuprite on surface, and has a 40′ shaft. The Kimbro claim is said to have a 100′ shaft, and the Lead Carbonate claim has a 100′ tunnel showing lead and copper sulphides. Company reports country rock as diorite, with porphyritic intrusions, ore being carried in the original magma. The 4 ore bodies under development carry carbonates and oxides near surface, with sulphides at depth. The Lead Carbonate claim carries a 10′ vein of auriferous and argentiferous galena. A crosscut tunnel now driving is planned to cut the ore bodies on the Velasquez claim at distance of 1026′ from the portal. Company takes electric power from the Copper Creek company, and it is planned to ship the Minnesota-Arizona ores to the concentrator building by the Copper Creek.

MINNIE-BELLE MINING & DEVELOPMENT CO. **ARIZONA.**

Mine office: Bouse, Yuma Co., Ariz. Lands are 2 groups, respectively 20 to 28 miles north of Bouse. The southermost group, on the southwestern slope of Ives Peak, in the Bill Williams range, across the Bill Williams Fork River in Mohave county, has a 100′ shaft in a vein said to be 8′ wide at depth of 20′, and 4′ wide at depth of 90′, claimed to average 8% copper and $50 gold per ton, which figures are considered high. Lands also include a smeltersite, on the Bill Williams Fork River, midway between the 2 groups, and about 7 miles from each.

MISSABE-MORENCI DEVELOPMENT CO. **ARIZONA.**

Office: 21 Fourth Ave. West., Duluth, Minn. Mine office: Morenci, Graham Co., Ariz. Richard Lakenan, president; Daniel Grant, vice-president; I. H. Knapp, secretary and treasurer; preceding officers and C. D. Muir, directors; Frank Rathbun, consulting engineer; F. H. Hereford, general counsel. Organized under laws of Arizona with capitalization $600,000, shares $2 par. Lands, 15 claims, area 300 acres, of which 3 are owned outright and 12 are held under bond and lease. Claims owned are the Stevens, Campbell and Dell Potter, with the Dick Lakenan group of 12 claims, 8 patented, held under bond and lease. Property, in Gold Gulch, is circa 2 miles southwest of Morenci. Company has sideline agreements with the Arizona Copper Co., Ltd., and Detroit Copper Mining Co. The Campbell claim is said to have produced $45,000 worth of very rich ore.

MISSOURI CONSOLIDATED MINING CO. **COLORADO.**

Office: 1524 Chestnut St., Philadelphia, Pa. Mine office: Idaho Springs, Clear Creek Co., Colo. J. W. Boyd, superintendent. Mine carries auriferous and argentiferous copper and lead ores, and has a small steam plant.

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MOCTEZUMA COPPER CO. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Was said, July, 1906, to have found black sulphide ore at the bottom of a 160′ shaft. Presumably idle.

MOCTEZUMA MINING CO. **MEXICO.**

Office: San Antonio, Tex. Mine office: Charcas, Moctezuma, San Luis Potosí, Mex. Otto Wahrmund, president; A. L. Tuttle, general manager; C. H. Hoffman, superintendent. Property shows chalcopyrite, estimated to average 4 to 5% copper, with small silver values. At last accounts company was considering the advisability of building a concentrator.

MOHOCHANG MINING SYNDICATE, LTD. **BURMAH.**

Office: 20 Copthall Ave., London, E. C., Eng. Mine office: Kijanksee, Northern Shan States, Burmah. C. A. Moreing, F. A. Govett, H. C. Hoover and R. Tilden Smith, directors; F. A. Grew, secretary; Bewick, Moreing & Co., managers and consulting engineers. Organized March 2, 1909, under laws of Great Britain, with capitalization £5,000, shares £1 par; issued, £3,557. Property is prospecting licenses covering the Mohochang silver and lead mine, the Yetha copper mine near Kijanksee, in the Northern Shan States, and the Taungaung silver-lead mine, 37 miles from Mandalay.

MOLLIE GROVES MINING & MILLING CO. **COLORADO.**

Office: 328 New York Life Bldg., Kansas City, Mo. Mine office: Parshall, Grand Co., Colo. I. M. Horton, president; J. M. Percy, vice-president; J. N. Birch, secretary; W. H. Bousfield, treasurer; O. M. Groves, general manager; preceding officers, F. M. Crews, I. H. Anthony and D. W. White, directors; Everett F. Philips, general counsel. Organized March 4, 1909, under laws of Colorado, with capitalization $2,000,000, shares $1 par. Lands, 11 claims, unpatented, area 110 acres, and a 40-acre millsite, about 6 miles northwest of Parshall. Development is by 2 tunnels, on the vein, deepest planned to give a back of 2,300′. Vein is said by management to average 18′ in width, running as wide as 30′ with a 6′ central streak carrying gray copper ore, with copper stains and copper sulphide on either side, and vein is said to be opened for a length of 4,500′. Two mill tests, on ore taken from surface, returned 7.8% and 7.9% copper, but the company's circulars claim 72,000,000 tons of ore from the top of the mountain to the tunnel level, which apparently is a typographical error for 7,200,000 tons, but nothing like even the smaller amount is proven, and apparently the management figured the full width of the vein, which is not all of commercial grade, and figured on possibilities rather than on what has been proven. The company announced that a smelter was expected to be installed, early 1909, but apparently same failed to materialize. Is not regarded favorably.

MONARCH DEVELOPMENT CO. **ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. H. S. Chamberlain, president; W. K. Morrow, vice-president; F. S. Hayward, secretary; J. G. Sweeney, treasurer; preceding officers and J. C. Hancock, directors. Organized June, 1909, under laws of Arizona, with capitalization $1,000,000, shares $2 par. Lands, 10 claims, partly owned outright and partly held under bond and lease, including the Morrow & Chamberlain group of 2 claims, having a 125′ vertical shaft.

MONTANA CENTRAL MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Property is the mineral rights to the Black Placer claim, adjoining the Davis-Daly, located in the business section of Butte. Property was in litigation for 30 years, until 1909.

MONTANA-CLINTON COPPER CO. **MONTANA.**

Office: First National Bank Bldg., Laurium, Mich. Mine office: Elliston, Powell Co., Mont. Capt. Wesley Clark, president; Thos. Bastian, vice-president; Michael E. O'Brien, secretary; Alex. Levine, treasurer; preceding officers, Chas. Kendall, Jas. Rowe, M. J. Harrington, Jos. Strobel and Chas. L. Fried-

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erichs, directors. Organized 1909, under laws of Montana, with capitalization $1,500,000, shares $5 par. Of the issued stock, 50,000 shares are $1.50 paid and 32,955 shares are $1 paid, with a 10-cent assessment payable Dec. 22, 1909, on the dollar-paid shares. Of the capitalization, 9,829 shares were issued for commissions and promotion, and 42,000 shares were issued to the Syndicate Lode Development Co. in consideration of the first payment on the original property, leaving 165,216 shares unissued. Owners of the Julia group, the present property, were given 50,000 shares of stock, $1.50 paid, and company agreed to pay $30,000 in cash in addition, from ore shipments, after deducting operating expenses.

Company's first venture was a bond and lease on the Triangle group, at Clinton, Missoula County, Montana, taken from the Triangle Mining & Development Co., but bond was forfeited, October, 1909, because it was found impossible to make the payment, owing to lack of cash, and operations were transferred to the Julia group at Elliston. The company sold some town lots in East Clinton, from a townsite held in connection with the Triangle property.

The Julia group of 5 claims, unpatented, 9 miles southeast of Elliston, is fairly timbered and watered, and is said to show 7 veins, carrying chalcocite, azurite, malachite, chalcopyrite and tetrahedrite. Transportation is by a mountain road to Elliston, in poor condition, but with no bad grades, except over the last 2 miles. Development is by the 284′ Julia tunnel, 7x10′ in cross-section, which is a crosscut for 100′, and thence follows a paystreak. There also is a 110′ tunnel on the Grey Copper claim. The Julia mine is said to have made 2 shipments of ore, netting $20 per ton, March and April, 1909. Machinery and buildings at the Triangle were sold October, 1909, to Chas. L. Friederichs, for $5,000, and were transferred from the Triangle to the Julia.

MONTANA COPPER CO. **AUSTRALIA.**

Mine office: Sunny Corner, N. S. W., Australia. M. Welch, superintendent. Property, reopened 1906 by present company, has a 250′ shaft showing rich leaders of ore assaying up to 16% copper. Equipment includes a hoist and necessary mine buildings.

MONTANA-CORBIN MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Arthur H. Mueller, president; C. F. Lloyd, vice-president; N. J. Lloyd, secretary and treasurer. Organized September, 1908, under laws of Montana, with capitalization $500,000, shares $1 par. Lands, 8 claims, about one-half mile from Corbin and about the same distance from the Alta mine and the Bertha mine of the Boston & Corbin. Property carries a vein of auriferous and argentiferous bornite and chalcopyrite, that is reported to widen from 2″ to 20″ with depth, assaying 4 to 25% copper and $5 to $20 per ton in combined gold and silver values.

MONTANA-CORBIN MINING CO. **MONTANA.**

Office: 19 East Broadway, Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Chas. A. Clark, president; Geo. F. Bartlett, vice-president; Edwin L. Mayo, secretary and treasurer; preceding officers, Wm. B. Arnold, Arthur P. Hawes, Norman J. MacGaffin and Chas. W. Andrews, directors; W. D. Gibson, superintendent. Organized circa May, 1909, under laws of Maine, with capitalization $750,000, shares $5 par.

Lands, 8 claims, about one mile from Corbin, including options on 6 quartz claims, and the Hidden Treasure and Copper King claims bought of the Corbin-Wickes Copper Mining Co. The 2 Corbin-Wickes claims are about one-half mile from the Alta, and across Picnic Gulch from the Bertha mine of the Boston & Corbin, and are supposed to carry the extension of the Bluebird vein. Property has a 40′ shaft on the Copper King claim, and a 40′ shaft and about 100′ of drifts on the Black Eagle claim. There also are 3 tunnels of about 100′ length each, and 300′ tunnel. Principal development is by a 245′ shaft, planned to

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be sunk to 500′, with crosscutting from the bottom, this shaft having about 340′ of crosscuts and drifts, July, 1909, a crosscut from the shaft being said to show an 18′ vein carrying hanging-wall and footwall paystreaks of bornite and chalcopyrite, assaying about 4% copper, 8 oz. silver and 40 cents gold per ton, with occasional assays up to 12% copper, 34 oz. silver and 60 cents gold per ton. The shaft has a 40′ gallows frame. Equipment includes two 60-h. p. boilers, a 15-h. p. hoist and a 5-drill electric air-compressor, taking current from the Missouri River Power Co. Was idle, late 1909, but it was stated that operations were to be resumed, company having been financed.

MONTANA MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John Roundy, president and general manager; Ernest R. Woolley, vice-president; Fred R. Woolley, secretary and treasurer; preceding officers, Duncan McVichie, J. C. Jensen and E. J. Raddatz, directors. Organized circa May, 1909, under laws of Utah, with capitalization $250,000, shares 25 cents par. Lands are in the vicinity of the Lily mine, and a 3-compartment shaft was begun, April, 1909. Company was said, June, 1909, to have contracted for a complete electric mining equipment, including an 8x10″ hoist, 125-h. p. air-compressor, and electric drills.

MONTANA OREWAY MINING CO. **MONTANA.**

Mine office: Wisdom, Beaverhead Co., Mont. Lands are the Straight Tip group, in the Big Hole Basin, showing no ore on surface. Development is planned by a 1,500′ tunnel to give an 800′ back.

MORESBY ISLAND MINING CO. **BRITISH COLUMBIA.**

Mine office: Jedway, Queen Charlotte Island, B. C. Property is on Moresby Island of the Queen Charlotte group. Presumably idle.

CARLOS MOSER. **MEXICO.**

Office: Apartado 103, Monterey, N. L., Mex. Mine office: Cuatro Ciénegas, Monclova, Coahuila, Mex. Is an extensive operator of silver mines, also a zinc producer. Property includes Santo Tomás mine, area 16 hectares, developed by a 40-meter tunnel and a 50-meter shaft, producing copper carbonates with a force of 40 men, also Las Boquillas del Carmen mine, area 200 hectares, developed by 6 tunnels, of 900 meters aggregate length, producing carbonate and sulphide ores of copper, lead and zinc, with some silver, employing about 120 men.

MOUNTAIN QUEEN MINING & MILLING CO. **COLORADO.**

Office: Victoria, Colo. Mine office: Animas Forks, San Juan Co., Colo. Frederick V. Bodfish, general manager. Property carries auriferous and argentiferous sulphides of lead, copper and zinc. Equipment includes an electric plant and air-compressor.

MOUNT BAKER GOLD, COPPER & TIN CO. **WASHINGTON.**

Mine office: Glacier, Whatcom Co., Wash. Lands, 22 claims, in 4 groups, within a radius of 12 miles. The White Swan group, 10 miles from Glacier, shows a 5′ vein, traceable circa 1,500′, carrying gold and silver ore, with quartz gangue, giving assay values of $4 to $35 per ton.

MOUNT BALFOUR COPPER MINES, LTD. **TASMANIA.**

Office: 31 Queen St., Melbourne, Australia. Mine office: Mt. Balfour, Tasmania. A. E. Langford, chairman; Dr. B. P. Ekberg, consulting engineer. Lands, on Mount Balfour, are reached by launch from Launceston and by horseback from Zeehan and Waratah. Country rock is laminated sandstone, in places interbedded with slate, and on the eastern side of the property is a belt of black slate, carrying some large quartz veins, up to 50′ in width, traceable several miles. Principal vein, carried for 5,000′ on the company's lands, is developed by a 91′ shaft, all in copper ore, with some drifting, and by shallow surface trenches showing 3′ to 10′ of ore carrying melaconite and chalcopyrite,

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with gangue of graphitic slate and quartz, giving average assays of 2.4% copper, with small gold and silver values, and up to 12% copper from selected samples. Company estimates ore opened to average 3.75% copper tenor, and estimates 54,000 long tons of ore in sight. Ore is carted to Whale's Head, and shipped to Launceston by launch, for reshipment to smelters. Property considered promising.

MOUNT BROWNE COPPER & GOLD MINING CO. **AUSTRALIA.**

Mine office: Karangi, Fitzroy Co., N. S. W., Australia. Organized circa August, 1908, under laws of New South Wales, with capitalization £35,000, shares £1 par.

MOUNT COSTIGAN & CORDILLERA CO. **AUSTRALIA.**

Mine office: Mount Costigan, N. S. W., Australia. The mine, discovered 1880, was worked for silver-lead until 1889, to depth of about 200', when the mining and smelting plants were dismantled. Property was reopened, 1906, by present company, for copper ores below the water-level. The mine has a vein of about 4' width, carrying mixed sulphides of copper, lead, zinc and iron, all argentiferous, similar to the silver ore in the lower levels of the Sunny Corner silver mine. Assays of ore have shown 12 to 20 oz. silver and 2 dwts. 4 grains gold per long ton. Production, 1907, was 50 long tons of ore, shipped to Europe for reduction, giving bulk assays of 12% copper.

MOUNT HOPE MINING & MILLING CO. **MONTANA.**

Office: Thompson, Mont. Mine office: Trout Creek, Sanders Co., Mont. E. A. Winstanley, president; J. F. Hague, vice-president; W. B. Ross, secretary and treasurer. Lands, near Trout Creek, show copper and lead ores.

MOUNT OXIDE MINE. **AUSTRALIA.**

Mine office: Mt. Oxide, Queensland, Australia. E. Henry, owner and manager. Mine has a 140' main shaft, bottomed in a vein of 55' claimed width, carrying a paystreak of 2' to 8' width, estimated to average 60% copper, with 12' estimated to average 25% copper and 15' to average 12% copper, and balance about 5% copper. These figures are considered their own refutation.

MUGWUMP MINING CO. **CANADA.**

Dead. Was liquidated February, 1909, and property sold to Consolidated Mining & Smelting Co. of Canada, Ltd., for $2,000, shareholders receiving $493.83 net. Formerly at Rossland, Trail district, B. C.

MUTUAL MINING & DEVELOPMENT CO. **MEXICO.**

Office: Mexico, D. F. Mine office: Ameca, Jalisco, Mex. L. C. Groce, general manager. Property is El Zapote mine, bought for $20,000, said to show rich copper ore.

NAMAQUA UNITED COPPER CO., LTD. **CAPE COLONY.**

Dead. Was reorganized Apr. 23, 1888, as Namaqua Copper Co., Ltd. Formerly at Concordia, Little Namaqualand, Cape Colony.

NATIONAL MINING & SMELTING CO. **NEW MEXICO.**

Office: 68 Center St., New York, N. Y. Mine office: Deming, Luna Co., N. M. Robert E. Powell, president. Company apparently succeeded the Luna Lead Co. Property is a smelter, formerly treating lead ores, but closed, April, 1909, with a view to enlargement, in order to smelt copper sulphides also, with trebled capacity.

NATIVIDAD COPPER CO. **MEXICO.**

Mine office: Ocotlán, Oaxaca, Mex. H. J. Hazzard, superintendent. Mine has a 60' shaft, said to show a 4' vein carrying mainly copper values, with a hanging-wall paystreak of auriferous copper ore. Presumably idle.

NEDRE MIDDAVARRE KOBBERGRUBER. **NORWAY.**

Office: Bodö, Norway. Mine office: Kvanangen, Tromsö, Norway. Property was being worked, on a small scale, at last accounts.

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NEEDLES EYE COPPER CO. **CALIFORNIA.**

Office: Los Angeles, Cal. Mine office: Needles, San Bernardino Co., Cal. John G. Burgess, W. A. Gordon, Alfred W. Allen, W. A. Smith and E. A. Larson, directors. Organized circa October, 1909, with capitalization $1,000,000.

NELLIE S. COPPER MINING & MILLING CO. **WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. Mine has about 800′ of workings, with about 100 tons of ore ready for shipment. At last accounts company was in a bad way financially, and planned reorganization.

NEVADA-ARIZONA COPPER CO. **ARIZONA.**

Mine office: Hillside, Yavapai Co., Ariz. Jos. L. Giroux, president. Lands, bought 1909, of the Copper Queen Development Co., include water rights on Burro and Copper Creeks, 30 miles north of Hillside, which management plans utilizing for electric power. Equipment includes a 50-h. p. hoist. Property was being prospected with churn drills, August, 1909.

NEVADA BUCKSKIN COMBINATION MINING CO. **NEVADA.**

Mine office: Buckskin, Douglas Co., Nev. J. W. Green, superintendent. Property carries auriferous copper ore, and equipment includes gasoline power.

NEVADA COPPER HILLS MINING CO. **NEVADA.**

Office: Mansfield, Ohio. Mine office: Luning, Esmeralda Co., Nev. Hon. S. S. Bricker, president; Dr. A. H. McCullough, vice-president; Dr. F. J. Foster, secretary and treasurer; preceding officers, Bernard Eastman, Chas. Ritter and Chas. E. Fish, directors; Rowland Lea, mine manager. Organized under laws of Nevada with capitalization $1,500,000, shares $1 par. Lands, 6 claims, area 150 acres, in the Fitting district, circa 9 miles north of Luning. Company claims possession of 65 veins of ore, ranging from 6″ to 14′ in width, which seems almost too good to be true. Property is developed by opencuts, trenches and a 200′ crosscut tunnel, and has secured ore giving assay values in copper, silver and gold. Company's prospectus states that at the present time there is sufficient work under construction, requiring copper, to consume the entire output of all the copper mines in the world for the next 20 years, which would be important, if true, and also states that no copper mine having a true geological formation and well defined copper veins ever has become exhausted or worked out, which also would be important, if true.

NEVADA MINING CO. **CALIFORNIA.**

Mine office: Auburn, Placer Co., Cal. L. G. Schuster, manager. Lands, 150 acres, in Placer County and 30 acres in Nevada County, former 8 miles from nearest railroad, at Auburn, with a good wagon road connecting. Development is by 2 shallow 2-compartment incline shafts, in a vein reported as diorite in slate, carrying malachite and chalcopyrite, associated with pyrite and hematite, all apparently auriferous. Buildings include a smithy and boarding house.

NEVADA-PACIFIC COPPER CO. **NEVADA.**

Office: 40 Exchange Place, New York, N. Y. Mine office: Luning, Esmeralda Co., Nev. Samuel I. Silverman, manager; preceding officer, L. L. Patrick, A. E. Spriggs, J. H. Mifler and C. H. Palmer, directors. Organized circa 1909, with capitalization $3,000,000, shares $5 par, in $500,000 of 6% preferred stock and $2,500,000 common stock. Lands, in the Luning district, are said to be extensive, and company was said, August, 1909, to have taken an option on the Mayflower group of the Copper King Mining & Smelting Co. Mr. Silverman is variously quoted in the press as claiming to have in sight 100,000 to 1,000,000 tons of ore assaying 5.5% copper, with combined gold and silver values of about $1 per ton, and also is quoted as claiming that the company could produce copper for 7 cents per pound, which remains to be demonstrated. Company plans erecting a custom smelter on the Southern Pacific railway, in the Walker Lake district, and it was stated in the press, July, 1909,

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that A. Scott Ives, of Montreal, was selling 6% preferred stock at 6 cents per share, to raise funds for building the proposed smelter.

NEW ANNIVERSARY COPPER PROSPECTING SYNDICATE, LTD. AUSTRALIA.

Mine office: Herberton, Cardwell Co., Queensland, Australia. Capitalization £750, shares £10 par. In 1907 an old 90′ shaft was unwatered and cleaned out, showing a 2′ vein of 10% ore in the bottom, and showing, in a drift therefrom, a 30″ vein giving average assays of 13% copper and 9 oz. silver per long ton. No. 2 shaft is 66′ deep. Mine is said to have about 3,000 tons of ore in sight. Ore is shipped to the Chillagoe smelter for reduction, but transportation facilities are bad, and ore shipments are held down, for the completion of a railroad building toward the mine. Production, 1907, was 550 long tons of ore, yielding 208,320 lbs. fine copper and 5,600 oz. silver, and production, for year ending April, 1909, was only 145 long tons of ore, averaging 11.2% copper and 8 oz. silver per long ton.

NEW ARCADIAN COPPER CO. MICHIGAN.

Office and mine: Houghton, Houghton Co., Mich. Robt. H. Shields, president and general manager; Col. Sylvester T. Everett, vice-president; Wm. F. Miller, secretary and treasurer; preceding officers, C. M. Higgins, Allen F. Rees, John C. Shields, Jas. W. Shields, Wm. B. Anderson, John Merten, Simon J. Beahan and L. W. Killmar, directors; Herman W. Fesing, engineer; Otto Sieber, superintendent. Organized May 5, 1909, under laws of Michigan, with capitalization $3,750,000, shares $25 par; $10 paid in. Was organized as successor of Arcadian Copper Co., a corporation organized under laws of New Jersey with nonassessable stock, and new corporation exchanged stock for shares in the old company. An assessment of $1 per share has been levied, payable 50 cents Sept. 1, 1909, and 50 cents March 1, 1910. Property was transferred by deed from the old company to the new on May 30, 1909. American Trust Co., Boston, registrar; Boston Safe Deposit & Trust Co., transfer agent. Shares are listed on the Boston stock exchange. Annual meeting, in May. Company has given an option, for $40,000, to the New Baltic Exploration Co., on a quarter interest in lands in Section 16.

Lands, 3,500 acres, including 3,200 acres of mineral lands, all freehold. Property includes 5 old mines, worked in a small way at various periods in the past. The Arcadian Copper Co., predecessor of present company, operated the property with great vigor, 1898-1901, and equipped it with magnificent buildings and machinery, including a 3-stamp mill at Grosse Point. Operations proving unsatisfactory, all work was suspended June 15, 1903, and the hoist, machinery and shafthouses were sold to the Trimountain Mining Co.; the stamp-mill was sold to the Centennial Copper Mining Co., and the mine buildings were disposed of to various purchasers, the property being almost completely dismantled. The floating debt of the old company was liquidated by the sale of 800 acres of land, for $750,000, to the Quincy Mining Co.

Exploratory work was resumed, October, 1905, on an amygdaloidal bed about one-fourth mile east of the Isle Royale lode previously worked, and crosscutting from the 200′ level of the new exploratory shaft disclosed 5 copper bearing beds in a distance of 110′. Work was suspended March, 1908, until reorganization of the company, which was necessary in order to provide further funds, stock in the New Jersey corporation being nonassessable. Work was resumed August, 1909, when company contracted for a considerable amount of diamond-drill boring, from the bottom of the 200′ exploratory shaft, which is in the southwest quarter of Section 29, about 1,500′ from the center of the section. Equipment includes a 15-drill air-compressor, and a hoist good for 1,500′ depth, with boilers and other necessary machinery. Old workings and equipment are fully described in Vols. I and II. Present efforts of the company are confined

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to diamond drilling, with a view to locating the northern extension of the Baltic amygdaloidal bed on the eastern part of the property. Management is good, and property is considered a prospect of exceptional value, by reason of its great landed area on the mineral zone, and the likelihood of finding a payable amygdaloidal bed near the Eastern sandstone.

NEW BALTIC EXPLORATION. **MICHIGAN.**

Office and mine: Shelden Bldg., Houghton, Houghton Co., Mich. Jas. P. Edwards, general manager. Was organized circa December, 1908, with capitalization $20,000, shares $2 par, fully paid, but is not incorporated. Plans of management call for the incorporation of the New Baltic Copper Co., under the laws of Michigan, with capitalization $2,500,000, shares $25 par, and it is planned to issue one share of stock in the mining company for each share of stock in the development pool, and to give shareholders of development stock rights to subscribe to additional stock, 3 shares for 1, at whatever subscription price the new company may be floated at.

Lands in Section 16, east of the Arcadian, are held under option from various owners, and an undivided quarter interest owned by the New Arcadian Copper Co. is held under a $40,000 option, and it is probable that the New Arcadian Copper Co. will take stock in the New Baltic Copper Co., to be organized, in payment for this amount.

Work includes considerable trenching, and holes bored with a Calyx drill, which had considerable trouble in getting down standpipes. No. 3 borehole, at depth of 330′, cut 2′ of exceptionally good copper bearing rock, with 6″ of heavy copper, and in September, 1909, a drill-core was taken from what was thought to be the western bed of the Baltic, fairly charged with copper, at depth of 300′. In November, 1909, a drill hole, pitched at an angle of 60°, cut through an amygdaloidal bed, estimated also to pitch at 60°, in opposition, gave cores of 105′ aggregate length, showing copper at various points, with the final 7′ carrying much fine stamp copper, and a considerable amount of very coarse stamp copper, the bed giving every indication, from this drill hole, of carrying workable values if developed. Property considered decidedly promising.

NEW CONSOLIDATED MINING CO., LTD. **MEXICO.**

Dead. Was reconstructed, June 10, 1909, as Consolidated Copper Co., Ltd. Formerly at Charcas, Moctezuma, San Luis Potosí, Mex.

NEW DOMINION COPPER CO. **BRITISH COLUMBIA.**

Office: 42 Broadway, New York, N. Y. Mine office: Phoenix, Boundary district, B. C. Works office: Boundary Falls, Boundary district, B. C. J. A. Lewisohn, president; Newman Erb, vice-president; Theo. Herrmann, secretary; Julius H. Susmann, treasurer; preceding officers, Hon. Warren W. Foster, F. L. Sommer, N. Bruce McKelvie and John A. Sleicher, directors; John Seward, superintendent; J. Parke Channing, consulting engineer.

Organized June 9, 1909, under laws of British Columbia, with capitalization $1,750,000, shares $5 par, fully issued and fully paid. Bonds, $500,000, at 6%, for 10 years, convertible into stock at par. Windsor Trust Co., New York, transfer agent. Annual meeting, first Monday in June.

Company is a reconstruction of the Dominion Copper Co., Ltd., which defaulted on bond interest, June, 1908, and for which a receiver was appointed Oct. 2, 1908, on application of the mortgage trustee. Property of the old company was bid in at mortgage sale, June, 1909, for $261,500, by Col. Chas. Hayden, chairman of the reorganization committee, and property of old company was turned over to the new corporation, August, 1909. The plan of reorganization was extremely drastic, and there were many bitter complaints from dissenting holders of stocks and bonds of the old company. A protective committee of dissenting shareholders has been appointed, with B. W. Lincoln as chairman, and this committee is to investigate the legal rights of the old

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company, but it is doubtful whether the protective committee will secure any satisfaction.

The British Columbia Copper Co. owns a considerable share interest in the New Dominion, and is said to hold approximately 132,000 shares, said to have been bought for 80,000 shares of British Columbia treasury stock, and cash. The General Development Co., controlled by the Lewisohn interests, has a considerable stock interest in both British Columbia and New Dominion, and, by reason thereof, the Lewisohn interests are practically in control.

Lands, 15 claims, area 500 acres, also fractional interests in 94 claims additional, and a smelter site. Mining lands are in 4 groups, in the Phoenix, Deadwood, Wellington and Summit camps. Country rocks are limestone and greenstone, ore bodies occurring as contact deposits, and largely as replacements in greenstone, there being 8 different ore bodies, all more or less developed, of about 25′ average width, having a generally north and south strike, with average dip of about 40°. The ores are low in average grade, and the mines, though showing large ore bodies, have a comparatively small amount of ground blocked out. For the fiscal year ending July 31, 1907, the mines made 8,519′ of new openings.

The Phoenix group, area 366 acres, includes the Brooklyn, Idaho, Rawhide, Stemwinder, Montezuma and Standard mines. The Brooklyn and Idaho are adjoining properties that produced 55,548 tons of ore in 1907, and the Rawhide is about one-half mile distant.

The Brooklyn mine, which is the principal property, has a 430′ main shaft, with about 8,000′ of workings, showing a 40′ vein, estimated to average 1.43% copper, 25 cents silver and $1.32 gold per ton.

The Idaho mine, connected with the Brooklyn on the 250′ level, is opened by tunnel and shaft, latter having an electric hoist, but is worked mainly open-cast.

The Stemwinder mine, opened on a vein parallel with and about 1,000′ east of the Brooklyn, has a 400′ shaft, with about one-half mile of workings, ore giving average assays of 1.4% copper, 25 cents silver and $1 gold per ton.

The Rawhide mine, adjoining the Gold Drop mine of the Granby, has a 180′ shaft, 6 tunnels, and various open-cuts, exposing circa 250,000 tons of ore averaging about 1.4% copper, 25 cents silver and 90 cents gold per ton. Equipment includes a 500′ Ingersoll-Sergeant electric air-compressor, and production, 1907, was 64,873 tons of ore.

The Montezuma and Standard claims, but slightly developed, show ores similar to those of the other mines in the Phoenix camp.

The Deadwood group, area 110 acres, includes the Sunset, Morrison, Crown Silver and C. O. D. mines. The Sunset mine, with shafts of 200′ and 412′ and large open-cast workings, has a large ore body, valuable chiefly for flux, as it carries excess of iron, silica and lime, with only small copper, silver and gold values. Production, 1907, was 81,258 tons of ore. A trestle from the Sunset mine runs to a 2,000-ton ore-bin on the railroad siding. Equipment includes a 14x20″ Jenckes duplex link-motion hoist, 14x20″ Lidgerwood double-cylinder hoist, and a 10-drill Ingersoll-Sergeant duplex air-compressor.

The Crown Silver mine adjoins the Sunset, and is practically a part thereof. Development is by a 365′ shaft and an 880′ tunnel.

The Morrison mine has a 364′ shaft, with 4,300′ of tunnels, showing ore averaging circa 0.6% copper, 1.5 oz. silver and up to $4 gold per ton. Equipment includes a 110-h. p. steam plant, with 7x9″ hoist and a 5-drill Rand air-compressor.

The Wellington group includes the Athelstan and Jackpot mines, with combined area of 34 acres. These show a large outcrop of oxidized ore carrying

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very low values in copper, about 1 oz. silver and up to $7.50 gold per ton, but expected to carry somewhat better copper values below the oxidized zone.

Property in the Summit camp includes a half interest in the Lancashire mine, having a silver vein, and a three-fourths interest in the Mountain Rose mine, with combined area of 74 acres, carrying fluxing ores. The Mountain Rose, owned one-fourth by the Hall Mining & Smelting Co., has 2 tunnels, opening a vein of about 15' width, and produced 3,999 tons of fluxing ore in 1907.

Power for the mine and works is mainly electric, current being furnished by the South Kootenay Power Co., from Bonnington Falls, circa 25 miles distant. The Phoenix group has electric hoists and a 25-drill Canadian Rand air-compressor, driven by a 450-h. p. Canadian Westinghouse electric motor. The largest crusher is a Jenckes-Farrel-Bacon, with 42x30" jaw openings, weighing circa 125,000 lbs., with an hourly capacity of 150 tons of ore reduced to 6" size, being one of the largest ever built.

Ore is transported 4 to 25 miles by rail from the various mines to the smelter. The matter of building a 5-mile aërial tram to cost circa $200,000 was given tentative consideration by the former owners, but financial considerations precluded its construction. Rail freights are 17 cents per ton on Deadwood ore, and 30 cents per ton on ore from the Phoenix and Summit camps.

The 1,500-ton smelter, 4 miles from Greenwood, was built by the Standard Pyritic Co., passing later to the Montreal & Boston Consolidated Mining & Smelting Co., Ltd., thence to the Dominion Copper Co., Ltd. The smelter was poorly equipped and poorly located, but was overhauled and modernized by the Dominion company, and lands were added for slag storage.

The works include a small sampling mill, equipped with crushers, rolls, belt-conveyors and Vezin and Bridgeman automatic samplers.

The 120x182' blast-furnace building has, in the building, sixteen 16x25' ore-bins, and there are 3 large ore and coke-bins outside, with railroad tracks running above. There are two 325-ton water-jacket blast-furnaces, 40x176" at the tuyeres, and one 600-ton 44x255" furnace, all having automatic feed. The dust-flue, 200' long, has a 30x50' brick dust-chamber, and leads to a stack 112' high and 9' 6" in diameter, and a self-supporting stack 100' high and 8' in diameter. Slag is handled by a 7x12" locomotive, on a 40" gauge railroad track.

The power plant at the works includes No. 7 Connersville blowers and a 250-light dynamo. The old machinery plant, burned 1908, was rebuilt. The works include a machine-shop.

When operated the smelter works three 8-hour shifts, product being a matte carrying about 45% copper, 13 oz. silver and 3 oz. gold per ton, shipped to the British Columbia smelter at Greenwood for refining. The smelter also does custom work when in blast.

Production, for year ending July 31, 1907, was 187,981 tons of ore, yielding 2,910,695 lbs. fine copper, 42,606 oz. silver and 10,321 oz. gold, realizing $820,184.84, with total operating expenses of $740,002.72, giving a net mining profit of $80,942.91. The former company's financial statement showed a profit, on operations for 18 months ending July 31, 1906, of $139,144. Production for year ending July 31, 1907, averaged 15.5 lbs. fine copper, 0.5 oz. silver and $1.10 gold per ton, and the management was said to have secured costs of $1.34 per ton for mining, including freight, and $1.32 for smelting, or total mining and smelting costs of $2.66 per ton. Allowing 34 cents miscellaneous expenses, the cost would be $3 per ton on ore reduced to matte, to which should be added 40 to 50 cents per ton for conversion, refining, smelting and miscellaneous expenses, giving total costs of about $3.50 per ton on ore, exclusive of interest on bonded indebtedness. Deducting therefrom $1.40 per ton for included gold and silver values, cost of copper contained in a ton of ore, amounting to 15.5 lbs., would

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be $2.10, or 13.5 cents per pound, instead of the alleged cost of 8 cents per pound that was claimed by the management of the old company. These figures, reprinted from Vol. VIII, show why the Dominion Copper Co., Ltd., came to grief.

Matte of the New Dominion smelter was converted, when the property was operated, at the British Columbia works, and it is probable that the New Dominion will contract with the British Columbia for smelting its ores at the Greenwood smelter of the former, suspending operations at the Boundary Falls works. The new company planned resuming mining and smelting in August, 1909, but was idle at last accounts, though with prospects of resumption shortly. The property is dangerously low in grade, but has enormous ore bodies, and, under the present strong management, and especially if operated in close working alliance with the British Columbia, should become a large producer eventually.

NEW DOMINION COPPER MINING & DEVELOPING CO. WASHINGTON.

Mine office: Chewelah, Stevens Co., Wash. Lands are the Enterprise group of 4 claims, 3 miles east of Chewelah, adjoining the Copper King and United mines, developed by a 100′ shaft, showing an ore body, widening with depth, from which assays of $75 to $200 per ton have been secured in silver and copper.

NEW ENGLAND & ARIZONA GOLD & COPPER MINING CO. ARIZONA.

Office: 235 Main St., Lewiston, Me. Mine office: Humboldt, Yavapai Co., Ariz. Geo. A. Whitney, president; Lewis Harlow, treasurer. Organized 1900, with capitalization $750,000, shares $1 par. Company was short of cash at last accounts. Lands, 9 claims, 3 patented, circa 2 miles from Humboldt. Mine is developed to depth of 400′, showing ore giving gross assay values of $1.32 to $68.56 per ton.

NEW KEYSTONE COPPER CO. ARIZONA.

Office: 42 Broadway, New York, N. Y. Mine office: Miami, Gila Co., Ariz. Employs circa 50 men. Samuel A. Lewisohn, president; J. Parke Channing, vice-president; Julius H. Susmann, secretary and treasurer; preceding officers, Adolph Lewisohn, Walter Rosen, Jacob Langeloth, Theo. I. Herrmann, Ralph C. Lupton and Herman Cook, directors; Geo. C. Lawton, superintendent; B. Britton Gottsberger, general manager; Louis Wright, consulting engineer.

Organized circa August, 1909, under laws of Delaware, with capitalization $3,000,000, shares $5 par; issued, $1,500,000. Company was organized as a reconstruction of the Keystone Copper Co., shareholders of old corporation taking stock in new company in exchange for the property. Is controlled by the General Development Co., which also is in control of the Miami.

Lands, 12 claims, area 240 acres, lying next east of the Live Oak and near the Inspiration and Miami mines. Property shows granite and quartz-porphyry, with occasional schists. East of the main workings there are surface deposits of chrysocolla, said to assay 3 to 7% copper, and a conglomerate bed of 4′ to 12′ thickness, said to be impregnated with copper to the extent of 3 to 6%, from which values apparently could be recovered by leaching. Ore, as developed, is mainly chrysocolla, with disseminated carbonates and occasional sulphides, latter including chalcocite of 40 to 60% copper tenor. Principal ore body is a 12′ vein carrying a 15″ paystreak said to average circa 22% copper and 2 to 5 oz. silver per ton, balance of vein carrying concentrating ore of 3 to 5% copper tenor, which has been left standing, for later extraction.

Development by former owners included 3 tunnels, with about one-half mile of workings. No. 2 tunnel, of 570′ length, shows chrysocolla and carbonate ores of 4 to 24% tenor, and No. 3 tunnel, circa 600′ long, shows somewhat similar ore. Development by present management is along different lines, with a view to making a mine from disseminated sulphides in the Pinal schist. The

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new 3-compartment Keystone shaft was 350′ deep August, 1907, with cross-cutting and drifting in progress on the 150′ level. Work is planned to block out ore in squares of 200′, with levels at 100′ intervals. The new work shows disseminated sulphides in Pinal schist, similar to those of the Miami, but apparently somewhat lower in grade, being about 2.5% in copper tenor, with some ore carrying up to 3% copper. In addition to underground work, prospecting is in progress by two No. 5 Keystone churn drills, boring to depth of 400′ to 600′, making an average progress of 15′ daily.

Equipment includes a 25-h. p. gasoline hoist and a 3-drill air-compressor, also a 25-ton experimental plant, built 1905, using a modification of the Hoepfner sulphide process, for leaching chrysocolla, carbonate ores and roasted sulphides. By this process ore is reduced to fines, pulped and leached for 3 hours in a slowly revolving chlorination barrel. The leaching solution is cupric chloride, which is changed to cuprous chloride by the absorption of one atom of copper. The enriched solution goes to precipitation tanks, where the extra molecule of copper is precipitated upon large copper sheets, and the solution, thus regenerated to cupric chloride, is returned to the storage tank for further use. The mill does not seem to have proven a success.

The Keystone has been a small producer since 1899, shipping ores giving smelter returns of 22 to 27% copper, in addition to yielding low grade silicious ores of 3 to 5% copper tenor, used at Old Dominion smelter for converter linings. Production, 1907, was 208,801 lbs. fine copper. Management is good and property considered decidedly promising.

NEW MONARCH MINING CO. **COLORADO.**

Office: 310 Cuyahoga Bldg., Cleveland, Ohio. Mine office: Leadville, Lake Co., Colo. Jas. B. McDonald, manager; Frank Fuller, superintendent. Property carries auriferous and argentiferous copper, lead and zinc sulphides. Equipment includes steam power and an air-compressor. Employs circa 50 men.

NEW PLANET COPPER MINING CO. **ARIZONA.**

Office: 42 Broadway, New York, N. Y. Mine office: Planet, Yuma Co., Ariz. Chas. S. Barton, president; Wm. G. Nickerson, vice-president; O. J. Ashman, secretary; Julius H. Susmann, treasurer; preceding officers, S. S. Rosenstamm and Alexander Rae, directors; Samuel Untermeyer, general counsel; J. Parke Channing, consulting engineer; W. E. Upham, superintendent. Organized circa July, 1909, under laws of Delaware, with capitalization $4,000,000, shares $5 par, as a reconstruction of the Planet Copper Mining Co. Stock in old company was retired by exchange of 240,000 shares of New Planet stock, 560,000 shares going to the General Development Co., which is in control and will finance the property. Company is said to have a guarantee fund of $1,000,000 for development.

Lands, 34 claims, area circa 650 acres, also 40 acres in millsites, in the Harcúvar district, on the south side of Bill Williams Fork river, 12 miles east of the Colorado river. Property shows about 50 exposures of ore, with 2 ore zones, apparently metamorphic contact deposits, having diorite on the footwall, overlaid by sedimentary shales and impure limestone, much altered by intercalated eruptives, the veins, which carry a heavy iron capping, mainly of hematite, for a distance of 3,000′, ranging up to 200′ in width, with average width of about 30′. Apparently the gossan is of workable grade, and it is estimated that the property shows about 500,000 tons of 60% iron ore. The main ore zone, traceable about 2,700′, ranges up to 300′ in width, carrying oxidized and silicate ores estimated to average 7 to 8% copper and 50 cents gold per ton, with traces of silver, but apparently the workable portion of the vein is 3′ to 20′ in width. The vein is very flat, dipping about 15° only.

Development is by 3 incline shafts, deepest 800′, giving a vertical depth of 365′, showing ore of 5 to 12% copper tenor, with 12 vertical pits and shafts, of 25′ to 325′ depth, and 8 tunnels, longest 225′, with total workings of 6,000′,

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estimated by former owners to show 100,000 tons of ore, with 75,000 tons blocked out for stoping. The sulphide zone has not been reached, as yet, by any workings, which is an indication of strong and persistent copper values.

Equipment includes a 75-h. p. gasoline plant, with two 15x25" hoists and a 5-drill air-compressor. Buildings include a 15x40' frame carpenter-shop, 10x10' smithy, 2 shafthouses and 3 dwellings.

The mine, opened circa 1864, was worked in a small way until 1874, and was reopened in 1884, when a 36" circular blast-furnace was erected. Property was taken over, 1902, by former company, since which it has been developed steadily, with a small force. The mine produced, 1864-1874, upwards of $500,000 worth of high-grade ore, ranging from 15 to 40% in copper tenor, which was shipped by water to a port on the Gulf of California, presumably Guaymas, and transshipped thence to Swansea for reduction. A little ore was sent to San Francisco also, and the production is said to have given fair profits, notwithstanding the heavy expenses for freight and smelting, and the harassing difficulties caused by various Indian uprisings.

The property has been handicapped by lack of rail connections, but the Arizona & California railway is now only 27 miles distant by wagon-road, with prospects of a new line to come much nearer. Management considered good and property promising.

NEW SUPERIOR MINING CO. — **UTAH.**

Office and mine: Bingham Canyon, Salt Lake Co., Utah. F. E. Straup, president; Jas. E. Dow, secretary; W. W. Trimmer, treasurer. Organized 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Apparently no work has been done.

NEW WORLD MINING & MILLING CO. — **CALIFORNIA.**

Mine office: Havilah, Kern Co., Cal. G. Miller, superintendent. Property carries gold and copper ores. Equipment includes a water power plant. Was developing with a small force at last accounts.

NEW YORK & CORBIN COPPER & SILVER MINING CO. — **MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Quinn Crowley, superintendent; Wm. A. Farish, consulting engineer. Organized Apr. 27, 1908, under laws of Maine. Property was under development at last accounts.

NIJNI-TAGILSK MINES & WORKS. — **RUSSIA.**

Office: Nevski 15, St. Petersburg, Russia. Mine and works office: Nijni-Tagilsk, Perm, Russia. Prince San Donato, owner. Property includes various mines, and a smelter known as the Vijski Works. Production was 4,917,896 lbs. fine copper in 1902, falling to 2,962,250 lbs. in 1905, owing to flooding of mine. Production for first 9 months of 1907 was 196,049 poods, equal to 5,551,981 lbs. fine copper, and for first 9 months of 1908 was 103,122 poods, equal to 3,723,942 lbs. fine copper. Production, 1908, estimated at 5,000,000 lbs. fine copper.

NINETY-NINE COPPER CO. — **NEVADA.**

Office: Salt Lake City, Utah. Mine office: Goodsprings, Lincoln Co., Nev. J. B. Jenson, general manager. Mine has a 200' shaft, planned to be sunk to 500', and a tunnel showing ore giving assays up to 63% in copper tenor. A carload shipment gave smelter returns of circa 25% copper. Equipment includes a 15-h. p. hoist and a 3-drill air-compressor.

NORDISKA GRUFAKTIEBOLAGET. — **NORWAY.**

Office: Trondhjem, Norway. Mine office: Ripperfjord, Finmarken, Tromsö, Norway. Property was under exploration, at last accounts, in 1907.

NORTH AMERICAN MINES CO. — **COLORADO.**

Mine office: Frisco, Summit Co., Colo. H. T. McAllister, general manager. Property shows auriferous and argentiferous copper and lead ores. Equipment includes steam power and a small air-compressor.

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NORTH AMERICAN MINING & MILLING CO. **COLORADO.**

Mine office: Liberty, Saguache Co., Colo. Jos. A. Powell, superintendent. Property shows copper ore, under development with a small force at last accounts.

NORTH BALFOUR COPPER MINES, LTD. **TASMANIA.**

Office: 31 Queen St., Melbourne, Australia. Mine office: Balfour, Tasmania. P. J. Deely, chairman; Prince Cameron, manager. Organized Apr. 7, 1909, under laws of Victoria, with capitalization £4,000, shares £5 par. Lands, 110 acres, adjoining the Mount Balfour mine on the north, near the Frankland river, on the northwest coast of Tasmania. Property shows a large copper outcrop, supposed to be the extension of the vein of the Mount Balfour mine.

NORTH BECK MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. E. J. Raddatz, president; H. G. Snyder, secretary. Organized March, 1909, under laws of Utah, with capitalization $1,000,000, shares $1 par. Lands, 14 claims, 5 owned outright and 9 held under bond and lease, latter including property, 2 claims, of the North Gemini Mining Co. Development is by an 85′ shaft on the Manhattan group, and a 75′ shaft on the Seneca group, both planned to be sunk to depth of 500′ before crosscutting.

NORTH BUTTE EXTENSION DEVELOPMENT CO. **MONTANA.**

Office: 1911-74 Broadway, New York, N. Y. Mine office: 113 Hamilton St., Butte, Silver Bow Co., Mont. Joseph O. Morris, vice-president; preceding officers, R. J. Horner, C. H. Moore, Geo. N. Orcutt and A. M. Andrews, directors. Organized circa 1909, under laws of Maine, with capitalization $1,500,000, shares $1 par, as a reconstruction of the North Butte Extension Copper Mining Co., which was organized October, 1906. Stock in the new corporation was exchanged for stock in old, on payment of an involuntary assessment of fifty cents per share, but the company finally gave one share of new stock for 6 shares of old, to the delinquent shareholders. The career of the North Butte Extension Copper Mining Co., the predecessor of the present corporation, was marked by a series of continuous stock-jobberies and rascalities, giving the company a most malodorous reputation. The new company's career has proven nearly as stormy as that of the old, being marked by numerous squabbles and perpetual lack of cash, though the new company is said to have paid about $130,000 on debts and options, after organization, which may or may not have been true. Property was again attached, March, 1909, for a $600 unpaid bill. Circa July, 1909, the directors offered $100,000 of the company's 6% notes to the shareholders, offering, as "security," 400 shares of treasury stock for each $100 of notes, but the plan did not seem to appeal to the grasping shareholders, possibly because the stock was then selling at about 5 cents per share, when a market could be found for it.

Lands of the old company originally were 4 claims and 2 millsites, area 55 acres, lying north of the Butte & London, and supposed to carry the extension of the Black Rock vein. In March, 1908, the old company added the Michigander and Third Sphinx claims, north of the Berlin mine of the North Butte, on which options were extended, October, 1908, but these claims reverted, April, 1909, to the owner, Alexander Leggatt, through inability of the company to take up a bond for $5,000, although Mr. Leggatt offered to take $1,000 cash and the company's notes for the balance. In 1908, the old company lost the Occidental and Free Trade claims, after payments of $90,000 on the bonds. Apparently the company's only present property is the Black Crow fractional claim, of circa 2½ acres area, and the Clipper and Assay millsites, with a five-eighths interest in the Overman claim, and an eleven-sixteenths interest in the Free Trade claim.

This company and its predecessors are said to have handled, or expended,

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about $300,000, mainly to the very worst possible advantage, and the present holdings are of slight area and questionable value. At various intervals the press announces that work will be resumed, immediately. Company is regarded most unfavorably, and everybody connected with the old corporation came out with a smirched reputation, while some of the principals can congratulate themselves as extremely lucky in having escaped jail.

NORTH COLORADO MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jos. Werthlin, president; Hyrum Straw, vice-president; Heber C. Jex, secretary and treasurer; preceding officers, Perry Fuller and John Roundy, directors. Organized circa May, 1909, under laws of Utah, with capitalization $50,000, shares 5 cents par. Lands are in the North Tintic district.

NORTH CROWN LYELL MINING CO., N. L. **TASMANIA.**

Office: 90 Queen St., Melbourne, Australia. Mine office: Mt. Lyell, Montagu Co., Tasmania. G. A. Lawson, manager. Capitalization £125,000, shares £1 par. Lands, 66 acres. Idle and apparently moribund.

NORTH GEMINI MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Lands, 2 claims, which were under bond, 1909, to North Beck Mining Co.

NORTH MOUNT LYELL MINING CO., N. L. **TASMANIA.**

Dead. Was succeeded, Sept. 20, 1907, by North Mount Lyell Copper Co., Ltd. Formerly at Mt. Lyell, Montagu Co., Tasmania.

NORTHERN ANNIVERSARY COPPER CO., N. L. **AUSTRALIA.**

Mine office: Gympie, Queensland, Australia. Capitalization £1,500, shares 6s. 3d. par. Presumably idle.

NORTHERN LIGHT DEVELOPMENT MINING CO. **ALASKA.**

Mine office: Latouche, Alaska. Organized circa 1909, under laws of Washington, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, on an island in Prince William Sound, opposite Latouche Island, slightly developed by tunnels, with about 250′ of workings. A blind shaft, sinking from a crosscut, shows 6′ of auriferous and argentiferous chalcopyrite. Property has necessary mine buildings.

NORTHERN TEXADA MINES, LTD. **BRITISH COLUMBIA.**

Office: Vancouver, B. C. Mine office: Van Anda, Texada Island, B. C. S. G. Faulkner, president. Property is the Cornell mine, opened by a glory hole, which caved in, and a 550′ main shaft, showing bornite and chalcopyrite assaying 8% copper, 2.5 oz. silver and $1 gold per ton. Equipment includes a steam plant, hoist and 5-drill Rand air-compressor. Early 1909 property was shipping ore to the Ladysmith smelter.

NORTHWEST COEUR D'ALENE ITALIC COPPER MINING & DEVELOPMENT CO. **IDAHO.**

Office: Spokane, Wash. Mine office: Priest River, Bonner Co., Idaho. Thos. Golden, president and general manager; Wm. K. Glenn, secretary and treasurer. Lands, 3 claims, showing a 20′ iron gossan carrying considerable hematite and magnetite, giving assay values of circa $2.50 per ton in copper, gold and silver. Development is by a tunnel, started March, 1909, planned to be driven 300′ to give a back of 150′. Property has mixed river and rail transportation to the Panhandle smelter.

NOTRE DAME COPPER CO. **NEWFOUNDLAND.**

Office: Braddock, Pa. Mine office: Twillingate, Nfld. Lands are a short distance south of the holdings of the Great Northern Copper Co., and management is in practically the same.

OARASAWA MINE. **JAPAN.**

Mine office: Iwate, Sendai, Japan. Tatsugoro Saito, owner. In 1907, employing 139 hands, without power equipment, produced 265,730 lbs. fine copper.

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OEST & ENRIQUEZ. **MEXICO.**

Office: Apartado 65, Oaxaca, Oax., Mex. Mine office: Ocotlán, Oaxaca, Mex. Alfredo Oest, general manager; Porfirio B. Enriquez, superintendent. Lands, 363 hectares, well watered and timbered, said to be 23 leagues from Ocotlán, including El Alfirez, La Morena, La Soledad and El Fresno mines, carrying ores with gold, silver, copper and lead values. About 75 men were employed, at last accounts, and a small matting furnace was planned.

OGDEN-LUCIN COPPER CO. **UTAH.**

Office: 411 First National Bank Bldg., Ogden, Utah. Mine office: Lucin, Box Elder Co., Utah. E. A. Stratford, secretary and treasurer. Presumably idle.

OHIO MINES CO. **ARIZONA.**

Mine office: Poland, Yavapai Co., Ariz. Company bought, January, 1909, the lands of the Jessie Mines Co., including 14 lode claims and 160 acres of water rights on the Agua Fria river, 6 miles from the mine, which was discovered 1889. The Jessie Mines Co. claimed to have 150,000 tons of ore blocked out for mining, worth, at a conservative estimate, $2,000,000, which, of course, was untrue, and paid quarterly dividends of 3% while peddling shares, and was a mere bit of stock-jobbery, although its promoters managed to escape jail. Main shaft is 667′ deep, and mine is claimed to have produced upwards of $750,000 in gold under ownership previous to that of the Jessie Mines Co.

OJO VERDE COPPER CO. **MEXICO.**

Office: Chicago, Ills. Mine office: Autlán, Jalisco, Mex. Thos. Kelly, president; Stanislaus F. Ossolinski, manager. Lands include El Refugio mine, showing an outcrop for nearly a mile. Property is said to have an extensive ore body, carrying mainly copper values. Management plans building a wagon road to Chamela, on the Pacific, and erecting a mill.

OKLAHOMA MINING CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Lands, near Wheeler Pass, include the Morgan-Beaman properties, taken over February, 1909. Development is by an 80′ shaft, said to show a 12′ vein carrying 5 stringers of high grade ore, with 100 tons of ore on the dump giving assays of $50 per ton.

OLD DOMINION COPPER MINING CO. **ARIZONA.**

Dead. Was succeeded, circa 1895, by Old Dominion Copper Mining & Smelting Co. Formerly at Globe, Gila Co., Ariz.

OLENTANGY MINING CO. **WASHINGTON.**

Office: Columbus, Ohio. Mine office: Chesaw, Okanogan Co., Wash. John H. Arnold, president. Mine has shipped ore giving smelter returns of $47.50 per ton in copper, gold, silver and lead, in order named. In April, 1909, management planned erecting a new process copper smelter, of 100 tons daily capacity, at an estimated cost of $20,000.

OLIVER MINING CO. **COLORADO.**

Dead. Was merged, 1903, in San Juan Smelting & Refining Co. Formerly at Silverton, San Juan Co., Colo.

ONN COPPER MINING CO. **CALIFORNIA.**

Office and mine: Coram, Shasta Co., Cal. Alfred Onn, president; W. C. Onn, secretary and treasurer; preceding officers, Arthur E. Onn, Frederick S. Lanyon and J. C. Isaacs, directors. Organized under laws of Arizona, with capitalization $2,000,000, shares $2 par. Lands, 22 claims, area 440 acres, known as the Spread Eagle group, showing a gossan giving assays of $3 to $8 per ton in gold, with some silver and copper. Mine is claimed to have 4,000′ of workings, showing ore assaying 8 to 10% copper and $5 to $6 gold per ton, with some silver, which figures are considered above the actual average of ore values. Company has permission to use the Balaklala wagon road, and prospectus announces that

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the corporation will be conducted on strictly Puritan principles. The prospectus also claims that the Mammoth mine, in the same district, has $450,000,000 worth of ore in sight, which, of course, is untrue.

ONO MINING CO. **JAPAN.**

Mine office: Funatsu, Yoshiki-gori, Hida, Japan. Property is the Hatasa mine, having an 86-h. p. installation, and employing 212 hands in 1907, in which year production was 77,879 lbs. fine copper and 21,053 oz. fine silver.

OPHIR GOLD & COPPER MINING CO. **AUSTRALIA.**

Mine office: Lewis Ponds, Bathurst Co., N. S. W., Australia. The mine, southeast of Lewis Ponds, opened 1852, was reopened, 1906, by present company, which cleaned out an old 600′ tunnel, retimbered an old 120′ shaft and sunk a new 85′ shaft. Property is said to show a vein of 2′ to 12′ width in the tunnel, with large bodies of low grade ore in the deeper shaft. The mine produced considerable ore, in early days, from the oxidized zone, which carried auriferous copper ore with quartz gangue, 200 tons yielding 30 tons fine copper, but the sulphide ores give assays of 1% or under in copper tenor, and apparently are unworkable.

OPHIR MINING CO. **ARIZONA.**

Office: 341 Carondelet St., New Orleans, La. Mine office: Jerome, Yavapai Co., Ariz. John Nelson, president and treasurer; Kit Carson, vice-president and general manager; D. J. Holt, secretary. Organized under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 8 claims, area 160 acres, adjoining the Black Mountain Mining & Milling Co., in Gold Basin, about 4 miles from Jerome Junction, from which ore has been secured said to assay 7 to 85% copper, with some gold and silver. The company's prospectus is filled with crudities and glittering generalities, and states, among other things that "if you are looking for a safety deposit vault of stored up dividends, invest in a good copper mine. The Ophir Mining Co. is one of this kind." Is not regarded favorably.

ORANGE BLOSSOM EXTENSION MINING & MILLING CO. **CALIFORNIA.**

Office: San Diego, Cal. Mine office: Bagdad, San Bernardino Co., Cal. J. A. Hodgman, president; J. M. Dodge, vice president; Wm. H. Holcomb, secretary; R. B. Dodge, treasurer; preceding officers and C. A. Meyer, directors. Lands, 20 claims, having a 125′ tunnel and a 715′ shaft, quite wet, on the Bengal claim, with about 3,000′ of workings. Improvements include necessary mine buildings and an 8-stamp mill with Nissen heads. Company states that ore cannot be treated profitably with present limited milling capacity.

OREGON & BRITISH COLUMBIA MINING & DEVELOPING CO. **BRITISH COLUMBIA.**

Office: 218 Board of Trade, Portland, Ore. Mine office: Princeton, Boundary district, B. C. Lands, for which applications for crown-granting have been filed, have several shallow shafts and short tunnels.

OREGON-COLORADO MINING, MILLING & DEVELOPMENT CO. **OREGON.**

Mine office: Bohemia, Lane Co., Ore. F. J. Hard, manager. Property is a copper prospect, under development with a small force at last accounts.

ORION ORO DEVELOPMENT CO. **ARIZONA.**

Office: Rock Island, Ills. Mine office: Vicksburg, Yuma Co., Ariz. Victor Satterdahl, manager. Lands, about 2 miles west of Vicksburg, on the western slope of the Granite Wash Mountains, have several short tunnels and an incline shaft cutting several veins, and, at last accounts, management planned sinking a vertical shaft.

OROGRANDE SMELTING CO. **NEW MEXICO.**

Mine and works office: Orogrande, Otero Co., N. M. Company is a reconstruction of the South West Smelting & Refining Co. Property includes 36 claims, area 720 acres, an 80-acre smelter and the 640-acre townsite of Oro-

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grande, giving total holdings of 1,440 acres, in the Silver Hill district of Otero County, and in the Organ district of Donna Ana County. Principal holdings are in the Silver Hill district, in the Jarilla Mountains, circa 60 miles north of El Paso, and, in addition to copper lands, the company holds sundry placer gold claims and a mine of auriferous iron ore, highly suitable for fluxing. The company also owns a limestone quarry for flux, which has been claimed in the press to carry 80 cents to $6 gold per ton, which seems to have been too good to be true.

Principal mining properties are the Lucky, Nanny Baird, Iron Mask and Garnet mines. The three properties first named show limestone and porphyry, carrying 16 contact deposits, of which 7, more or less developed, range from 3′ to 40′ in width, with known lengths of 100′ to 700′, carrying native copper, cuprite and malachite, said to give average assays of 7% copper, 2 oz. silver and $5 gold per ton, which figures are too high, all ores being slightly argentiferous and strongly auriferous.

The Lucky mine, developed by a 300′ shaft, and by tunnels of 250′ and 625′, is said to show a large amount of auriferous copper ore averaging circa 7% copper and $6 gold per ton, also considered too high, and the mine has proven very wet. A 500′ tramway from the mine leads to the railway track.

The Nanny Baird mine has a vein of circa 25′ average width, carrying small copper and silver values, with good gold values, and to the south is a placer gold tract, of some promise. Development in the Nannie Baird is by a 100′ vertical shaft and an 800′ incline shaft. The Lucky and Nanny Baird mines jointly have about one mile of workings, estimated by former owners to show 100,000 tons of ore of good average grade blocked out for stoping, which figures were too high.

The Iron Mask mine, on Iron Mountain, has auriferous iron ore, assaying up to circa 60% iron and $2 to $8 gold per ton, with an estimated average gold value of $3 to $4, also considered too high. It is planned to reach the Iron Mask by a railroad spur.

The Garnet mine has a 480′ shaft, equipment including a 20-h. p. gasoline engine and an air-compressor.

The mining plant includes three 85-h. p. boilers, two 8x10″ hoists, good for 800′ each, and 2 Sullivan air-compressors, of 28 drills aggregate capacity, with 23 power drills.

Buildings, 22 in number, include 4 smithies, a 20x40′ machine-shop, general store, office, assay office and laboratory. The townsite of Orogrande has electric lights and a telephone exchange, maintained by the company.

Water is brought, 21 miles, from a dam across the Sacramento River, in the Sacramento Mountains, by a 6″ pipe-line, leading to a 25,000,000-gallon reservoir, on the side of Baird Hill, just above the townsite. The daily flow of the river is said to be 10,000,000 gallons, and the capacity of the pipe-line is said to be circa 500,000 gallons daily, delivering water at about 800 lbs. pressure per square inch, under a static head of 1,500′. If these figures are correct there is no excuse apparent for the use of steam power.

The smeltersite, less than a mile from Jarilla Junction, is about 1½ miles from the mine, and the plant includes ore-bins, a sampling mill, furnace building and power-house. The furnace building, of steel, is designed for two 250-ton furnaces, with equipment in place for both, but only one furnace is installed, this having been blown in early November, 1907. The furnace building has a 125′ steel smokestack, of 14′ diameter at the base and 9′ at the top. The smelter is reached by a private spur track from the El Paso & Northeastern railroad, and is connected by a branch line with the mines.

The smelter power plant has three 150-h. p. Heine boilers, two 120-h. p.

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Filer & Stowell Corliss high-speed engines, 2 Hendrie & Bolthoff electric generators and two No. 8 Connersville blowers.

The former company employed about 200 men, and made its first matte shipment to Chrome, N. J., in July, 1907, but suspended operations May, 1908, when Geo. J. Green, the president, was appointed receiver, in a friendly action. A new concrete office building and cement storage tank for overflow of water from furnace were built in 1909, when the sampling mill was remodeled, giving automatic unloading and sampling.

PACIFIC COPPER MINING CO. **ARIZONA.**

Office: 405 Board of Trade, Kansas City, Mo. Eastern office: 504 Commonwealth Bldg., Pittsburg, Pa. Mine office: Harrington, Yavapai Co., Ariz. John Kelley, president; C. W. Mitchell, vice-president and general manager; W. J. Morse, secretary; W. A. Moses, treasurer; W. V. DeCamp, superintendent. Organized March, 1909, under laws of Arizona, with capitalization $3,000,000, shares $1 par; issued, $2,150,000. Cash on hand, Nov. 1, 1909, was $6,250. J. G. Armstrong, 504 Commercial Bldg., Pittsburg, Pa., fiscal agent; Union Trust Co., Pittsburg, Pa., transfer agent.

Lands, 30 claims, unpatented, area 600 acres, including a mill and smelter site, in the Silver Mountain district of Arizona, showing schist cut by a porphyry dyke of 50′ to 150′ width, with 3 contact deposits between schist and porphyry, of which 2, of 50′ to 200′ estimated width, with northeast and southwest strike, traceable 4,000′, are under development. Property shows a very extensive gossan of 100′ to 500′ width at surface, much leached and porous, carrying honeycombed hematite and limonite, with occasional copper carbonates. Mine has shafts of 20′, 60′, 50′, 75′ and 310′, with a number of tunnels of 25′ to 100′ length, showing a vein of 50′ estimated average width, giving ores assaying 5% copper, 1 to 5 oz. silver and $1 to $5 gold per ton. Ores are malachite and azurite, at and near surface, the sulphide zone, beginning at 50′ depth, showing chalcocite, bornite and chalcopyrite.

Equipment includes a 15-h. p. gasoline hoist, good for 500′ depth, and 8 mine buildings. Nearest railway is the Prescott & Eastern line of the Santa Fe system, distant 9 miles. Company plans deepening the main shaft and crosscutting therefrom, with drifting on the ore bodies, and also plans adding a 5-drill air-compressor and a larger hoist.

PACIFIC DEVELOPMENT CO. **OREGON.**

Office: Calumet, Mich. Mine office: Riddle, Douglas Co., Ore. W. R. Vivian, president; W. J. McCormack, secretary and treasurer; preceding officers, G. Martini, W. C. Miller, Cornelius Hanley and Jas. A. Sullivan, directors; Edw. McCormack, consulting engineer. Organized circa March, 1909, with capitalization $30,000, shares $1 par. Lands, 2 claims, area 40 acres, and a 45-acre millsite, said to be well timbered, on Drew Creek, 36 miles east of Riddle. Property shows a fissure vein of 16′ estimated width, giving ore assaying 4% copper and $2 to $2.50 gold per ton. Mine has 6 tunnels, No. 1 being 900′ long, with a total of 3,500′ of workings. Improvements include a number of buildings. Idle and apparently moribund.

PARKER GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Parker, Yuma Co., Ariz. Lands, 6 claims, about 4 miles east of Copper Basin, said to show veins of 6′ to 25′ width in limestone, granite and schist, carrying ores giving assay values in copper and gold.

PARRAL CONSOLIDATED MINES CO. **MEXICO.**

Office: Philadelphia, Pa. Mine office: Ap. 155, Hidalgo del Parral, Chihuahua, Mex. H. C. Gosch, president; D. H. Bradley, Jr., manager. Organized 1906, under laws of Maine, with capitalization $1,000,000, shares $1 par. Lands, 36 hectares, including La Prieta, Buena Fé and Boquilla mines, carrying mainly silver-lead ore, with gold and copper values, developed by a 420′ main shaft and

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a 220′ main tunnel, with about one-half mile of workings. Mine has rail connection and a 200-h. p. electric plant.

PENN MINING CO. **NEW MEXICO.**

Mine office: Lordsburg, Grant Co., N. M. Lands, 52 claims, area 1,145 acres, in the Virginia district, formerly held by Aberdeen Copper Co., which was a very badly managed concern, paying a dividend of $32,175 which came from sale of treasury stock, and not from earnings.

Property is said to show 10 fissure veins, of which 7, of about 5′ average width, are more or less developed, having 8 shallow shafts, deepest 400′, which it is planned to sink to 600′ and possibly 1,000′, mine having about 3,000′ of workings. Equipment includes steam power, air-compressor and a 50-ton concentrator.

PENN-WASH CONSOLIDATED MINES CO. **WASHINGTON.**

Mine office: Conconully, Okanogan Co., Wash. Wm. Baines, president; H. H. Nickell, vice-president; F. J. May, secretary and treasurer; David Gubser, general manager; Dr. Jacob May, fiscal agent. Organized as successor of Washington Consolidated Copper Co., and has absorbed several minor companies. Lands, circa 50 claims, in the Mineral Hill district, including the Mineral Hill group of 20 claims, originally held by Mineral Hill Mining Co. and later by Washington Tunnel & Copper Co. The Mineral Hill group has an 1,800′ tunnel, said to cut 3 veins carrying auriferous and argentiferous copper ores, mainly argentiferous tetrahedrite. The 400′ main tunnel is planned to be continued to 12,000′, to cut 8 known ledges. Mine also has several shallow shafts. Property has an available water power, rated as capable of developing circa 4,000 h. p., and has a steam plant, crusher, ore-bunkers and sawmill.

PEWABIC CONSOLIDATED GOLD MINES CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. John C. Fleschhutz, superintendent. Mine carries auriferous and argentiferous copper ore, with values mainly in the precious metals. Equipment includes a steam plant, air-compressor, 70-stamp mill and 150-ton concentrator.

PHELPS, DODGE & CO., INC. **ARIZONA & MEXICO.**

Office: 99 John St., New York, N. Y. Prof. Jas. Douglas, president; Geo Notman, secretary; preceding officers, Cleveland H. Dodge, Arthur C. James, Jas. McLean, Geo. B. Agnew, E. H. Ferry, Francis E. Hine, E. Hayward and Wm. C. Osborn, directors. Organized Dec. 14, 1908, under laws of New York, with capitalization $50,000,000, shares $100 par. Shares are listed on the New York Stock Exchange. Company was organized as successor to the firm of Phelps, Dodge & Co., composed of Cleveland H. Dodge, Arthur Curtis, A. C. James and Jas. McLean. The firm of Phelps, Dodge & Co. has a history of nearly a century, its founder, Wm. Earle Dodge, having been one of the great pioneer merchants of America, and a noted philanthropist. The company pays regular quarterly dividends of $2.50 per share, and earned, 1909, a safe margin above the dividends, with copper selling on an average of 13 cents per lb.

Company controls, through ownership of more than 99% of the various stock issues, the Copper Queen Consolidated Mining Co., Moctezuma Copper Co., Detroit Copper Mining Co. of Arizona, and Stag Cañon Fuel Co., latter capitalized at $6,100,000. Company apparently owns no interest in the Old Dominion or Indiana & Sonora, which are controlled by the members of the old firm. Company does not own the El Paso & Southwestern Railway system, which is controlled by the James family, owners of a very great majority of the stock of Phelps, Dodge & Co., Inc. The company is reported to have taken over stock in the various subsidiary companies on the basis of $135 for each $10 share of the Copper Queen, $307 for each $100 share of the Moctezuma, $150 for each $100 share of the Detroit Copper Co., and $100 for each $100 share of Stag Cañon Fuel Co., this arrangement calling for nearly $45,000,000

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in shares, leaving $5,000,000 unissued in the treasury. The new company also took over the metal selling business of the old firm. Balance sheet of the corporation, as of date Jan. 31, 1909, gave assets of $44,959,660. Statements of the subsidiary companies, as of date March, 1909, gave a total net surplus of $12,832,202.54. Production controlled by the corporation is 10,000,000 to 11,000,000 lbs. fine copper monthly, or upwards of 125,000,000 lbs. yearly, made at an average cost of little if any above 9 cents per lb. Management is excellent, and company's assets are among the soundest and most productive in the copper mining industry, while the corporation is undercapitalized rather than the reverse, a most unusual circumstance in Twentieth Century financial operations.

PIONEER MINE. **CALIFORNIA.**

Mine office: Auburn, El Dorado Co., Cal. Wm. Haaker, owner and manager. Lands, 80 acres, patented, carrying the extension of the Lilyama vein, with an ore body of circa 50′ width, showing slightly auriferous and argentiferous malachite and bornite, associated with pyrite, and occasional copper oxides and native copper. Development is by shafts of 90′ and 100′, and a 900′ tunnel.

PINTADA COPPER CO. **NEW MEXICO.**

Mine office: Pintada, Guadalupe Co., N. M. C. H. Taggart, superintendent. Lands are in Pintada Cañon, 8 miles from Pintada Station, and 18 miles northwest of Santa Rosa. Property carries a blanket vein of 4′ to 12′ thickness, said to be proven under 240 acres, and claimed to assay 4 to 12% copper, which probably is an overestimate.

PIOCHE & ARIZONA COPPER & GOLD MINING CO. **ARIZONA.**

Mine office: Bouse, Yuma Co., Ariz. Thos. A. Barden, manager. Is controlled, through stock ownership, by Scott Mines Co. Lands include properties at Pioche, Lincoln Co., Nev., and the Hearts Desire group, 2 miles south of the Little Butte mine, in the Plomosa district, circa 5 miles from Bouse, having a contact deposit between diorite and schist, developed by a 250′ two-compartment vertical shaft, a crosscut from which is said to show a large body of copper ore. Equipment includes a 60-h. p. gasoline hoist. Property has necessary mine buildings. It was planned, September, 1909, to begin ore shipments to the Sasco smelter.

PITTSBURG & TENNESSEE COPPER CO. **TENNESSEE.**

Dead. Property was the Polk County mine, now owned by Tennessee Copper Co. Formerly at Copper Hill, Polk Co., Tenn.

PLATA MEXICANA MINING CO. **MEXICO.**

Mine office: Nacozari, Moctezuma, Sonora, Mex. F. W. Pheby, manager. Lands, 6 hectares, having a 60′ tunnel, showing ore assaying 13% copper, with some silver, gold and lead values. Presumably idle.

PLATANOS DEVELOPMENT CO. **MEXICO.**

Office: 516 South Broadway, Los Angeles, Cal. Mine office: Choix, Fuerte, Sinaloa, Mex. Capitalization $300,000, shares $10 par. Property in Los Platanos mine, carrying ore claimed to average 8% copper, with substantial silver values. At last accounts company proposed shipping.

COMPAÑÍA EXPLORADORA DE LOS PLATANOS, S. A. **MEXICO.**

Office: 516 South Broadway, Los Angeles, Cal. Mine office: Choix, Fuerte, Sinaloa, Mex. Organized under laws of Mexico, with capitalization 10,000 pesos, shares 1 peso par. Is controlled through ownership of entire stock issue, by Platanos Development Co.

PLUTUS MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Jesse Knight, president; R. E. Allen, secretary and treasurer; David Evans, general manager; John Roundy, superintendent; John Strang, mine superintendent. Organized circa 1909, under laws of Utah, with capitalization $100,000, shares 10 cents

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par, and absorbed the Tetro company, circa March, 1909. Shares are listed on the Salt Lake stock exchange.

Lands, 14 patented claims, including the Tetro group, carrying auriferous and argentiferous lead and copper ores. Company began operations Feb. 1, 1909. Property has a 500′ shaft and circa 3,500′ of tunnels. In 1909 new work developed a 3′ vein of carbonate ore, averaging about 45% lead and 30 oz. silver per ton. Equipment includes a 75-h. p. electric motor, hoist and air-compressor, and improvements include an office, shops and necessary mine buildings. Production, 1903-1904, under former ownership, was 1,250 tons of ore, said to have netted $70,000. Management is good and property considered valuable.

PODEROSA MINING CO., LTD. **CHILE.**

Office: Dashwood House, New Broad St., London, E. C., Eng. Operating office: Antofagasta, Chile. Mine office: Collahuasi, Tarapacá, Chile. Employs circa 500 men. A. Bertrand, D. Burns, C. Furn, F. W. Hayne and J. R. King, directors; F. W. Bishop, secretary. There also is a Chilean board, with officers as follows: Juan G. Searle, president; Carlos A. L. Dick, secretary; Anglo-South American Bank, treasurer, preceding officers, Carlos Gregorio Avalos, Gustavo Jullian, Thompson Matthews and Carlos A. Gibbes, directors; Robert Hawxhurst, Jr., general manager; M. A. Wolff, superintendent; August Denks, mine superintendent; A. Y. Hardy, engineer.

Organized Nov. 27, 1908, under laws of Great Britain, with capitalization £500,000, shares £5 par, fully issued and fully paid. Corporation is merely a reconstruction of Compañía Minera Poderosa de Collahuasi, organized to bring the property under the laws of Great Britain, in order to make an English market for the shares. The new corporation paid the old company £480,000 in 96,000 full paid shares for its property. The old company showed a profit of £84,923 for 6 months ending June 30, 1908, and paid dividends of £60,000.

Lands, 37 contiguous claims, area 185 hectares, equal to 457 acres, carrying the strike of the ore formation for 4,500′. Lands inclue the Poderosa mine, which is the principal property, and the San Carlos, Rosario and Condor mines. Lands, located at an extreme elevation of 15,400′, on the Bolivian plateau, lie above the timber-line, and are barren of vegetation, with the exception of a fungus bearing the botanical name of fungi cordillerensi, which forms the local fuel of the district. There are no high hills in the vicinity, lands being on the top of an elevated plateau, surrounded, at a considerable distance, by high peaks of the Andes. There are no running streams, and potable water is scarce. The climate is extremely bleak, winter prevailing 12 months yearly, with snow or hail falling nearly every day in the year. Copper mines in the district were worked in the era of Spanish domination, and previously by the Indians, as shown by the ancient remains of furnaces, fragments of matte, scoria, and tools left in old workings.

The country-rock is feldspar-porphyry, stratified and fissile, there being a slight stratification, with dip of about 70 degrees to the westward, with an amygdaloidal diabase running northwest and southeast, dipping with the country rock to the weatward, ore bodies occurring in contact with and in the immediate vicinity of the intrusive dykes. There has been considerable disintegration, and overburden covers the rock formation so that few outcrops are given, these usually carrying low grade malachite and chrysocolla, or brochantite, the gangue being mainly felsitic rock, much decomposed. The Poderosa lode consists of several parallel bodies of partly or wholly decomposed country rock, with considerable faulting, having a general strike of N. 40 W., crossed, at practically right angles, by a secondary set of leaner veins, the master veins being fissures in a shear-zone. Characteristic ores of the Poderosa system are cuprite, melaconite, malachite, chalcocite, covellite, bornite, chalcopyrite,

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chrysocolla, brochantite, atacamite and tetrahedrite, the latter decidedly argentiferous, the ores, as a whole, averaging about 8 to 12 oz. silver per metric ton.

The Poderosa mine, which is the principal property, has a 433′ main shaft, with about 7,000′ of workings, carrying oxidized ores on the 400′ level. The mine has 2 veins, known as the Poderosa and Portillo, of 3′ to 30′ width, carrying paystreaks of high grade ore 1′ to 20′ wide, with average width of about 4′, the gangue being decomposed quartzose felsite, very soft, requiring heavy timbering, while, unfortunately, the old timbering remaining in place is extremely poor. The hanging-wall is well defined, but the ore shades gradually into the altered country-rock of the footwall, there being a fluccan, usually of 3″ to 12″, and even up to 4′ width, on the hanging, with an occasional gouge on the footwall. The main shaft is only 6x8′ inside of timbers, and should be cut down to larger size, and the shaft is in the hanging-wall, west of the lode, crossing the vein about the fourth level, with five levels opened, at only 22-meter intervals, the shaft cutting another vein about midway between the fifth and sixth levels, this vein, averaging circa 30″ width and dipping toward the main vein, carrying exceedingly high grade ore. The various levels are connected by winzes. There are indications that the ore will grow richer until the base zone is reached. The mine is quite wet, making about 90,000 gallons of water per day, in the wet season. Estimated ore reserves of the Poderosa mine alone, March, 1907, were 101,600 long tons, with an average tenor of 23.66% copper, and circa 10 oz. silver per long ton. These figures, while appearing very high, seem warranted. Equipment of the Poderosa mine is primitive, consisting only of a wooden head-frame, with a 10x15″ single Tangye hoist, raising half-ton buckets.

The Rosario mine, northwest of the Poderosa, has a 166′ incline shaft, on a 30″ vein dipping at about 80°, ore assaying about 15% copper, shaft being bottomed in the top of the base zone, which shows chalcopyrite, arsenopyrite and pyrite. The San Carlos mine, practically an extension of the Poderosa, and to be connected therewith, has a 146′ shaft, showing a 3′ vein carrying ore of about 19% average copper tenor. The Condor mine has a 147′ shaft showing a 2′ vein carrying ore giving average assays of about 18% copper. The Campanil mine, a new property, is being opened by shaft. Mine timber is Oregon fir and pine, costing, at Antofagasta, £9 per thousand feet, with 4d. per square foot transportation charges thence to the mine. During the period of development, supplies and ore were hauled 65 miles, over an extremely rough road, between Estación Carcote and the mine, one week being required for the round trip, but a branch of the Antofagasta & Bolivian railway has been built from Ollagüe to the mine.

Labor is supplied mainly by Bolivian Indians, from the neighboring republic, who work intermittently, putting in about half time, and are dull, drunken and lazy, but, bad as it is, the labor supply is short, though the completion of the railway should give improvement. The manager desires to import Chinese, which would seem a sensible plan.

The mine has 9x18″ and 6x20″ crushers, reducing ore to 2″ to 3″ size before shipment. Ore formerly was hand-picked to an average tenor of about 45% copper, for shipment, and ore shipped, to end of 1906, was 770,185 kilo grams, giving average returns of nearly 40% copper and 17.5 oz. silver per long ton. Production, 1908, is estimated at 8,000,000 lbs. fine copper.

This is a property of exceptional promise, and has been well handled by Mr. Hawxhurst, under exceedingly trying circumstances.

POINT LEWIS REDUCTION WORKS. **CALIFORNIA.**

Owned by Mountain Copper Co., Ltd., at Martinez, Contra Costa Co., Cal.

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POLIEFF-SYSSTERSKI WORKS. **RUSSIA.**

Mine and works office: Nijni-Tagilsk, Perm, Russia. Property is a smelter. Production, first 9 months of 1908, was 10,462 poods, equal to 377,804 lbs. fine copper, and production, 1908, is estimated at 500,000 lbs. fine copper.

POLKINGHORN MINING CO. **CALIFORNIA.**

Mine office: Ingot, Shasta Co., Cal. R. Polkinghorn, superintendent. Lands, 5 claims, in process of patenting, developed by shaft. Presumably idle.

PORSA KOBBERGRUBER. **NORWAY.**

Mine office: Porsa, Altenfjord, Finmarken, Tromsö, Norway. Ingolf Bjornstad, manager. Mine was under development with a small force at last accounts.

PRIMROSE COPPER SYNDICATE. **TRANSVAAL.**

Mine office: Pietersburg, Zoutpansberg, Transvaal. Property is mineral lands on the farm Wagendrift, on the Buffels road, about 50 miles from Pietersburg. A small shipment of ore, for test purposes, was made November, 1908.

PRINCE MINES DEVELOPMENT CO. **COLORADO.**

Mine office: Copperfield, Frémont Co., Colo. E. S. Halter, superintendent. Property carries copper ore, and is developing with steam power and a small force.

LIZANDRO A. PROAÑO. **PERÚ.**

Works office: Pacococha, Junín, Perú. Property includes La Victoria mine, near Backus & Johnston, at Morococha, the Chapichaca mine, and various claims in the Tamboraque district. Principal property is the Germania y Perú mine, in the Pacococha district, having a 3′ to 6′ vein, producing ore assaying 7 to 16% copper, and 10 to 20 oz. silver per short ton.

The smelter, known as La Fundición Tamboraque, 120 kilometer from Callao, at an elevation of 9,820′ above sea level, built 1906, has a 40-ton water-jacket blast-furnace. Production, 1907, was 1,055 metric tons of ore averaging 6% copper and 1,140 grams silver per metric ton, yielding 139,551 lbs. fine copper and 1,202 kgs. silver.

PROMONTORY MINING CO. **UTAH.**

Mine office: Promontory, Box Elder Co., Utah. Property, near Promontory Point, has an 88′ incline shaft showing an 8′ vein, with a 14″ paystreak carrying ore assaying 5 to 18% copper, 1 to 40 oz. silver and $9 gold per ton.

PROMONTORY SIGNAL MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Promontory, Box Elder Co., Utah. L. F. Lehn, president and treasurer; W. E. Buys, vice-president; Ed. A. Sparks, secretary; H. E. Buys, manager; preceding officers, G. L. Asher, H. C. Ralston and L. J. Risco, directors. Organized circa July, 1908, under laws of Utah, with capitalization $60,000, shares 10 cents par.

COMPAÑÍA MINERA LA PROTECTORA y ANEXAS. **MEXICO.**

Office: Gante 12, Mexico, D. F. Mine office: San Salvador, Mazapil, Zacatecas, Mex. Percy A. Babb, president and general manager; J. L. Miranda, secretary; D. B. Andrews, superintendent. Organized 1907, under laws of Mexico, with capitalization 100,000 pesos, fully paid in. Lands, 68 hectares, including La Protectora y Anexas and San Francisco mines, carrying argentiferous oxides and carbonates of copper, lead and zinc, occurring as replacements in limestone. Low grade ores average 2.5 to 5% copper, and high grade ores 12 to 19% copper. Mine has a depth of 100 meters, with about 1,500 meters of workings. Equipment includes a 15-h. p. hoist. Employed about 50 men at last accounts.

PROVIDENCE COPPER CO. **ARIZONA.**

Office: 18 Tremont St., Boston, Mass. Mine office: Paradise, Cochise Co., Ariz. J. A. Lewandowski, general manager; Samuel S. Supplee, superintendent. Organized 1908, under laws of Arizona, with capitalization $1,250,000. Lands,

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8 claims, including the Rabbitt group, near Dunn Springs, 16 miles southwest of Paradise. Property has about 500′ of workings, with several shallow shafts, of which Nos. 2 and 5 have been selected for permanent shafts. Shaft No. 5 is said to show a 30″ vein of ore, with calcite gangue, assaying 30% copper and carrying silver values. At last accounts management planned installing a steam hoist.

PROVO MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Control was secured, 1908, by Eureka Lily Mining Co., through stock ownership. Lands, 3 claims.

PURITAN GOLD & COPPER CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. In 1908 sold some surface rights to Utah Copper Co. for dumping rock from capping. Idle for some time.

Q. S. MINING CO. **WASHINGTON.**

Office: 408 Empire State Bldg., Spokane, Wash. Mine office: Conconully, Okanogan Co., Wash. Col. Adelbert M. Dewey, president and general manager; M. L. Bevis, vice-president; A. M. Polk, secretary; E. J. Hyde, treasurer; preceding officers, Milton N. Rogers, Herman Linke, M. D. Winder, E. H. Thatcher and H. W. Gibford, directors; L. K. Armstrong, consulting engineer.

Organized March 13, 1909, under laws of Washington, with capitalization $2,000,000, shares $1 par, as successor of Q. S. Gold Mining & Smelting Co., property of which was foreclosed March 4, 1908, on a mortgage, and bid in by trustees at mortgage sale, April, 1909, for the benefit of the new company. The old company is said to have expended circa $75,000. Stock of old company was retired on the basis of actual cost to holders, ranging from 5 cents to $1 per share, and the old stockholders were practically assesed a portion of their holdings in order to provide a treasury fund. The stock issued to old shareholders is pooled for 5 years, and the 250,000 shares of treasury stock is guaranteed by the Granite Securities Co., which promises to pay face value for the stock, in case the company does not pay in dividends, within 10 years, as much as the stock cost the purchaser.

Lands, 20 claims, along the crest and flank of Æneas Mountain, about midway between Conconully and Loomis, also 90 acres of millsites, and water rights on Sinlahekin Creek, in the Salmon River district. Property shows diorite, carrying 6 fissure veins having mainly low grade copper values, property carrying the strike of the veins for 6,000′. Development, begun 1897, is by 2 tunnels, the second, started 1907, at the base of the mountain, being planned to cut ore at about 2,000′ estimated depth. This tunnel, at a distance of 1,068′ from the portal, cut 233′ of ore without reaching the footwall, and it is planned to complete this tunnel by July, 1910. The ore shown by the tunnel is chalcopyrite, estimated to be of 2 to 4% copper tenor, with small and variable silver values and about $1 gold per ton. Col. Dewey writes that if the ore body is found at greater depth to be as wide as at the depth of 800′, where crosscut by No. 2 tunnel, and maintains its width for the length of the ore body stripped on surface for 6,000′ on the company's lands, then the ore body is larger than that of the Granby. Col. Dewey has been quoted as claiming 300,000,000 tons of ore above the lower level, which is an unwarrantable claim, though the vein is very wide and persistent, and there is no question that the ore deposit is of enormous size. As to the ore being of about double the average value of the Granby, as claimed by the management, this is a matter that will require demonstration from actual production.

Equipment includes a 200-h. p. hydro-electric plant, taking water from Sinlahekin Creek, and a new power plant is planned. Improvements include a sawmill and several substantial mine buildings. Survey has been made for the

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construction of the Okanogan County electric railway from Nighthawk to Brewster, Washington, crossing the Q. S. property, and it is hoped this line will be completed in 1910.

Notwithstanding the claims of the company as to tonnage and ore values, which are greater than are warranted by present developments, the property is one of much promise, and the management, despite its financial troubles in the past, is to be commended for its persistence, while the work done seems well planned and executed.

QUINBY MINING CO. **CALIFORNIA.**

Mine office: Quinby, Trinity Co., Cal. Lands, 6 claims, on Quinby Creek, carrying a vein of 4′ to 6′ width, opened by tunnels of 100′ and 120′, with about 1,000′ of workings, showing chalcopyrite, associated with pyrite in quartz gangue. Copper in the upper portion of the vein is oxidized, leached and redeposited as chalcanthite. Property has a small mill, treating ore for gold values.

QUINCY-THOMPSON CONSOLIDATED MINING CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. Organized circa July, 1909, with capitalization $1,250,000, shares $1 par, as a merger of West Quincy Mining Co. and Thompson Mining Co., and, of the capitalization, 400,000 shares were given the West Quincy, 330,000 shares were given the Thompson Mining Co., and 200,000 shares were given the Daly West, and Ontario companies for drainage and operation easements, leaving 370,000 shares in the treasury.

Property of the West Quincy Mining Co. was a ⅝ interest, with an option on the remaining interest, in the mine of the J. I. C. Mining Co. Lands of the J. I. C. are 5 claims, supposed to carry the extension of the Quincy ore body of the Daly West mine. Development is by a 625′ two-compartment vertical shaft, and a crosscut tunnel through the Little Bell mine, cutting a contact deposit carrying ore assaying up to 20% lead, 160 oz. silver and $2 gold per ton. It is expected that the main ore body will be cut at depth giving a back of 750′, and that the Daly West contact ore body should be cut at depth giving a back of 900′. Considerable trouble has been had from shifting ground and a heavy inflow of water. Property was probed, 1907, to depth of 1,300′, by diamond drills.

RARITAN REFINING WORKS. **NEW JERSEY.**

Owned by International Smelting & Refining Co., at Perth Amboy, Middlesex Co., N. J.

RAY CENTRAL COPPER MINING CO. **ARIZONA.**

Office: 42 Broadway, New York, N. Y. Mine office: Ray, Pinal Co., Ariz. Employs 138 men. Julius A. Lewisohn, president; Oscar A. Turner, first vice-president; Benj. A. Hazell, second vice-president; Julius H. Susmann, secretary and treasurer; preceding officers, Thos. P. Dyer, Meyer Schamberg, Wm. E. Sharpe, N. Bruce McKelvie and Alvin Untermeyer, directors; Ralph B. Williams, superintendent; J. Parke Channing, consulting engineer.

Organized Jan. 28, 1909, under laws of Delaware, with capitalization $6,000,000, shares $5 par; issued $4,000,000. Bonds, $2,000,00 authorized, at 6%, gold, convertible at par into shares at any time between March 1, 1911, and March 1, 1916. Company holds 200,000 shares unissued, in the treasury, against the convertible bonds authorized but unissued. Bankers Trust Co., New York, registrar. Shares are listed on the New York curb. Annual meeting, third Wednesday in January.

Company is controlled by the Lewisohn interests, through the General Development Co. Property was bought of the Kelvin-Calumet Copper Mining Co., 1 share of Ray Central being given for 5 shares of Kelvin-Calumet, and, according to the contract of sale with the Kelvin-Calumet, the Ray Central has to expend not less than $310,000 on development work during 1909, and $1,600,000 subsequently. Company was said, April, 1909, to have expended, in

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cash and shares, $3,714,000 for lands and options, and was said, September, 1909, to have $246,000 cash in its treasury.

Lands, circa 380 acres, including the Big Lead group, taken over from the Kelvin-Calumet in March, 1909, and 3 claims adjoining, the Original group bought circa July, 1909, and the Carrie Nation, Wedge and Juarez-Adventure group bought August, 1909. Property as a whole had 5,900′ of workings Nov. 15, 1909.

The Globe-Isabella group of 30 acres is entirely surrounded by the holdings of the Ray Consolidated, and the company hopes to develop thereon 10,000,000 to 12,000,000 tons of low grade disseminated sulphide ore, of about the same average grade as the Ray Consolidated, of which its ore body is a continuation. The Globe-Isabella tract, developed by the 300′ Globe shaft, has carbonates at surface, and at depth carries chalcocite disseminated in schist. Estimated ore in sight June, 1909, on the Globe-Isabella tract, was 5,620,000 tons, of about 3% average copper tenor. Developments on the Globe-Isabella tract include two shafts, about 400′ apart, of which one, of 300′ depth, known as the Madelaine, shipped, under former ownership, some high grade ore and native copper, with oxidized ores claimed to average circa 3.5% copper, carrying small gold and silver values.

The Calumet group, area circa 100 acres, has a 150′ shaft, showing medium grade carbonate ores. Geological conditions at the Calumet group are much similar to those at the Globe-Isabella, though no ore bodies have been developed as yet in the schist, considerable work having been done on a contact deposit between schist and greenstone, from which shipments of about 8,000 tons of smelting ore have been made in the past.

The Copper Contact group, area about 40 acres, also has a shallow shaft.

The power plant at the Madelaine shaft includes two-130-h. p. boilers, a steam hoist and a 12-drill air-compressor.

The Big Lead property has an old 4-stamp mill, now idle, also a 60-ton concentrator, including a 35-ton McIntosh leaching plant, latter designed to utilize a secret process to secure instantaneous results, which apparently were not forthcoming. Mill is terraced, all material being handled by gravity, but it is doubtful whether operations will be carried on along the same lines by the new management, which is not given to secret processes, being satisfied to make copper at a profit by the ordinary means of mining and reduction.

Production, 1907, of the Big Lead mine, was 178,516 lbs. fine copper. Management is good and property considered decidedly promising.

RAYMOND-ILLINOIS MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. J. C. Sullivan, general manager; preceding officer, Hon. Thomas Kearns, John Lynch, Frank J. Hagenbarth and R. Wheeler, directors. Mine has a 1,500′ vertical shaft, with about 2 miles of workings, which, as yet, have shown but little ore. At last accounts management planned diamond drilling to test the ground 1,000′ below bottom of present workings.

RAY NORTHERN COPPER CO. **ARIZONA.**

Office: Phoenix, Ariz. Mine office: Ray, Gila Co., Ariz. W. B. Twitchell, president; Dr. Walter Harvey Weed, consulting engineer. Organized circa June, 1909, with capitalization $1,000,000. Lands, 14 claims, known as the Mayflower group, 2 miles north of Ray, said to have about a mile of workings, showing some ore of fair grade. Sinking of a new main working shaft was begun September, 1909.

RED MOUNTAIN COPPER-GOLD MINING CO. **CALIFORNIA.**

Office and mine: Cisco, Nevada Co., Cal. J. A. Wilcox, manager. Lands, 640 acres, unpatented, 3½ miles from Cisco, showing auriferous and argentiferous copper ore between schist and slate walls, reported as averaging, in carload

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lots, 4.5% copper, 1 oz. silver and $15.50 gold per ton. Mine has but slight development, and presumably is idle.

RED RAVEN MINING CO. **B. C.**

Mine office: Jedway, Queen Charlotte Island, B. C. Property, on Moresby Island of the Queen Charlotte group, is in the vicinity of Awaya, Ikeda & Co. Presumably idle.

RED ROVER COPPER MINING CO. **ARIZONA.**

Office and mine: Phoenix, Maricopa Co., Ariz. Organized circa July, 1909, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 12 claims, known as the Red Rover group, 15 miles north of Camp Creek and 50 miles north of Phoenix, the nearest railroad point. Mine has a 200′ tunnel and a 200′ incline shaft, with about one-half mile of workings, showing a 10′ ore body between limestone and porphyry, carrying a 3′ paystreak estimated to average 10% copper, 6 to 60 oz. silver and $20 gold per ton. The Red Rover mine, discovered 1882, has shipped, from shallow workings, about $200,000 worth of high grade ore, running about 15 to 25% copper, with values mainly in silver chlorides, one carload of 20 tons netting $41,000, with no allowance made for copper contents.

RESTAURADORA MINING & MILLING CO. **MEXICO.**

Mine office: Hunutla, Juárez, Morelos, Mex. Chas. L. North, general manager. Mine carries auriferous and argentiferous copper and lead ores. Equipment includes a steam plant and 20-ton mill.

SOCIEDAD MINERA LA RICA MINA (BAJO RIO TINTO). **SPAIN.**

Office: 7 Calle Churruca, San Sebastian, Spain. Mine office: Berrocal, Huelva, Spain. Prince J. Piguatelli de Aragon, P. Duthie de la Tuque, A. Barthes, F. Fernandez and E. Wisse, directors. Organized Jan. 1, 1907, under laws of Spain, with capitalization 1,250,000 pesetas, 5 pesetas par. Lands include La Rica mine.

RICHARDS-CLIFTON MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Ibapah, Tooele Co., Utah. Henry P. Richards, president; Richard W. Young, vice-president; Harold E. Young, secretary and treasurer. Organized September, 1909, under laws of Utah, with capitalization $50,000, shares $1 par. Property is in the Clifton district.

RICHFIELD CONSOLIDATED MINING CO. **UTAH.**

Office and mine: Bingham Canyon, Salt Lake Co., Utah. Organized circa August, 1907, under laws of Utah, with capitalization $100,000 shares, 10 cents par. Thos. H. Quillen, president; Francis W. Quinn, secretary and treasurer; preceding officers, E. C. Ashton and Ray Van Cott, directors. Lands, 4 claims, in the West Mountain district.

RIO TINTO TREADWELL MINING CO. **WASHINGTON.**

Mine office: Curlew, Ferry Co., Wash. G. B. Dennis, president; J. L. Martin, manager. Lands, 7 claims, 24 miles from Phoenix, B. C., showing 4 parallel veins, with north and south strike, claimed to range 50′ to 100′ in width. Ore is chalcopyrite, associated with galena, both argentiferous and auriferous, giving assays up to $18.50 per ton, in combined values of copper, lead, silver and gold. Mine has several shallow shafts and an 85′ tunnel, latter planned to be driven to 400′.

RIO YAQUI CO. **MEXICO.**

Office: Bisbee, Ariz. Mine office: San Antonio de la Huerta, Ures, Sonora, Mex. Fritz L. Harrington, president; Geo. Buxton, vice-president; A. L. Greeler, secretary; Jos. E. Morrison, treasurer. Organized circa 1909. Lands, 1,185 acres, adjacent to San Antonio Copper Co., including the San Antonio Segundo group, showing some traces of antigua workings.

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ROB ROY MINING CO. **IDAHO.**

Office: Wallace, Idaho. Mine office: Burke, Shoshone Co., Idaho. Hugh Toole, president; Otto A. Olsson, secretary. Capitalization $1,500,000, shares $1 par. Lands, 5 claims, on Sunset Peak, north of Burke, showing a vein in porphyry carrying azurite, malachite and galena, with quartzite gangue, developed by a 180′ tunnel.

ROGERS SPRINGS SMELTING CO. **ARIZONA.**

Office: Indianapolis, Ind. Works office: Cavé Creek, Maricopa Co., Ariz. Mount Campbell, fiscal agent. Is closely connected, in ownership and management, with Rogers Springs Mining Co. Company plans building a 100-ton smelter, which was to have been in operation June 1, 1909, but failed to materialize, the actual work of clearing a site having been started April, 1909, in which month the company was said to have bought a 30-ton furnace. The management plans using petroleum for fuel, converting crude oil into gas, and burning latter, which is expected to give such intense heat that matting and conversion will be done in a single operation, giving finished copper as a product, which seems entirely too much to expect.

ROOSEVELT MINING & MILLING CO. **CALIFORNIA.**

Office: Pasadena, Cal. Mine office: Stagg, San Bernardino Co., Cal. L. E. Porter, general manager; S. B. Porter, superintendent. Lands show ores of gold and copper. Equipment includes a gasoline engine, air-compressor and a 25-stamp mill.

ROSE MINING & MILLING CO. **COLORADO.**

Mine office: Red Mountain, Ouray Co., Colo. Property is the old Congress mine, showing an ore body that was said, early 1909, to give ore returning average assays of 19% copper and $10 gold per ton, with small silver values.

ROUGH RIDER MINING & MILLING CO. **MONTANA.**

Office: P. O. Box 714, Spokane, Wash. Mine office: De Borgia, Missoula Co., Mont. A. L. Thurston, president; A. E. Wayland, secretary. Capitalization $1,500,000, shares $1 par. Lands, 4 claims, 6½ miles from a railroad, carrying an ore body without defined walls, opened by a 60′ shaft, showing ore giving assay values in lead, copper, silver and gold.

ROY MINING & MILLING CO. **UTAH.**

Office: Provo, Utah. Mine office: Ibapah, Tooele Co., Utah. Franklin N. Willett, president; John H. Stratton, vice-president; Don C. Clayton, secretary and treasurer; preceding officers, Paul A. Willett and Walter Cox, directors. Organized circa June, 1909, under laws of Utah, with capitalization $55,000, shares 5 cents par. Property is in the Clifton district.

COMPAÑÍA MINERA RUBÍ. **MÉXICO.**

Office: Centro Mercantil, Tercer Piso 25, Mexico, D. F. Mine office: Matehuala, Catorce, San Luis Potosí, Mex. Julio Limantour, president; Manuel Lomeli, secretary; T. A. Verger, general manager. Organized July 24, 1907, under laws of México, with capitalization 250,000 pesos, shares 50 pesos par; paid in, 2 pesos 50 centavos per share. Lands, 84 hectares, including the Rubí, Bonanza, Todos Santos and Anexas de Todos Santos groups, opened by two 75-metre shafts, with about 200 metres of workings, showing ore carrying gold, silver, copper and lead. Equipment includes gasoline hoists. Property is served by a railway at the shafts, and ore is shipped to the Aguascalientes smelter, 6 kilometres distant.

SAGAMORE MINING CO. **CALIFORNIA.**

Office: Philadelphia, Pa. Mine office: Manvel, San Bernardino Co., Cal. S. M. Connelly, superintendent. Lands, 8 claims, known as the New York mine, carrying 4 veins in phonolite, of which No. 3 vein is 4′ to 12′ wide, with occasional rich paystreaks. No. 1 vein has a 50′ shaft and a 200′ tunnel; No. 2 vein carries silver chloride; No. 3 vein has a 100′ shaft and tunnels of 600′ and

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700', showing mainly sulphides, with some copper oxides, associated with lead, zinc, and antimony, all slightly auriferous.

AKTIESELSKABET SAINT KNUT'S GRUBER. **NORWAY.**

Mine office: Lille-Elvedalen, Trondhjem, Norway. A. M. Baastad, agent. Organized under laws of Norway, with capitalization 100,000 kroner. At last accounts was doing exploratory work for copper, with a small force.

SAINT MARY MINING CO. **UTAH.**

Office: Palladio Bldg., Duluth, Minn. Mine office: Milford, Beaver Co., Utah. Patrick Ryan, president and treasurer; L. B. Bohn, vice-president; P. D. Rohlfing, secretary; preceding officers, Jas. Barrett and Isidore Lessing, directors; W. J. Merritt, superintendent. Lands, 3 claims, 2 patented, area 30 acres, on the eastern flank of Picacho Mountain, 4 miles from Milford, in the Star district. Mine has an 85' two-compartment shaft and a 375' tunnel. A carload shipment of ore gave smelter returns of 17.07% copper, 2.5% zinc, 10.5 oz. silver and $2.20 gold per ton. Equipment includes a 36-h. p. gasoline hoist.

ST. NEOT MINING SYNDICATE, LTD. **ENGLAND.**

Office: 6 Queen Street Place, London, E. C., Eng. Mine office: Liskeard, Cornwall, Eng. W. F. Garland, secretary; John Taylor & Sons, managers. Organized July 4, 1907, under laws of Great Britain, with capitalization £5,000, shares £1 par; issued, £4,907, of which 1,000 shares are fully paid and 3,907 are 12s. paid in. Property is an option over copper and tin mining rights, in the parish of St. Neot, near Liskeard, consideration for which was £1,000 in full paid shares.

ZEFERINO SALAZAR. **MEXICO.**

Mine office: Matehuala, Catoree, San Luis Potosí, Mex. Lands, 9 groups, area 60 hectares, including La Valenciana mine at Hacienda de Vánegas, near Matehuala, developed to depth of about 60 meters, carrying argentiferous copper carbonates, from which a small production has been secured. Also owns La Independencia mine, near Concepción del Oro, Zacatecas, Mexico, area 38 hectares.

SALTDALEN OG STREMEN'S GRUBERSELSKAB. **NORWAY.**

Office: Gransvits, Norway. Mine office: Kaafjord, Tromsö, Norway. Property is sundry copper claims, under development at last accounts, in 1907.

SALTILLO MINING & MILLING CO. **MEXICO.**

Mine office: El Salado, Catorce, San Luis Potosí, Mex. Merle M. Stewart, general manager. Property is El Saltillito mine, carrying auriferous and argentiferous copper ores, with values mainly in the precious metals. Equipment includes steam and electric plants and a 3-stamp mill. Employs circa 100 men.

SALUDA COPPER MINING CO. **SOUTH CAROLINA.**

Office: Lynchburg, Va. Mine office: Donalds, Abbeville Co., S. C. Frank P. Harman, president; J. P. Smith, vice-president; John F. McGee, secretary, treasurer and general manager; preceding officers, P. K. McCully, Sr., J. M. McConnell, Thos. Atten and G. W. Ould, directors. Organized under laws of South Carolina, with capitalization $50,000. Lands, about a mile from Donalds, were prospected, to some extent, by individuals, before organization of present company. Development is by temporary shafts, showing sulphide copper ore carrying small quantities of gold. It is claimed that the average of 10 assays was 40% copper, which seems doubtful, unless samples were selected with great care. Company plans shipping ore to Ducktown, Tennessee, and building a smelter later.

COMPAÑÍA MINERA SAN BERNABE y ANEXAS. **MÉXICO.**

Office and mine: Zacatecas, Zacatecas, Mex. C. A. Bentley, manager. Lands, 25 hectares, including La Confianza, El Faro and La Fama mines, west of the Malanoche mine. Lands include the oldest mine in Zacatecas, discovered circa A. D. 1546, which was a considerable producer of silver in olden

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days. Property formerly was under option to an English company, but option was dropped after unwatering the old shaft. Ore is highly argentiferous copper, associated with some lead, values being mainly in silver. Was shipping, April, 1909, some copper and lead ore.

MINA SAN BRUNO. **SPAIN.**

Mine office: Paimogo, Huelva, Spain. Lands adjoin the Sociedad Anonima Minas Peñuelas Paimogo. Mine, supposedly bottomed, is not a producer, but ore outcrops apparently might be followed. Idle.

SAN CARLOS MINING CO. **MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: Ures, Sonora, Mex. Jos. H. Everett, president; F. Willard Carlisle, secretary and treasurer; Geo. D. Stonestreet, engineer. Capitalization $500,000, shares $1 par. Company planned, August, 1909, to reorganize under proposed title of Sonora United Mines. Lands, 169 acres, including various groups. San Carlos No. 1, area 10 acres, and San Carlos No. 2, adjoining, area 50 acres, are 9 miles south of Matape and 45 miles northeast of the terminal of the Torres y Prieta railroad, connecting with the Southern Pacific. The San Carlos group shows good outcrops, and has several veins carrying rich ore. La Paloma group, area 25 acres, 8 miles from Matape, has a 50′ shaft, showing ore assaying 13% copper. A 15-ton mill was installed, April, 1908, on San Carlos No. 1.

SAN JUAN MINES CO. **MEXICO.**

Office: 317 Equitable Bldg., Denver, Colo. Mine office: San Javier, Hermosillo, Sonora, Mex. J. F. Williams, superintendent. Ores carry gold, silver and copper values. Was developing with a small force at last accounts.

COMPAÑÍA MINERA DE SAN LUIS POTOSÍ. **MEXICO.**

Mine office: Mapimí, Durango, Mex. Property is the Siderita y Anexas mines, carrying copper ore. Was a small producer at last accounts.

SAN LUIS POTOSÍ SMELTER. **MEXICO.**

Owned by Compañía Metalurgica Mexicana, at San Luis Potosí, S. L. P., Mex.

SAN MARCOS MINING CO. **MEXICO.**

Office: Calle Espiritu Santo 5, Mexico, D. F. Mine office: Etzatlán, Ahualulco, Jalisco, Mex. F. W. Green, president; T. J. Pomeroy, secretary and treasurer; Riley R. Morrison, general manager; E. B. Elliott, superintendent. Lands, 100 acres, on Tepehuaje Mountain, in vicinity of Etzatlán, showing veins carrying copper, which have been slightly developed.

SAN MARINO MINING & MILLING CO. **WASHINGTON.**

Mine office: Nespelem, Okanogan Co., Wash. Capitalization $50,000. Lands, 4 claims, area 64 acres, in process of patenting. Property shows a north and south vein and 3 cross veins. Development is by a 180′ tunnel, with back of 150′, intersecting a 12′ vein carrying mainly gold and silver values; by an opencut 25′ deep showing ore assaying well in gold and silver, and by shafts of 28′ and 40′, latter showing ore assaying 2 to 3% copper and $2.60 per ton in combined gold and silver values.

SAN MARTÍN MINING CO. **MEXICO.**

Office: : Paseo Bolivar 407, Chihuahua, Chih., Mex. Mine office: Uruáchic, Rayón, Chihuahua, Mex. John J. Clague and John J. Waterson, managers. Lands, 68 hectares, having 4 shafts and a 1,600′ tunnel, developing ore carrying copper, lead, zinc, silver and gold. Equipment includes a 50-h. p. Pelton wheel, and a concentrator with two 4′ Bryan mills, 2 Bartlett tables and 3 Wilfley tables. There also is a small smelter with 25-ton reverberatory furnace. Employed about 50 men at last accounts.

SAN ROBERTO MINING CO. **MEXICO.**

Office and mine: Zacatecas, Zacatecas, Mex. C. A. Bentley, general man-

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ager. Property, slightly developed, shows auriferous and argentiferous copper and lead ores, and small smelter shipments have been made.

SAN SALVADOR MINING CO. **MEXICO.**

Mine office: Terrazas, Iturbide, Chihuahua, Mex. Alberto Terrazas, president; Felix MacDonald, general manager. Property is San Salvador mine, opened by 2 shafts, showing lead and copper ores. Has a gasoline hoist.

SAN TIMOTEO MINING & SMELTING CO. **MEXICO.**

Mine office: Uruáchic, Rayón, Chihuahua, Mex. T. A. Ripperdan, superintendent. Mine carries auriferous and slightly argentiferous copper ore, said to average about 50 pesos per ton in gross values. A smelter, built 1909, has a 25-ton reverberatory matting furnace.

SANTA ANA MINING CO. **MEXICO.**

Office: Paseo Bolivar 284, Chihuahua, Mex. Mine office: Jiménez, Chihuahua, Mex. Alberto Goldschmidt, president and general manager. Property, 25 kilometers from Jiménez, has a 150′ shaft developing auriferous copper ore. Presumably idle.

COMPAÑÍA MINERA SANTA ELENA DEL COBRE y ANEXAS, S. A. **MEXICO.**

Mine office: Sultepec, Mexico, Mex. Organized Aug. 24, 1907, under laws of Mexico, with capitalization 66,000 pesos. Property includes La Santa Elena, El Protectorio, La Salvadora and La Esmeralda mines.

SANTA FÉ CONSOLIDATED MINING CO. **MEXICO.**

Office: Bisbee, Ariz. Mine office: La Cananea, Arizpe, Sonora, Mex. P. J. Tehaney, president; B. A. Packard, vice-president; C. I. McReynolds, secretary; R. L. O'Neil, treasurer; preceding officers and C. W. McHenry, directors. Organized April, 1909, under laws of Arizona, with capitalization $500,000, shares $2.50 par. Lands, 238 hectares. Property was worked, 1886, by Col. Wm. C. Greene.

SANTA LUCIA SYNDICATE, LTD. **CHILE.**

Office: 4 Copthall Chambers, London, E. C., Eng. Mine office: Los Anjeles, La Ligua, Aconcagua, Chile. H. K. Paxton, director; F. E. Hodges, secretary. Organized Dec. 24, 1906, under laws of Great Britain, with capitalization £15,000, shares £1 par; issued, £5,570, fully paid. Property was an option on copper mining claims on the Canaveral Estate, near Los Anjeles, which option is said to have been surrendered.

COMPAÑÍA MINERA SANTA RITA. **MEXICO.**

Office: Chihuahua, Chih., Mex. Mine office: Santa Barbara, Hidalgo, Chihuahua, Mex. Alberto Terrazas, president; Miguel Horcasitas, manager. Property is the Santa Rita mine, in the Chorreros Mountains, showing ore carrying values mainly in copper.

COMPAÑÍA MINERA SANTA ROSA. **MEXICO.**

Mine office: Mazapil, Zacatecas, Mex. Lands, showing copper ore, were under development at last accounts.

COMPAÑÍA MINERA BENEFICIADORA DE SANTA TERESA, S. A. **MEXICO.**

Office: Mexico, D. F. Mine office: Coyuca de Catalán, Mina, Guerrero, Mex. Organized Apr. 30, 1897, under laws of Mexico, with capitalization 300,000 pesos. Property is the Santa Teresa mine, in the Mina district, carrying argentiferous copper ores.

SOCIEDAD MINERA SANTO DOMINGO HUACHUAMACHAY. **PERÚ.**

Mine office: Morrococha, Junín, Perú. Mine has a vein of 60 to 70 centimeters width, traceable circa 400 meters, with irregular mineralization, carrying argentiferous copper ores, developed by 4 tunnels, at distances of 40 to 50 meters vertically. Product is exported to Liverpool for reduction.

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SANTO DOMINGO MINING CO. **MEXICO.**

Office: San Antonio, Tex. Mine office: Velardeña, Cuencamé, Durango, Mex. C. W. Comstock, general manager. Property carries copper and lead ores, and employs about 40 men.

SCHELL CREEK RANGE ORE DEVELOPMENT CO. **NEVADA.**

Office: 406-35 Congress St., Boston, Mass. Mine office: McGill, White Pine Co., Nev. Frederick R. Tibbitts, president; Paul O. Welles, vice-president; Harold N. Willis, secretary and treasurer; preceding officers, Chas. Sumner Smith and Henry H. Melville, directors; E. L. Fletcher, general manager; Wm. Balch, mine superintendent; Edwin E. Chase, consulting engineer. Organized Sept. 11, 1908, under laws of Arizona, with capitalization $2,000,000, shares $1 par; issued, $627,212. International Trust Co., Boston, registrar. Annual meeting, second Thursday in September.

Lands, 31 claims, area 620 acres, known as the Muncy mine, 24 miles east of McGill. Property shows porphyry and old sedimentary beds, mainly limestone and quartzite. The Schell Creek Mountain Road Telegraph & Telephone Co., capitalized at $20,000, under Nevada laws, has completed a toll-road from the mines of the Scrod company, at Muncy, to the Steptoe reduction works at McGill. road having a maximum grade of 8%, and it is planned to ship ore to the Steptoe smelter over this road by a 5-ton auto truck.

SCHULER & VOGEL. **MEXICO.**

Mine office: Las Minas, Jalacingo, Vera Cruz, Mex. Firm is a copartnership, by A. Schuler and G. Vogel. Property is the Elisa mine, carrying auriferous and argentiferous copper ore.

SCOTT MINES CO. **ARIZONA, NEVADA & UTAH.**

Office: 322 Judge Bldg., Salt Lake City, Utah. Mine offices: Bouse, Yuma Co., Ariz., and Pioche, Lincoln Co., Nev. A. W. Scott, president; preceding officer, Emile Maertens, René Van Bouggenoudt, T. A. Snider, Fred Richmond, J. L. Scott and John Burton, directors. Organized under laws of Nevada, with capitalization $5,000,000, shares $1 par. Controls, through stock ownership, the Pioche & Arizona Copper & Gold Mining Co., having claims at Bouse and Pioche. Also controls the Rawhide Northern Consolidated Mines Co., at Rawhide, Nevada, Wild Bill Mining & Milling Co., in Beaver County, Utah, and Tiewaukee Leasing Co., of Bingham Canyon, Utah.

SCRANTON EXTENSION MINING CO. **UTAH.**

Office: Lehigh, Pa. Mine office: Eureka, Juab Co., Utah. Geo. Beck, president; L. P. Johnson, vice-president; Jas. M. Kirkham, secretary and treasurer. Organized December, 1908, under laws of Arizona, with capitalization $100,000, shares 10 cents par. Cannot be learned that any work has been done.

SEATTLE CONTACT CO. **NEVADA.**

Office: Seattle, Wash. Mine office: Contact, Elko Co., Nev. V. A. Marshall, president. Lands, 16 claims, developed by a 100′ shaft and 300′ tunnel, with several 75′ exploratory tunnels. A 3′ vein of ore cut in the main tunnel, 30′ from the portal, gave assays of 25% copper, 0.5 oz. silver and $5 gold per ton. There also is a parallel vein, of 16′ estimated width, said to average 5% copper.

SEATTLE COPPER & ASBESTOS CO. **WASHINGTON.**

Office: 531 Peoples' Bank Bldg., Seattle, Wash. Mine office: Leavenworth, Chelan Co., Wash. Organized under laws of Washington, with capitalization $2,000,000, shares $1 par. Lands include copper, lead, gold and asbestos claims, and 2 water powers at the base of Mount Stewart. The copper group, 6 claims, 3 miles from Aurora Mining Co., is claimed to have a copper ledge of about 15′ width, between granite and schist, traceable 6,000′, yielding ore assaying well in copper, silver and gold, opened by a 50′ tunnel, showing ore assaying

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up to 29.1% copper. Company apparently is devoting its attention mainly to exploitation of its asbestos claims.

SECTION TWELVE EXPLORATION CO. **MICHIGAN.**

Office: Hancock, Mich. Mine office: Houghton, Houghton Co., Mich. M. C. Getchell, agent; Jas. P. Edwards, engineer. Capitalization $20,000, shares $2 par, convertible into shares at subscription price in case of the organization of a mining company to succeed the exploration pool, which is not incorporated. Lands, 440 acres, held under option, adjoining the Isle Royale on the southeast, including the Lynch farm, lands being in Section 12, T. 54 N., R. 34 W. and Sections 6 and 7, T. 54 N., R. 33 W. Company is boring with diamond drill for the northern extension of the Baltic lode, and secured, November, 1909, a copper-bearing drill core, but experienced much delay from caving ground. Property considered promising.

SECURITY GOLD & COPPER CO. **WYOMING.**

Mine office: Atlantic City, Frémont Co., Wyo. Lands, west of Atlantic City, show a vein of 20′ estimated width, carrying ore said to give good gold assays.

SECURITY MINING & DEVELOPMENT CO. **MONTANA.**

Mine office: Princeton, Granite Co., Mont. Lands, 5 claims, near the Brooklyn group, showing a porphyry dyke of 130′ estimated width, in limestone, with entire dyke claimed to carry average values of 15 oz. silver, with fair lead and copper values. Mine, opened to depth of 175′, shipped 15 carloads of ore during development, having average assays of 2.98% copper, 7.5% lead, 50.7 oz. silver and 40 cents gold per ton.

SEGURANZA MINING CO., S. A. **MEXICO.**

Office: Apartado 295, San Luis Potosí, Mex. Mine office: Zacualpam, Sultepec, Mexico, Mex. G. Waddill, president; preceding officer, F. C. Doty, C. C. Brueggerhoff, E. Lavin and Pedro Barcena y Trueba, directors; A. Kraemer, commissario. Organized 1907, under laws of Mexico, with capitalization 300,000 pesos, shares 10 pesos par. Lands, 25 hectares, an antigua mine, said to have been worked in the Sixteenth Century, near Zacualpam, adjoining the Carboncillo mine, carrying 7 defined veins, opened by about 1,500 meters of tunnels, the Bobo tunnel exploiting a vein of about 35′ width, said to carry 1 to 3 kgs. silver and 4 to 10 grams gold per ton. Company also owns copper claims, carrying auriferous and argentiferous copper ore, in the state of Michoacán, which apparently are idle. Company was said, 1908, to have ordered a 120-ton mill.

SENATOR GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Breckenridge, Summit Co., Colo. M. M. Howe, manager. Property carries auriferous and argentiferous copper ores, with values mainly in the precious metals. Equipment includes a small steam plant.

SHAMROCK MINE. **CALIFORNIA.**

Office: P. O. Box 117, Placerville, Cal. Mine office: Greenwood, El Dorado Co., Cal. Lle. H. Wilkins, owner and manager. Lands, 28 claims, area 560 acres, in Section 26, and 12 claims, area 150 acres, patented, in Section 24, T. 13 N., R. 9 E. Property, well watered and timbered, is 3 miles from Greenwood, in the Foothill copper belt, and is about equally distant from Auburn and Placerville. The tract carries about 4,500′ of the strike of a copper ore body having a hemitite footwall and porphyry hanging-wall. Several prospect shafts show the continuity of the ore body, which is sulphide, estimated to average about 6% copper, with fair to good gold and silver values. Developments include the 80′ Lipton tunnel, showing an ore body of 2′ to 4′ width, giving assays up to 4% copper, 12 oz. silver and $10 gold per ton, and the 180′ Dundee tunnel, in ore, breasted in a vein of about 4′ width carrying a 2′ paystreak showing good values in copper, gold and silver. The floor of the Dundee tun-

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nel gives ore assaying 4% copper, 12 oz. silver and $10 gold per ton, with some ore assaying up to 8% copper, 12 oz. silver and $20 gold per ton.

SHASTA COUNTY EXPLORATION CO. **CALIFORNIA.**

Office and mine: Redding, Shasta Co., Cal. M. E. Dittmar, manager. Lands, 760 acres, adjoining the Balaklala mine, near Kennett, apparently held under bond from the Onn Copper Mining Co., having 8 tunnels, of about 3,000′ aggregate length. Report of the company states that 3 small stringers of copper ore were cut, 1909, in tunnel No. 7. Diamond drill boring was planned at last accounts.

SHOOFLY MINE. **CALIFORNIA.**

Mine office: Quincy, Plumas Co., Cal. G. H. Goodhue, owner and manager. Lands, 21 claims, on the north bank of Indian Creek, showing a cupriferous quartz schist, with nearly vertical dip, having clay-slates to the west and porphyry to the east. The schist is estimated to average about 80′ width, carrying mainly bornite, with some azurite and malachite near surface, ore occurring in minute sheets and lenses between the much contorted laminations of the schists. Property has numerous trenches and an 80′ crosscut tunnel. Development work was in progress at last accounts.

SHOSHONE MINING & MILLING CO. **IDAHO.**

Office and mine: Wallace, Shoshone Co., Idaho. P. F. McGovern, president; Jos. F. Whelan, secretary; Boyd Hamilton, treasurer; J. J. McMullan, superintendent. Lands, 6 claims, on Nine Mile Creek, near Wallace, having a 160′ shaft with a 400′ drift. Operations suspended, November, 1908.

SHYLOCK MINE. **ARIZONA.**

Owned by Central Arizona Copper Co., at Dewey, Yavapai Co., Ariz.

SIBERIAN PROPRIETARY MINES, LTD. **SIBERIA.**

Office: 20 Copthall Ave., London, E. C., Eng. Mine office: Pavlodar, Semipalitinsk, Siberia. J. C. Williamson, chairman; preceding officer, Prince Khikoff, J. D. Cohn and Heyman Irkin, directors; Wm. Goldie, secretary; Hooper & Speak, consulting engineers. Organized Aug. 8, 1905, under laws of Great Britain, with capitalization £135,000, shares £1 par; issued, £116,000, fully paid, including £65,000 to vendors. Lands originally were 16,000 acres of gold claims, east of the Suvunduk river, near Kotchkar, in the government of Orenburg, Russia, which options were abandoned. Property, acquired 1909, is an option and lease on several copper mining properties in the Pavlodar district, some of which have been sold.

SIERRA MADRE MINING & DEVELOPMENT CO. **MEXICO.**

Office: 500 North Sixth St., St. Louis, Mo. Mine office: Choix, Fuerte, Sinaloa, Mex. W. C. Harlan, president; J. S. Harlan, secretary; A. W. Warwick, consulting engineer. Property, showing high grade argentiferous copper ore, was under development at last accounts.

SILVERHORN MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Minersville, Beaver Co., Utah. Claud W. Freed, president; R. G. Wilson, vice-president; H. Barnett, secretary and treasurer; preceding officers, Hugh Roberts and B. Taber, directors. Organized May, 1909, under laws of Utah, with capitalization $60,000, shares 10 cents par. Property is in the North Star district.

SILVER ROCK MINING CO. **IDAHO.**

Office and mine: Wallace, Shoshone Co., Idaho. Geo. F. Stoney, director. Lands, 9 claims, between the Argentine and Rainbow, on the southern side of the Oregon Railway & Navigation line, between Wallace and Osburn, showing a heavy iron outcrop carrying gray copper ore.

SILVER SEAL MINING CO. **MEXICO.**

Mine office: Pilares de Teras, Moctezuma, Sonora, Mex. John A. Judah, superintendent. Work was begun, early 1909, by present company, which has

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secured ore assaying up to 15% copper and 400 oz. silver per metric ton. Up to August, 1909, company shipped, by pack trains, 15 miles to Nacozari, about $25,000 worth of ore, said to have given smelter returns of $75 to $90 per metric ton. Property considered promising.

SILVER SPUR PROPRIETARY, N. L. **AUSTRALIA.**

Mine office: Silver Spur, Stanthorpe Co., Queensland, Australia. Property lies immediately south of the Silver Spur mine. Presumably idle.

SIMS MOUNTAIN COPPER CO. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Edward Ball, manager. Was developing with a small force at last accounts.

AKTIESELSKABET SKANDIA KOBBERGRUBER. **NORWAY.**

Mine office: Narvik, Tromsö, Norway. Property includes copper claims at Tysfjord, Salten and Nordreisen, Tromsö, and pyrite claims at Ofoten.

SKINCUTTLE MINING CO. **BRITISH COLUMBIA.**

Mine office: Jedway, Queen Charlotte Island, B. C. Property is on Moresby Island. Presumably idle.

SKOOKUM COPPER CO. **WASHINGTON.**

Mine office: Cle Elum, Kittitas Co., Wash. Property was under development with a considerable force, and management planned a 250-ton concentrator at last accounts.

SOL LUNA MINING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Rufus C. Bonney, general manager. Lands are the Sun and Moon group, formerly owned by the Sun & Moon Mining & Milling Co. The mines carry auriferous and argentiferous copper and lead ores. Equipment includes steam and electric plants, a Leyner air-compressor and a 50-ton cyanide plant.

SONORA CONSOLIDATED MINES CO. **MEXICO.**

Office and mine: Hermosillo, Sonora, Mex. Max Müller, president; Herman Wendler, general manager; Hon. Victorano Aguilar, secretary. Organized 1909, with capitalization $2,000,000. Lands include about 20 different groups, adjacent to the new line of the Southern Pacific, showing ores containing gold, silver, copper and mercury.

SOUTHERN NEVADA COPPER CO. **NEVADA.**

Office: Blackfoot, Idaho. Mine office: Gold Butte, Lincoln Co., Nev. Hardy Bennetts, president; John W. Jones, secretary and treasurer; Orange W. Earle, manager. Capitalization $750,000, shares $1 par. Lands, 6 claims, showing a big iron blowout carrying copper carbonates and sulphides, said to exist in payable quantities. Development is by a 185′ tunnel.

SOUTHERN OREGON CO. **CALIFORNIA.**

Mine office: Hutton, Siskiyou Co., Cal. Horace Monroe, manager. Development is by tunnels, longest, of circa 400′, showing a main vein of 7′ to 10′ estimated width, carrying sulphide ore said to assay 4 to 5% copper, 5 oz. silver and $2.80 gold per ton.

SOUTHERN SULPHUR ORE CO. **ALABAMA.**

Office: Atlanta, Ga. Mine office: Pyriton, Clay Co., Ala. W. T. Williams, superintendent. Property is a mine producing cupriferous and slightly auriferous and argentiferous iron pyrites. Equipment includes a steam plant. Mine employs about 50 men.

SOUTH LAKE MINING CO. **MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. Mine office: Greenland, Ontonagon Co., Mich. John C. Watson, president; F. W. Morandi, secretary and treasurer. Organized 1863, under laws of Michigan, with capitalization $1,000,000, shares $25 par, as the Aztec Copper Co., and title changed, Aug. 9, 1909, to South Lake Mining Co., at which time capitalization was increased to $2,500,000, shares $25 par. Outstanding shares of old company were $4.60 paid in. Of the 60,000 new

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shares, 20,000 were issued at $2 each, in August, 1909, to shareholders of record, in proportion to their holdings, thus raising $40,000 for operations.

Lands, 320 acres, being the W. ½ of Section 31, T. 51 N., R. 57 W., also 1,214 acres of agricultural and timber lands, in Sections 10, 12 and 14, T. 50 N., R. 38 W. Work was begun on the property in 1862, and the mine had a stamp-mill in early days, producing 756,863 lbs. fine copper, of which 100 tons were secured in a single mass. Exploratory work was done, 1905-1906, on the Knowlton lode of this property by the Aztec-Algomah Development Co. Diamond drill borings were begun September, 1909, starting work at the base of Evergreen Bluff, near the footwall of the Evergreen belt, thence working southward toward the Eastern sandstone. Property, though small, is considered to have good prospects of locating the Lake amygdaloid.

SOUTH MOUNTAIN COPPER MINING CO. **MARYLAND.**

Mine office: Smithsburg, Washington Co., Md. Warren H. Gotwold, manager. Organized 1907, under laws of Delaware, with capitalization $1,000,000, shares $1 par. Lands, 80 acres, 3 miles southeast of Smithsburg, on the flank of South Mountain. Property, under development by tunnel, is said to carry native copper, and has secured good copper assays, with fair gold and silver values, and the precious metals are said to exist in sufficient quantities to give copper without cost, which possibly may not prove the case, inasmuch as it is not the case in any other copper mine.

SOUTHWEST CONSOLIDATED MINING & MILLING CO. **UTAH.**

Office and mine: Farmington, Davis Co., Utah. J. D. Wood, president; J. H. Robinson, vice-president; J. H. Wilcox, secretary and treasurer; preceding officers, David Hess and W. Crawford Anderson, directors; W. J. Huselton, general manager. Capitalization $30,000, shares 10 cents par. Property has a contact deposit, with quartzite hanging and gneiss footwall, developed by a 345' tunnel, showing a 40" vein carrying ore said to average 1.5% copper, 3% lead, 2.5 oz. silver and $2 gold per ton.

SOUTHWESTERN DEVELOPMENT CO. **MEXICO.**

Office: 22 Congress Square, Boston, Mass. Mine office: Moctezuma, Sonora, Mex. Capitalization $500,000, shares $1 par. Federal Trust Co., Boston, registrar. Lands are 9 claims in the Marius Mountain district of Riverside County, California, said to carry "stratas" of high grade ore, mainly copper, with some silver and gold, also 200 acres, known as the Casa Vieja group of 4 properties, in the district of Hermosillo, Sonora, Mexico, said to carry numerous fissure veins. Company also was said to have had an option on the Promontorio mine of the Travers-Durkee Coppers, but apparently same was not exercised. Property was boomed systematically by M. C. Barnard & Co., of unsavory fame, from 10 cents to $1.06 per share, whence it slumped back promptly to 20 cents, the market sponsers going broke. Is not regarded favorably.

SPANISH PROSPECTING CO., LTD. **SPAIN.**

Office: 151 Cannon St., London, E. C., Eng. J. B. White, chairman; preceding officer, Wm. C. Punchard and Stephen Vivian, directors; Walter E. Hopper, secretary. Organized May 14, 1901, under laws of Great Britain, with capitalization £20,000, shares £1 par; issued, £10,817, of which 6,017 shares are fully paid and 4,800 are 13s. 6d. paid in. Property is 1,152 shares in Zalamea Copper Co., Ltd., and £3,840 debentures of Esperanza Copper & Sulphur Co., Ltd.

SPECIE PAYMENT GOLD MINING CO. **COLORADO.**

Office: 752 Equitable Bldg., Denver, Colo. Mine office: Idaho Springs, Clear Creek Co., Colo. A. M. Welles, general manager; A. E. Simpson, superintendent. Mine carries auriferous and argentiferous copper ores, with values mainly in gold. Equipment includes an electric plant, air-compressor and a 20 stamp mill.

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SPENCER MOUNTAIN TUNNEL CO. **COLORADO.**

Mine office: Eldora, Boulder Co., Colo. J. A. Gilfillan, superintendent. Mine, developed by tunnel, carries auriferous and argentiferous copper ores. Equipment includes a steam plant and air-compressor.

SPRING CREEK MINE. **AUSTRALIA.**

Mine office: Melrose, South Australia. Lands, 11 claims, on the bank of Spring Creek, north of Melrose, on the northern flank of Mount Remarkable. Property has country rocks of clay-slate and sandstone, giving a strong surface showing of copper ores, including cuprite, azurite and malachite and occasional native copper. Ore is bunchy, being mainly cuprite, malachite and tetrahedrite, associated with iron, and a general sample of ore from the workings gave 4.9 to 8% copper. Development is by a 140′ shaft and a tunnel. The property is said to have yielded considerable ore in early days, and a smelter was built nearby, on the Melrose road. Production, 1907, was 70 long tons of ore returning 5 to 15% copper.

SQUARE DEAL MINING & MILLING CO. **ARIZONA.**

Office: Marquette, Mich. Mine office: Cave Creek, Maricopa Co., Ariz. Company was organized, 1907, by A. Manthei, Frank E. Withey and Geo. E. French. Lands, 15 claims, 5 miles from Rogers Springs. Presumably idle.

STANDARD CONSOLIDATED MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Cedar City, Iron Co., Utah. J. W. Williamson, president; F. B. Clark, vice-president; Geo. Schultz, secretary and treasurer; preceding officers, J. R. Richards and Monroe Clark, directors. Organized circa October, 1909, under laws of Utah, with capitalization $250,000, shares 25 cents par. Lands, well timbered, near Sand Springs, above the heads of Bullion and Chloride cañons, in the Antelope range, carry a vein claimed to average 194′ between walls, also claimed to give surface ores averaging 3 to 8% copper, 8 to 33% lead and $1 to $9 gold per ton, but the company's claims are considered excessive.

SUCCESS MINING CO. **COLORADO.**

Mine office: Alma, Park Co., Colo. E. O. Moynihan, superintendent. Property carries auriferous copper ore, and has a small steam plant.

SUFFIELD & KING MINES. **QUEBEC.**

Owned by A. O. Norton, at Suffield, Sherbrooke Co., Que.

SUMMIT GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Rockcut, Ferry Co., Wash. N. T. Johnson, president and general manager; Stephen Tanner, secretary and treasurer. Lands are 2 groups, known as the Railroad and Summit claims. The Summit group, 7 claims, has a 110′ tunnel crosscutting a vein of 25′ estimated average width, and also has a 7′ vein, said to carry $10 gold per ton. The Railroad group, between Rockcut and Laurier, shows a vein of 25′ estimated width, showing 4½ to 5′ of chalcopyrite of smelting ore, and about 20′ of ore of concentrating grade, opened by a 147′ incline shaft.

SUNNYSIDE COPPER MINING CO. **AUSTRALIA.**

Mine office: Marodian, Queensland, Australia. Mine has shafts of 60′ and 90′ and an opencut, and in 1907 shipped 12 long tons of ore giving average smelter returns of £17 7s. 6d. per ton, of which 2 tons returned 14% copper. Idle at last accounts.

SUNSET MINING & DEVELOPMENT CO. **WASHINGTON.**

Mine office: Northport, Stevens Co., Wash. H. W. Working, superintendent. Lands carry auriferous and argentiferous copper ores, under development with steam power and a small force at last accounts.

SUPERIOR COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Property carries 3 veins, of which 1, of 14′ width, is opened by a 600′ crosscut tunnel, showing auriferous

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and argentiferous copper ore and galena. Was developing with a small force at last accounts.

SUPERIOR & GLOBE MINING CO. **ARIZONA.**

Office: 3 Calumet State Bank, Calumet, Mich. Mine office: Globe, Gila Co., Ariz. Employs 30 men. John Daniell, president; Frederick G. Coggin, vice-president; Fred Smith, second vice-president; Chas. Chynoweth, secretary; Joseph W. Selden, treasurer; Henry V. Snell, superintendent; Peter J. Wagener, foreman. Organized December, 1908, under laws of Arizona, with capitalization $3,000,000, shares $10 par; issued, $2,450,000, in 15,000 shares of full paid stock and 230,000 shares of stock $1 paid. Property is fully paid for, lands having been bought for $75,000 cash and 15,000 shares of full paid stock, and company began business with about $125,000 cash, statement as of date Sept. 23, 1909, showing $76,389.86 cash on hand. First National Bank, Calumet, registrar. Annual meeting, third Monday in November. The promoters took 30,000 shares of $1 paid stock for their services.

Lands, 13 claims, area 250 acres, including the Magnet group of 12 claims, adjoining the Mineral Farm group of the Globe Mining Co., also a fractional claim, of several acres area, carrying the outcrop, added circa March, 1909. The property, 2 miles northeast of Globe, is in the eastern portion of the Globe district, lying north of the Arizona & Michigan and northeast of and adjoining the Globe Mining Co. and the Yuma mine of the Old Dominion, latter carrying the Yuma-Big Johnnie-O'Dougherty fault. The outcrop of the Yuma fault, on the Superior & Globe lands, shows an iron gossan carrying copper stains, for circa 3,000'.

The property has several old shafts, of 50' to 60' depth, said to have been worked for gold in the past, but present management begun development by a 3-compartment shaft, sunk vertically in the hanging of the Yuma fault. This shaft, started circa March, 1909, on the Copper Trust No. 2 claim, is about three-quarters of a mile from the terminus of the Arizona Commercial railway, with an easy grade available for extension of the line. The shaft is framed with 10x10" timbers, and was 552' deep at the end of October, 1909. In sinking, the shaft cut a 5' vein carrying iron and copper stains. Original plans called for crosscutting at depth of 500', but plans were changed, and shaft will be sunk to the permanent water-level before beginning crosscuts.

Equipment includes a 25-h. p. hoist, good for 700', and a 5-drill gasoline air-compressor. There are 5 buildings, including a smithy, carpenter-shop, engine-house, office and dwelling.

SYNDICATE MINING & EXPLORATION CO. **IDAHO.**

Office: Wardner, Idaho. Mine office: Kellogg, Shoshone Co., Idaho. Jos. Shields, president; F. M. Barker, secretary. Capitalization $1,500,000, shares $1 par. Lands, 6 claims, showing, at surface, a 15' fissure vein in slate, opened by a 325' tunnel, developing ore giving good assays in silver, lead and copper.

COMPAÑÍA MINERA DE COBRES EN TAMAULIPAS, S. A. **MEXICO.**

Mine office: San Carlos, Centro, Tamaulipas, Mex. Organized Feb. 25, 1893, under laws of Mexico, with capitalization 50,000 pesos. Presumably idle.

TANTAMOUNT MINING CO. **UTAH.**

Office and mine: Park City, Summit Co., Utah. Jas. B. Allen, president; C. A. Springer, vice-president; H. S. Townsend, secretary; E. W. Berry, treasurer; preceding officers and J. W. Sutherland, directors. Organized 1908, under laws of Utah. Lands, 5 claims, surveyed for patent, developed by tunnel, showing a 30' vein assaying 1.5% copper.

TARAWERA GOLD MINING & SMELTING CO. **NEW ZEALAND.**

Mine office: Otago, Otago Co., N. Z. C. E. Storie, consulting engineer. Capitalization £25,000, and company is said to have started business with £10,000 working capital. Lands carry several ore bodies, said to average about

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4% copper, with combined gold and silver values in excess of the copper. Company plans utilizing an available water power, and at last accounts planned building a smelter, to do a custom business, in addition to treating the company's own ores.

TECOMA CONSOLIDATED MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Lucin, Box Elder Co., Utah. Wilford F. Giles, president; Thos. W. Walsh, vice-president; Chas. M. Roberts, secretary and treasurer; preceding officers, John T. Roberts and B. M. Roberts, directors. Organized circa October, 1909, under laws of Utah, with capitalization $50,000, shares 5 cents par.

TECOPA MINE. **CALIFORNIA.**

Office: care of Graves Bros., owners, Philadelphia, Pa. Mine office: Tecopa, Inyo Co., Cal. Jas. Lester, manager. Lands, 4 miles west of Tecopa, formerly constituted part of the holdings of the Greenwater & Death Valley Copper Co., but were segregated. Owners are said to plan building a spur to the mine from the Tonopah & Tidewater railway, 5 miles east, and also to plan a small smelter.

TEDDY MINING & MILLING CO., LTD. **IDAHO.**

Office and mine: Kellogg, Shoshone Co., Idaho. J. B. Cox, secretary; John Pelkes, superintendent. Capitalization $1,000,000, shares $1 par. Lands, 5 claims and a millsite, 1 mile east of Kellogg. Property shows a vein of 4′ to 10′ width at surface, carrying lead and copper ores, with quartz gangue. Mine has crosscut tunnels of 100′ and 200′, latter planned to be driven to 700′ length, in order to cut a ledge with a back of 400′. Improvements include several small mine buildings.

COMPAÑÍA EXPLORADORA DE TEJAMÉN. **MEXICO.**

Mine office: Tejamén, Durango, Mex. Ulysses Matthey, general manager. Property, carrying auriferous and argentiferous copper ores, was under development with a small force at last accounts.

TENABO MINING & SMELTING CO. **NEVADA.**

Mine office: Tenabo, Lander Co., Nev. Organized January, 1909. This company planned taking over the property of the Gem Consolidated Mining Co., but shareholders of latter brought suit and asked for a receiver for the Gem Consolidated.

TENNESSEE-SONORA COPPER CO. **MEXICO.**

Office: Chattanooga, Tenn. Operating office: Douglas, Ariz. Mine office: Fronteras, Arizpe, Sonora, Mex. Lands are 10 miles southeast of Douglas. Company planned beginning development work circa September, 1909.

MINA EL TESORA. **MEXICO.**

Mine office: Calmallí, Norte, Baja California, Mex. Emilano Ybarra, owner and manager. Property carries ores of gold, silver and copper, and is equipped with a steam plant and 10-stamp mill, employing about 25 men.

TEZOPACO COPPER CO. **MEXICO.**

Mine office: Rosario de Tesopaco, Alamos, Sonora, Mex. W. W. Harper, superintendent. Lands are between Rosario de Tesopaco and Movas. Ore produced is shipped to Hermosillo.

THOMPSON FALLS COPPER & MILLING CO. **MONTANA.**

Mine office: Thompson, Sanders Co., Mont. S. A. Hurlbut, manager. Property, known as the Copper Queen mine, which has shipped some rich ore in the past, is said to have been bought of Fred M. Steele, circa 1909, for $100,000.

THOMPSON MINING CO. **UTAH.**

Dead. Was merged, circa July, 1909, in Quincy-Thompson Consolidated Mining Co. Formerly at Park City, Summit Co., Utah.

THOR MINING CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. W. I. Snyder, president.

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Organized circa September, 1909, under laws of Utah, with capitalization $100,000. Lands, 22 claims, in the Bonanza Flat section, at the head of Big Cottonwood Cañon. Company plans sinking a shaft and driving 2 tunnels.

THREE M. MINING CO. **WYOMING.**

Mine office: Shoshoni, Frémont Co., Wyo. Louis Herbst, superintendent. Property shows copper ore, under development with a small force at last accounts.

TIEWAUKEE LEASING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Geo. Bellinger, superintendent. Is controlled, through stock ownership, by Scott Mines Co. Property is a lease on the Tiewaukee mine, an old silver-lead property of low grade, from which some ore was shipped, 1909, by the lessees.

TIGER GOLD CO. **ARIZONA.**

Office: 184 La Salle St., Chicago, Ills. Mine office: Harrington, Yavapai Co., Ariz. Andrew G. Sherer, manager; Stanton W. Forsman, superintendent. Property is the Grey Eagle and Oro Bella mines, carrying auriferous and argentiferous copper ore, developed by 8 tunnels and a 400′ shaft. Has steam and water power, with a 60-ton concentrator and 20-stamp mill, employing circa 35 men. Production, 1907, was 19,010 lbs. fine copper, 9,937 oz. silver and 4,313 oz. gold.

TINTIC COPPER KING MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Idle.

TINTIC DELMAR MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. Andrew Madsen, president; Harry Cluff, secretary and treasurer. Organized March, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Lands, 15 claims. Presumably idle.

TINTIC HUMBOLDT MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Thos. J. Pierpont, president. Capitalization $100,000. Shares are listed on the Salt Lake stock exchange. Lands, 10 claims, unpatented, in the North Tintic district, 3 miles from a railroad, having a 75′ tunnel and an 85′ shaft.

TINTIC MAYFLOWER MINING CO. **UTAH**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. S. E. Bunnell, president; H. F. Thomas, vice-president; J. C. Anderson, secretary and treasurer; preceding officers, Hyrum Madsen and Rufus Babcock, directors. Organized August, 1909, under laws of Utah, with capitalization $50,000, shares 5 cents par. Property is in the northern part of the Tintic district.

TINTIC MAYFLOWER MINING CO. **UTAH.**

Office: Provo, Utah. Mine office: Eureka, Juab Co., Utah. W. D. Rawson, president; Andrew Madsen, vice-president; Alfred F. Booth, secretary; Le Roy Rixon, treasurer. Organized July, 1909, under laws of Utah, with capitalization $100,000, shares 10 cents par. Property is in the northern part of the Tintic district.

TISCH CREEK MINING CO. **OREGON.**

Mine office: Nugget, Douglas Co., Ore. Property is a gold-copper mine, with values mainly in gold, equipped with a small steam plant, 5-stamp mill and a small cyanide plant, employing about 15 men.

TOGO MINING & SMELTING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Chewelah, Stevens Co., Wash. M. Ibister, president; G. W. Brash, secretary and manager. Capitalization $1,000,000, shares $1 par. Lands, 7 claims and 160 acres of miscellaneous lands, in the Cedar Cañon district, developed by opencuts and tunnels to depth of 600′, showing chalcopyrite giving average assays of about 4% copper. Buildings include a smithy and cabins.

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TOMOBUCHI MINE. **JAPAN.**

Mine office: Wakagama-mura, Naka-gori, Japan. Production, 1907, was 101,191 lbs. fine copper.

TOP HAND MINING CO. **WYOMING.**

Mine office: Hazelton, Johnson Co., Wyo. Thos. G. Smith, superintendent. Property shows auriferous copper ore. Equipment includes a small steam plant. Was developing at last accounts.

TOWN TOPICS GOLD MINING CO. **COLORADO.**

Office: 215 McPhee Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. S. A. Josephi, manager; T. G. Martin, superintendent. Property carries auriferous and argentiferous copper ore, with values mainly in gold. Equipment includes a steam plant.

TRAVERSE CITY MINING CO. **WYOMING.**

Office: Traverse City, Mich. Mine office: Encampment, Carbon Co., Wyo. Wm. DeKay, manager; A. H. Oldman, superintendent. Lands, 2 claims, adjoining the Great Lakes Mining Co., on the eastern slope of Green Mountain.

TREASURE MINING CO. **NEW MEXICO.**

Mine office: Orogrande, Otero Co., N. M. Wilton H. Bartlett, president; M. Nachtweih, vice-president; S. Howard Leech, secretary and treasurer; A. F. Schneider, general manager; preceding officers and P. A. Holm, directors. Organized April, 1909, under laws of Arizona, with capitalization $600,000, shares $1 par. Lands, 4 claims, known as El Paso group, next west of the Monte Carlo mine. Property has 2 fissure veins, crossing near the 70′ main shaft, which is said to show 5′ of ore assaying up to 21% copper and 200 oz. silver per ton. Management was said, April, 1909, to have let a 2-year contract for development.

TRES SEÑORES MINING CO. **MEXICO.**

Mine office: San Pedro Ocampo, Mazapil, Zacatecas, Mex. Property includes La Providencia and La Poderosa mines, near San Pedro Ocampo, yielding ores that have given smelter returns of 10% copper, 3,234 grams silver and 120 grams gold per metric ton.

TRIANGLE MINING CO. **MEXICO.**

Office: 1251 Michigan Ave., Chicago, Ills. Mine office: Pesqueira, Ures, Sonora, Mex. Hiram Baldwin, president; Winthrop Burdick, secretary; W. J. Burdick, superintendent. Organized under laws of Arizona, with capitalization $250,000, shares 50 cents par. Has a $25,000 bond issue, in denominations of $100 per bond, which the company was endeavoring, March, 1909, to sell at par, giving 400 shares of capital stock as a bonus with each bond. Lands, 10 hectares, about 25 miles east of Pesqueira, including the Rey Eduardo mine, said to be an antigua, and the Elena mine having an 80′ shaft and a 30′ drift said to show ore giving assays of 30 to 40% copper. Company claims to have 3 proven properties, which seems doubtful, and advertised, March, 1909, that within 3 months it could be shipping 5 cars of selected ore daily, averaging values of $200 per ton, which seems something more than dubious. The company also advertised that it should be able to pay 4% monthly dividends, but dividends apparently have failed to materialize. Is not regarded favorably.

TRIANGLE MINING & DEVELOPMENT CO. **MONTANA.**

Mine office: Clinton, Missoula Co., Mont. Robt. B. Hughes, president and general manager. Company bonded its property, circa January, 1909, to the Montana-Clinton Copper Co., but latter forfeited the bond, October, 1909, and property reverted to the Triangle company, after a payment of $15,000 cash and some stock in the Montana-Clinton. Lands, 11 claims, unpatented, well watered and timbered, including the Triangle group of 6 claims and the Grass Widow group of 5 claims, in the Wallace district, about 2 miles northeast of Clinton and 19 miles south of Missoula. Company also owns several blocks in

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the townsite of East Clinton, and a water right on Rock Creek, and holds a perpetual lease on the upper workings of the Hidden Treasure mine, about one-half mile from the Triangle, at a royalty of 30% of the gross assay value of the ore, which seems a high percentage.

Development is confined to the Triangle and Grass Widow claims, none of the others having any material showing of ore, or serious attempts at development. The Triangle claim has a 450′ tunnel with a 400′ back, showing a vein in tight granite, consisting of a few small seams, the footwall and hanging-wall being unusually well defined, carrying a vein of 6″ to 4′ width, the granite being slightly altered for an inch or two alongside each seam. There is no gouge on the walls, and no evidence of movement, and the zone of oxidation is shallow, sulphides being found even in the oxidized portions of the vein, which carries no indications of secondary enrichment, although small masses and particles of bornite, and occasionally of chalcopyrite, are found associated with clean, fresh chalcopyrite, and as stringers in bunches of specular hematite. Ore is essentially chalcopyrite, with mineral occurring in stringers and bunches irregularly throughout the veins, but usually on or near the walls. It is difficult to secure correct hand samples, values being irregularly distributed, but a sample taken from the ore-bin assayed 6.8% copper, 2 oz. silver and 80 cents gold per ton. The same vein, opened circa 400′ south of the Triangle, by a 40′ tunnel, is about 2′ wide. The Grass Widow, though having a small amount of development work, has a better showing than the Triangle. Equipment includes a 40-h. p. boiler and an Ingersoll-Rand air-compressor. Buildings include a small smithy and a log ore-bin.

COMPAÑÍA MINERA DE LA TRINIDAD. **MEXICO.**

Mine office: Ayutla, Autlán, Jalisco, Mex. Property, El Patrocino mine, carries auriferous copper ore, and is said to have been a considerable producer.

COMPAÑÍA MINERA LA TRINIDAD DE CHARCAS. **MEXICO.**

Office: Espalda de Santa Veracruz, 12, Mexico, D. F. Mine office: Charcas, Moctezuma, San Luis Potosí, Mex. Sr. Lic. José Luis Requeña, president. Organized under laws of Mexico, with capitalization 300,000 pesos, shares 100 pesos par, increased by a later issue of 100,000 pesos, shares 50 pesos par, 10 pesos paid in. Property is the San Augustin mine, carrying silicious ores of copper, with values mainly in gold and silver, developed by a 105-meter shaft.

TRIXEY COPPER MINING CO. **ARIZONA.**

Mine office: Phoenix, Maricopa Co., Ariz. L. J. Horton, general manager. Organized 1909, with capitalization $500,000. Property, 30 miles southwest of Phoenix, has a 50′ shaft, and shows values mainly in gold, near surface, followed by increased quantities of copper, lead and silver at slight depth.

TROJAN MINING CO. **CALIFORNIA.**

Mine office: Ballarat, Inyo Co., Cal. Lands, 5 claims, in the Argus range, about 15 miles from Ballarat, showing indications of copper.

TROUT CREEK MINING CO. **UTAH.**

Mine office: Trout Creek, Juab Co., Utah. H. J. Meyer, general manager. Lands, many miles from a railroad, carry complex sulphides containing copper, zinc, bismuth, silver and gold. Is under development, with a small force.

TSUBAKI MINE. **JAPAN.**

Mine office: Nishitate-mura, Kita-Akita-gori, Ugo, Japan. Kyosaku Takeda, owner and manager. Equipment includes steam installations aggregating 1,453 h. p. Employed, 1907, an average of 1,422 persons. Production, 1907, was 192,845 lbs. fine copper and 448,802 oz. fine silver.

TURKEY CREEK MINING & DEVELOPMENT CO. **ARIZONA.**

Dead. Officers were H. J. Freede, president; L. D. McCartney, vice-president; M. J. Donahoe, secretary and treasurer; R. D. Hall, superintendent. Was organized March 2, 1909, under laws of Arizona, with capitalization $1,000,000,

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shares $2 par, and was merged, 1909, in the Bernoudy-Turkey Creek Co. Former office was at Douglas, Ariz. Formerly at Paradise, Cochise Co., Ariz.

TWIN CITY MINING & MILLING CO. **MONTANA.**

Mine office: Elliston, Powell Co., Mont. Samuel Moore, superintendent. Property carries auriferous and argentiferous copper ores, and has a small steam plant. Was developing with a small force at last accounts.

TYEE SWANE COPPER MINE, LTD. **BRITISH COLUMBIA.**

Mine office: Duncans, Vancouver Island, B. C. Company did considerable diamond drilling, 1909, at North Vancouver, and is said to have located a good body of chalcopyrite thereby.

UNCLE JOE MINING CO. **UTAH.**

Mine office: Goshen, Utah Co., Utah. J. H. Weber, general manager. Lands, 180 acres, near Goshen, which company planned, September, 1909, testing by churn drill. Previous developments have shown streaks of high grade copper ore.

UNEEDA MINING CO. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Samuel Seelig, president; T. L. Cross, vice-president; C. W. Cross, secretary; preceding officers, J. F. Mayer, Eugene Barrows, G. W. Leonard, Wade Stowell and C. W. Cross, directors. Organized April, 1909, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands are 18 claims, on the Troy road, 6 miles southwest of Globe, having a 40′ shaft and a 35′ tunnel showing sulphide ore assaying 7.63% copper, 1 oz. silver and $1.40 gold per ton.

UNEKURA MINE. **JAPAN.**

Mine office: Iwate, Rikuzen, Japan. Jiro Sato, owner. Employs circa 125 hands. Production, 1907, was 145,979 lbs. fine copper.

COMPAÑÍA MINERA LA UNIÓN. **MEXICO.**

Mine office: Jimulco, Viesca, Coahuila, Mex. Employs circa 10 men. Property includes El Esfuerzo, Ampliacion de Providencia and other groups, producing mixed ores carrying mainly copper values.

COMPAÑÍA MINERA LA UNIÓN. **MEXICO.**

Office: Guanajuato, Gto., Mex. Mine office: Silao, Guanajuato, Mex. M. Sañudo, president; F. Arellano, secretary; Roberto Fernandez, consulting engineer. Organized under laws of Mexico, with capitalization 60,000 pesos, shares 20 pesos par. Lands, 24 hectares, carrying auriferous and argentiferous copper ores, planned to be developed by a 100-meter shaft.

UNION DEVELOPMENT CO. **CALIFORNIA.**

Office: Boston, Mass. Mine office: Johannesburg, Kern Co., Cal. Lands, 1 claim, known as the Juanita, in the Morrow district, 26 miles southeast of Johannesburg, showing 3 veins, about 30′ apart, said to have granite hanging walls and limestone footwalls, which presumably is meant for the general foot and hanging of the 3 veins as a whole, showing gossans of 2′ to 12′ width, underlaid by veins that widen with depth. Mine has shafts of 40′, 60′, 60′ and 212′, deepest showing copper sulphides with talcose gangue, said to average 17% copper and $3 gold per ton.

UNITED SMELTERS, RAILWAY & COPPER CO. **WYOMING.**

Office: Cleveland, Ohio. Mine office: Rudefeha, Carbon Co., Wyo. Works office: Encampment, Carbon Co., Wyo. I. N. Pennock, president; J. E. Haskell, vice-president; Willard Pennock, treasurer; preceding officers, Warner Moore, A. L. House, W. E. White, E. M. Cobb, F. A. Baldwin and A. S. Upson, directors; H. T. Forrest, assistant secretary; Geo. H. Hand, general superintendent; Andrew Anderson, mine superintendent. Organized Feb. 10, 1909, under laws of Wyoming, with capitalization $12,500,000, shares $10 par, nonassessable, in $2,500,000 non-cumulative 7% preferred stock, and $10,000,000 common stock; issued, $8,190,000 of common stock. Bonds, $2,500,000 authorized, at 6%; issued,

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$2,100,000. This bond issue was put out Jan. 1, 1909, by the Penn-Wyoming Copper Co., of which this company was organized as the successor. The preferred stock is for the purpose of taking up the bond issue at any time during the life of the bonds, or at the option of the bondholders. The Penn-Wyoming was capitalized at $10,000,000, with $8,963,000 issued, and, to Nov. 5, 1909, the United Smelters Railway & Copper Co. had exchanged its shares for more than 91% of the outstanding Penn-Wyoming stock. Doubtless the Penn-Wyoming will be liquidated eventually. Cleveland Trust Co., registrar. Annual meeting, second Wednesday in February.

The company was said, March, 1909, to have paid the $750,000 mortgage remaining due on the Ferris-Haggarty mine, with accrued interest, and is said to have finished paying the total indebtedness of the Penn-Wyoming, amounting to $1,390,798.62, principal and interest, in March, 1909, but apparently the amount actually paid was only $318,959.62, plus interest, this amount being the balance actually due on the underlying notes, aggregating $1,390,798.62, on which $1,072,839 had been paid previously by the Penn-Wyoming. The United Smelters, Railway & Copper Co. was said, March, 1909, to have a working capital of $250,000 in its treasury, but this seems open to doubt, as the company did not report its financial position in statements given this work, and has not resumed operations, being idle, except for a force of about 15 men required to care for the property.

The property of the company will be found fully described on pages 1111-1115, under title of Penn-Wyoming Copper Co.

UNITED STATES MODERN MINING CO. **WASHINGTON.**

Office: Bellingham, Wash. Mine office: Glacier, Whatcom Co., Wash. Lands, 19 miles from Glacier, on the headwaters of the Nooksack River, show 3 contact ore deposits between granite-porphyry and slate, of which No. 1 vein, about 25′ in width, carries ore giving good assay values in copper, zinc, silver and gold.

UNITED VERDE EXTENSION GOLD, SILVER & COPPER MINING CO. **ARIZONA.**

Dead. Was reorganized as United Verde Extension Mining Co. Formerly at Jerome, Yavapai Co., Ariz.

UTAH GLORY MINING CO. **UTAH.**

Park City, Utah. Mine office: Brighton, Salt Lake Co., Utah. Adolph Simon, president; J. P. Langford, secretary; J. F. Frankel, treasurer. Organized circa December, 1908, under laws of Utah, with capitalization $150,000, shares 50 cents par. Lands are in Big Cottonwood Cañon.

UTAH LEASING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. J. C. Dick, president and general manager; F. C. Dern, vice-president and treasurer; A. Thomas, secretary; preceding officers, Samuel S. Porter and E. E. Price, directors. Organized circa July, 1909, under laws of Utah, with capitalization $30,000, shares 10 cents par. Property is a lease on a portion of the old Telegraph mine of the United States Mining Co. Lessees are mining beneath the old silver-lead stopes, operated years ago, finding considerable dry silicious ore, worth $6 to $18 per ton, mainly in gold and silver. In August, 1909, company was shipping at the rate of about 15 carloads monthly to the Yampa smelter, which uses the ore for converter linings.

UTAH METAL MINING CO. **UTAH.**

Office: 161 Devonshire St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Samuel H. Treloar, general manager; E. J. Baker, superintendent. Was promoted by Walter B. Farmer, president and general manager of the Bingham Metal Co., and W. E. Hubbard of the Bingham Central-Standard Copper Co. Organized 1909, under laws of Maine, with capitalization

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$7,500,000, shares $5 par, as a merger of the Bingham Central Mining Co., Bingham Standard Copper Co. and Bingham Central-Standard Copper Co., latter being a holding company controlling the two other corporations previously named. The new company gave the Bingham Central-Standard Copper Co. 300,000 shares of stock, or about 1 share for 3, leaving 785,000 shares in the treasury of the new company. The Bingham Central-Standard had a $347,000 bonded indebtedness, and bond-holders have been given the privilege of converting bonds into stock, within 2 years, on the basis of $2 per share, or may accept cash in 5 years instead. After providing stock for the conversion of the bonds, there remained about 612,000 shares in the treasury, which the management planned underwriting at $3 per share, to provide a large working capital for the extensive equipment and development of the consolidated property.

Lands, circa 3,500 acres, including mineral lands and extensive timber tracts, with a millsite, and a water-right estimated as capable of developing 1,000 h. p. Company's holdings extend from Carr Fork Cañon, in Bingham Canyon, over the divide of the Oquirrh range into Middle Cañon, Tooele County, Utah. Property includes former holdings of the Bingham Metal Mining Co., Bingham Metals Co., Bingham Central Mining Co. and Bingham Standard Copper Co. Lands of the Bingham Metal Mining Co. and Bingham Metals Co., on the Tooele side of the divide, were circa 1,300 acres, in Middle Cañon, fairly timbered and having a saw-mill. The Middle Cañon lands show a limestone belt much similar to that on the Bingham side of the divide. The Tooele lands, in Middle Cañon, have 5 tunnels, No. 1 being 1,400′, No. 4 being 1,700′ and No. 5 being 500′ in length. It is thought that the cupriferous porphyry of Bingham Canyon may extend to this property.

Tunnel No. 1 of the Bingham Metal group, about 3,000′ long, Sept. 15, 1909, is planned to cut entirely through the mountain, in a length of circa 11,000′. At a further distance of about 2,500′, this tunnel should cut into the big fissures of the Bingham Central-Standard group, and the tunnel will give a back of circa 2,300′, vertically, at the deepest point, under the Ridge claim. Tunnel No. 1 is 9x9′ in the clear, and double-tracked, with a launder beneath for water, seepage of which is about 600 gallons per minute, which should be doubled by the completion of the tunnel. Tunnel was idle at last accounts, pending relaying of track with 35-lb. steel rails, and the construction of a new power house, electric plant and haulage system. By cutting through the entire hill to the Carr Fork side, No. 1 tunnel will afford drainage for the entire property, also transportation facilities, and will tap, at depth, the ore bodies of the Bingham Central-Standard group. This tunnel cost only a trifle above $7 per foot for the first 3,000′.

No. 2 tunnel is located about one mile down the cañon from No. 1, and 800′ vertically lower.

The Carr Fork property, in the Bingham Canyon district, adjoins the Boston Consolidated, Utah Consolidated and Bingham-New Haven properties, and includes the Bingham Central and Bingham Standard groups, carrying 3 large vein systems, known as the Saginaw, Burning Moscow and Nast, each traceable for a distance of circa 4,500′, and all intersected by the Old Jordan fault. Property also carries several smaller lead veins.

Lands of the Bingham Standard Copper Co. were 320 acres, partly patented, developed by the Saginaw tunnel, and the mine is said to have produced $600,000 worth of ore under a former management, shipping some ore in 1907.

The lands of the Bingham Central Mining Co. were 190 acres, patented, developed by 2 tunnels, known as the upper or Whiteley tunnel, and the lower or Jeff Davis tunnel, with about 9,000′ of workings.

The Whiteley or upper tunnel, of about 2,000′ length, shows mainly silver-

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lead ore, and has about 500′ to drive to reach the main ore bodies, which will be tapped at depth of about 450′ below the Deems tunnel.

The Jeff Davis or lower tunnel, of circa 2,000′ length, cut, at about 800′ from the portal, a vein of sulphide concentrating ore carrying about 2% copper, with small gold and silver values, and at a distance of 1,700′ cut a good silver-lead vein, of 2′ to 8′ width, carrying a considerable percentage of shipping ore, with copper values of 2 to 5%. In 1908 this tunnel opened 2 new ledges, one, of 3′ to 4′ width, giving assays of 12% copper, the other being a vein of silver-lead ore of good average tenor.

The Amelia tunnel, with portal about 175′ vertically above the Jeff Davis tunnel, shows a vein of about 75′ estimated average width, which, for a length of circa 90′, carries low grade concentrating ore said to average about 2.5% copper and $1.50 gold per ton, with small silver values.

The Deems tunnel, from Log Fork, is an old one, about 400′ long, showing a strong vein carrying some good ore.

The Saginaw tunnel, about 700′ long, follows for 400′ a strong fissure vein showing 1′ to 12′ width of ore, from which considerable shipments have been made.

The Mountain Maid tunnel of the Bingham Central-Standard group is about 950′ in length.

The property includes a millsite in Middle Cañon, near the mouth of No. 1 tunnel, and has enough water developed for a 500-ton mill, while further water supply can be obtained from springs on the opposite side of Middle Cañon, and it is planned to pipe water through the tunnel and down Carr Fork cañon to Bingham Canyon, where water is needed.

Equipment includes small mining plants at the various properties, and the power plant in Middle Cañon has direct-connected Pelton water-wheels. Management plans installing a heavy electric equipment. There is a considerable number of buildings at the various properties. The site designed for the camp and mill is about 4 miles from the International smelter.

The Utah Metal Mining Co. is an ambitious undertaking, with a very large acreage of land, but has a number of properties of merit, and is by no means devoid of promise, though it will require a heavy outlay to finance the property adequately.

UTAH MINES COALITION CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Duncan McVichie, president; Jas. B. Risque, vice-president; Roland H. Strickland, secretary and manager; Louis H. Farnsworth, treasurer; preceding officers and E. G. Woolley, Jr., directors. Organized January, 1909, under laws of Utah, with capitalization $1,250,000, shares $2.50 par; issued, $625,000. Company has authorized a bond issue of $200,000, gold debentures at 6%, in denominations of $100, dated March 3, 1909, payable in 10 years.

Lands, 15 patented claims, 4 fractional, at the head of Little Cottonwood Cañon, including the entire holdings of the Black Bess company. Property is said to carry 4 strong fissure veins and a contact deposit. The mine has a 350′ shaft, and a 345′ tunnel driving on the northerly vein, and plans crosscutting therefrom to the 4 other veins. This tunnel will give a back of about 1,000′, when completed. Equipment includes an 80-h. p. gasoline plant.

UTAH-PHILADELPHIA MINING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Lands, near the mouth of Little Cottonwood Cañon, have 2 tunnels, and the upper tunnel, February, 1909, cut ore assaying 8% copper, 62% lead, 32 oz. silver and $2.20 gold per ton. The vein is being developed by a lower tunnel, planned to give a back of 150′ on the vein.

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UTSUNOMIYA MINING CO. **JAPAN.**

Mine office: Mihara-mura, Itsuki-gori, Bitchu, Japan. Mine, having no power plant, employed 666 hands in 1907. Production, 1907, was 80,531 lbs. copper, 1,201 oz. silver and 30 oz. gold, in addition to 3,470,931 lbs. of auriferous and argentiferous copper ore, giving total production for 1907 estimated at 150,000 lbs. fine copper.

A. VANNONI. **PERÚ.**

Mine office: Casapalca, Oroya, Perú. Property, in the vicinity of Backus & Johnston, employed 30 men, at average wages of 1 peso daily, in 1907. Production, 1905, was 300 metric tons of ore, yielding 99,207 lbs. copper and 390 kgs. silver, and production, 1907, was 700 metric tons of ore, averaging 14% copper and circa 1,200 grams silver per ton, returning 216,050 lbs. fine copper and 840 kgs. silver.

VERCH-KYSSHTIM WORKS. **RUSSIA.**

Owned by Kyshtim Corporation, Ltd., at Kyshtim, Perm, Russia.

VERDE COPPER MINING CO. **ARIZONA.**

Office: 303-167 Dearborn St., Chicago, Ills. Mine office: Jerome, Yavapai Co., Ariz. W. P. Cooper, president; E. C. Weatherley, vice-president; John Tierney, general manager; J. J. O'Donohue, secretary and treasurer; J. P. Mowles, superintendent. Organized January, 1904, under laws of Arizona, with capitalization $3,000,000, shares $1 par, as North Verde Copper Co., and name changed, January, 1909, to present title. Lands, 6 claims, area 120 acres, near the United Verde, having a 375′ shaft, which management planned sinking to depth of 1,000′, and a 250′ tunnel, latter showing calcspar, iron and soft rock, in a zone of circa 150′ width, with a very little ore carrying 2.5% copper and 3 oz. silver per ton, with a trace of gold. Equipment includes a 70-h. p. boiler, 40-h. p. Fairbanks & Morse double-cylinder hoist and an air-compressor. Lands were jumped, January, 1908, but company claimed that assessment work was done properly, and jumping illegal, and apparently won out on this contention. Property was idle for more than 2 years, until March, 1909, when it was stated that work was about to be resumed, but property apparently has remained idle.

VERNA MINING CO. **UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Lands, 7 miles from Alta, in the Draper district, near the mouth of Little Cottonwood Cañon, are 6 claims, but company is in litigation with the Great Copper Flat Mining Co. over ownership of some of these claims, and possibly may be consolidated with the Copper Flat. Presumably idle.

VIRGIN COPPER CO. **PENNSYLVANIA.**

Office: York, Pa. Mine office: Charmian, Franklin Co., Pa. J. H. Dechert, president; H. S. Wiest, treasurer; C. E. Wills, general manager. Capitalization $500,000. Lands, about midway between Charmian and Gladhill, in the Blue Ridge Mountains, show ore giving assay values of $25 to $600 per ton in native copper, silver and gold. Mine has a 200′ shaft, sunk at an angle of 47°, and diamond drilling was begun, July, 1907, this including 4 holes, of 165′ to 800′. Equipment includes a hoist and air-compressor.

VIRGINIA DEVELOPMENT CO. **MEXICO.**

Mine office: Fronteras, Arizpe, Sonora, Mex. W. B. McBride, president; S. Grose, manager. Lands, 32 hectares, near the Cabullona mine, having a 40′ shaft, said to show native copper and mixed carbonates, claimed to give average assays of 26% copper, 30 oz. silver and $4.96 gold per ton.

VULCAN COPPER CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Chas. T. Joslin, president; W. S. Norvell, secretary; Jos. Larsen, superintendent. Capitalization $3,000,000, shares $10 par. Lands, 8 claims, partly fractional, area 98 acres, in Deception Gulch, surrounded by the United Verde, Hull, Haynes

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and Verde Grande properties. Mine is being developed by tunnel giving a back of about 300′, and management has planned sinking a 2-compartment shaft, to connect with the tunnel.

WALLABY COPPER MINES, LTD. **AUSTRALIA.**

Office: 17 Abchurch Lane, London, E. C., Eng. Mine office: Northampton, Western Australia. B. Argall and A. E. Powell, directors. Organized Feb. 24, 1909, under laws of Great Britain, with capitalization £20,000, shares 1s. par. Lands, 100 acres, freehold, known as the Wheal Fortune Extended mine, formerly held by Wheal Fortune Extended, Ltd. The company claims to have a lead vein of 3′ 6″ width, and to have raised therefrom 20 tons of ore returning 70% lead. Company also claims to have ore running as high as 40% copper. Property was idle for many years. Company's prospectus claims entirely too much, and the corporation is not regarded favorably.

WALLA WALLA COPPER MINING CO. **WASHINGTON.**

Office: Walla Walla, Wash. Mine office: Keller, Ferry Co., Wash. Lands are near Keller, in the southern half of the Colville reserve. Considerable work has been done on the property, and ore of fair assay grade in copper and gold was developed by former owners.

WANAMAKER MINING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Jas. Taylor, superintendent. Lands, 6 claims, 2 of which are supposed to carry the extension of the Iron Spar vein, adjoining the Bullion on the north, said to have a fair copper showing. Idle.

WANIBUCHI MINING CO. **JAPAN.**

Mine office: Hatazako-mura, Kamoishi-gori, Iwami, Japan. Property is the Wanibuchi mine, employing circa 200 hands, without power installation. Production, 1907, was 38,658 lbs. fine copper, 2,339 oz. silver, 1,594,890 lbs. copper ore and 1,486 metric tons of zinc ore, of the total value of 32,986 yen.

WASATCH-UTAH MINING CO. **UTAH.**

Office: 221 Atlas Block, Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. A. W. Nieman, manager; Frank Rumel, secretary. Organized circa 1908, as successor of Consolidated Jefferson Gold & Copper Mining Co. Lands of old company were 49 claims, 7 fractional, and 40 acres of placer grounds for a building site, but property of present company is said to consist of 22 patented claims, near the mouth of Little Cottonwood Cañon. Property has a 1,400′ tunnel, with about a quarter-mile of workings, showing sulphide ores said to average circa 5% copper, with small silver and large gold values. Equipment includes a good machinery plant and necessary mine buildings. Was developing with a small force at last accounts.

WELLWOOD COPPER SYNDICATE. **AUSTRALIA.**

Mine office: Lucknow, N. S. W., Australia. Property is in Wellwood paddock, near Lucknow, and prospecting work was begun thereon, circa 1907.

WESTERN COPPER CO. **NEWFOUNDLAND.**

Mine office: York Harbour, Birchy Cove, Bay of Islands, Nfld. H. V. Smythe, general manager. Lands, 4 claims, area 6,400 acres, also 26,880 acres of timber lands, giving total holdings of 33,280 acres. Mining lands are located back of the Bay of Islands, on the western coast of Newfoundland. In addition to the York Harbour mine, company holds 2 additional areas having extensive surface indications of copper. Country-rock is diorite, carrying 12 known fissure veins in serpentine, of which 5, including one of 50′ width, have been more or less developed. The country-rock is a dark green to black serpentine, the serpentine having a generally northeast and southwest trend, with dip of about 73° southeast, carrying superimposed lenticular masses of low-grade chalcopyrite, practically conformable in trend and dip, the lenses having been

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found much crushed or broken near surface, but occurring in solid masses of many thousand tons at depth.

The York Harbour mine, at the head of Eagle Nest brook, about 4,000′ from the bay, and at an elevation of about 1,000′ above tidewater, carries cupriferous pyrite, assaying 3 to 18% copper, with occasional zinc, up to 50% sulphur, 0.5 to 4 oz. silver and 40 cents to $1.40 gold per ton. The ore is compact and close-grained, with average values of circa 4.5% copper and 38 to 41% sulphur, the sulphur being valuable for use in the manufacture of acid, after the extraction of copper values. Development is by shafts of 54′, 64′, 70′ and 360′, with about one-half mile of workings, giving about 40,000 tons of ore in sight, and a new series of lenses is under development. The 360′ main shaft is sunk at an angle of 72° to the southeast, practically the same as the dip of the ore lenses. Levels are opened at 60′ intervals, with drifts driven southwest, along the strike of the ore bodies. One shaft is idle, and the two others are used for pumping and ventilating purposes only. Extraction is carried on by overhead stopes, averaging 10′ to 30′ in width, and timbering is with 12x12″ sticks, in square sets.

The shafthouse has a crusher of 500 tons daily capacity, reducing ore to size passing a 6″ ring, whence it goes into cars on the main tramway, which is 5,400′ long, with an elevation of 1,000′, having a 36″ gauge track, trains, consisting of 2 steel 3-ton self-dumping cars, which are lowered by a hoist and deliver ore into a 2,000-ton pocket on the bay, to a double-tracked tunnel, both sides of which are fitted with chute gates, connecting with the superstructure of the pier, over which one-ton cars are trammed, delivering ore into the hold of the steamer. The facilities suffice for loading 700 tons of ore daily.

Equipment includes a 250-h. p. steam plant, with a 50-h. p. Flory hoist and an 8-drill Norwalk high-altitude air-compressor. Improvements include an engine-house, boiler-house, sawmill and 15 dwellings. Property considered valuable.

WESTERN MINES DEVELOPMENT CO. **ARIZONA.**

Mine office: Swansea, Yuma Co., Ariz. C. C. Davis, president; W. C. Rowland, vice-president; R. W. Baxter, secretary and treasurer; preceding officers, Fred A. Mueller and F. A. Jones, directors. Organized April, 1909. Lands, known as the Central group, lying between the Clara and Moro groups of the Clara Consolidated, are 3 miles from Swansea and 22 miles from Bouse, and are about 5 miles from the Bill Williams Fork River, the nearest source of sure water supply.

WESTERN MINING & LEASING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. C. C. Parsons, Jr., vice-president and treasurer; L. L. Nettleton, secretary; preceding officers, R. J. Graham and E. Ben Brown, directors. Organized circa September, 1909, under laws of Utah, with capitalization $25,000, shares $1 par. Property is a bond and lease on the Comet group, in the Frisco district.

WESTERN NEVADA SMELTERS CORPORATION. **NEVADA.**

Works office: Carson City, Ormsby Co., Nev. Jas. Yerington, manager. Lands include a millsite and the old Merrimac mill, in Carson Cañon, with water rights to the Carson River, circa 40 miles from Yerington, whence ores are expected to be brought for reduction. Company also owns 280 acres of lands carrying iron ore and limestone for fluxing. Company plans building a 250-ton smelter, to be blown in circa April, 1910.

WESTERN PACIFIC GOLD & COPPER MINING & MILLING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Ogden, Weber Co., Utah. Thos. F. Feeney, president. Capitalization $1,000,000, shares $1 par. Stock is listed on the Salt Lake Stock Exchange. Lands, 12 claims, 2½ miles from a railroad,

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in the Sierra Madre district, having a 150′ incline shaft with 530′ of tunnels, showing low grade sulphide copper ore carrying gold and silver values.

WESTERN ZINC MINING CO. **CALIFORNIA.**

Office: French-American Bank Bldg., San Francisco, Cal. Mine office: Ingot, Shasta Co., Cal. C. D. Maze, manager. Lands include the Silverado mine, at Orange, Orange County, California. The Shasta County property, 2 patented claims, known as the Donkey mine, is 1½ miles from the Afterthought mine, and is supposed to carry a continuation of the Afterthought ore body, which is a sulphide complex including auriferous and argentiferous chalcopyrite, galena and sphalerite. Property is an old mine, on which some work has been done at intervals in the past, having a 250′ shaft. Ore is treated at the Reynolds chemical works, in South San Francisco, having a capacity of 15 tons daily, owned by the same company.

WICKENBURG REDUCTION CO. **ARIZONA.**

Works office: Wickenburg, Maricopa Co., Ariz. Chas. F. Brant, superintendent; Jonathan Gordon, metallurgical engineer. At last accounts company planned building a custom sampling mill at Wickenburg.

WICKLOW MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. J. D. Caldwell, president; A. J. Weber, secretary; M. W. Bird, treasurer; preceding officers, H. M. Dinwoody and W. F. Giles, directors. Capitalization $500,000, originally in 500,000 shares at $1 par, changed, March, 1909, to 1,000,000 shares, par 50 cents. Lands, 6 claims, north of the Eureka Lily and east of the Tintic Development Co., having a 527′ shaft.

WILLEY CANANEA COPPER CO. **MEXICO.**

Office: 50 Church St., New York, N. Y. Mine office: La Cananea, Arizpe, Sonora, Mex. Gen. Henry Ide Willey, president and general manager; David Miller, vice-president; A. B. Wadleigh, superintendent. Organized circa July, 1909, with capitalization $10,000,000, shares $5 par.

Lands claimed by company are about 3,200 acres, said to be entirely surrounded by holdings of the Greene-Cananea. Company is reported, by Humboldt Exploration Co., to have taken over the copper properties formerly held by the Greene Gold-Silver Co. Lands include former holdings of the Kansas-Cananea Copper Co., which was a consolidation of the Ortega Mining Co., Southwestern Mining Co., Red Cloud Copper Co., Consolidated Gold & Copper Co. and Miller Mining Co. Lands formerly held by the Consolidated Gold & Copper Co. were 1,729 acres, including the Chapultepec mine, area 879 acres, and the Corregidor mine, area 741 acres, adjoining properties about 6 miles southwest of Cananea, said to show a formation similar to the Capote mines of the Greene Cananea. The Southwestern group, formerly owned by the Southwestern Mining Co., area 342 hectares, known as the Huerfano group, 6 miles southeast of La Cananea, is said to carry an 800′ ore zone in rhyolite, developed by a 150′ shaft showing ores giving good assay values in copper, lead and silver. The Kansas-Cananea group, area 620 acres, developed by numerous shallow shafts, one 110′, and short tunnels, shows ore assaying 5 to 40% copper. Property as a whole has about 4,000′ of workings. Transportation is by a good wagon road to La Cananea. Company planned important work on a large scale, at organization, but it cannot be learned that same has been started.

WISCONSIN COPPER CO. **IDAHO.**

Mine office: Kellogg, Shoshone Co., Idaho. Herbert Yarrow, superintendent. Property is on the north side of the river, below the mouth of Moon Creek, between Kellogg and Osburn.

WOLVERINE COPPER MINING CO., LTD. **IDAHO.**

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. T. H. Thompson, president and general manager; preceding officer, M. F. Cotrell,

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Chas. M. Baillie, M. B. Thompson and G. B. Cotrell, directors. Organized December, 1906, under laws of Idaho, with capitalization $1,000,000, shares $1 par. Lands are east of Snowstorm. Presumably idle.

WYOMING HILLS MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co.,. Wyo. John J. Totten, president; W. B. Dorsey, secretary; Leo Davis, agent; preceding officers, S. B. Morris, A. B. Tolen, Chauncey H. Clark, Chas. Chenny, Geo. Harding and John Chenny, directors. Organized September, 1909, under laws of Utah, with capitalization $300,000, shares $1 par.

YAVAPAI GOLD, SILVER & COPPER MINING CO. **ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. Property is the Crowned King mine, in the Bradshaw Mountains, bought by present company from B. A. Turner, receiver of the corporation formerly owning the property, for $75,000, half in cash and half in shares. Lands are 18 claims, and mine has been a considerable producer, mainly of gold, in the past. Property has a 20-stamp gold mill.

YERINGTON MINES & EXPLORATION CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Otto Taubert, president; O. N. Parsons, secretary; preceding officers, August Taubert, C. S. Durand and Walter Taubert, directors. Lands, 33 claims, in 4 groups, aggregating 23 copper claims and 10 gold claims, in Lyon and Douglas counties. The Taubert group, 16 copper claims, adjoins the Wabuska Copper Mines Co., and the Copper Flat group, 9 claims, 1 mile east of Yerington, adjoins the Empire Copper Mines Co., north of the Bluestone. Development is by a shaft, said to show ore carrying about $200 gold per ton, and company plans building a mill at Nordyke, Lyon Co., Nevada.

YERINGTON NATIONAL COPPER CO. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. I. A. Strosnider, secretary; C. W. Gallagher, treasurer; W. A. Johnson, superintendent. Capitalization $1,250,000, shares $1 par. Shares are listed on the Salt Lake stock exchange. Lands, 19 claims, 15 surveyed for patent, area circa 340 acres, adjoining the Western Nevada on the west and the Malachite on the south, about 1½ miles from the townsite of Mason and 12 miles from the Wabuska branch of the Southern Pacific Railroad, which line is surveyed to run across the property. Development is by 2 prospect tunnels, of 100′ and 300′ length, and a 40′ shaft. Management plans development by a double-track tunnel, to be driven about a mile on the vein, giving a back of about 1,000′. The longer tunnel has cut carbonate ores averaging about 3% copper, with small gold and silver values.

YOSEMITE MINES CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. W. Mont Ferry and Ernest Bamberger, directors. Organized circa August, 1909, with capitalization $1,000,000, shares $1 par. Is practically controlled by Bingham Mines Co., through a large share interest. Lands, 12 claims, including the Yosemite group of 6 patented claims, the Cluster group of 5 claims, and the Mississippi claim adjoining. Property is said to have produced upwards of $1,000,000 in gross ore values, under previous ownership. It is planned to develop the mine by a branch tunnel from the Mascot tunnel, giving a back of 1,500′ on the dip of the vein at the beginning of the branch tunnel.

YOSHITANI COAL MINE CO. **JAPAN.**

Mine office: Satokawa-mura, Nomi-gori, Kaga, Japan. Property is the Yusenji mine, having power installations of 213 and 1,367 h. p. Ore carries neither gold nor silver values. Company employs circa 700 hands. Production was 921,491 lbs. fine copper in 1906, and 960,052 lbs. fine copper in 1907.

YOUNG AMERICA MINE. **NEW MEXICO.**

Mine office: Magdalena, Socorro Co., N. M. W. Russell, lessee and man-

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ager. Property carries auriferous copper ores, and has a small steam plant, employing about 20 men at last accounts.

YUMA COPPER CO. **ARIZONA.**

Office: Shelden Bldg., Houghton, Mich. Mine office: Vicksburg, Yuma Co., Ariz. Employs circa 25 men. Samuel Brady, president; John L. Harris, vice-president; Courtney C. Douglass, secretary; Wm. B. McLaughlin, treasurer; preceding officers, Prof. A. E. Seaman, Allen F. Rees and Thos. C. Job, directors; Dr. Ernest A. Haggott, consulting engineer; Enoch Henderson, superintendent; W. M. Wilson, mine foreman. Organized March, 1909, under laws of Arizona, with capitalization $2,000,000, shares $10 par; issued, 50,000 full-paid shares and circa 100,000 shares $1 paid, leaving 50,000 shares unissued. The full-paid stock was given in part payment for lands and options and for promotion profits, and the full paid stock is in escrow until September, 1910. Stock is listed on the Boston curb.

Lands, 31 contiguous claims, area circa 600 acres, in the Ellsworth mining district of the Harcúvar Mountains, north of McMillan valley, 9 miles northwest of Vicksburg and 5 miles from Arizona & California railroad, also a millsite and townsite on the railroad line, 6 miles from Vicksburg and 5 miles from the mine. Property includes the Lind-Griffin group of 21 claims, and 10 claims adjoining, formerly held by the Ironwood & Arizona Development Co., which expended about $25,000 on the property, and sold same to the Butte & Arizona Copper Mining Co., which in turn disposed of it to the Yuma Copper Co. Price of lands, in addition to full-paid shares, was $75,000, of which $29,000 has been paid, leaving $46,000 due, in equal installments of $23,000, June, 1910, and March, 1911.

The hills to the west, north and northeast enclose a central amphitheatre, apparently forming an anticlinal fold, the basin lying 1,000′ to 1,700′ higher than the railroad valley, 5 miles below. The property shows 2 main mineralized zones of limestone, ranging from east and west, there apparently being a much greater limestone area capped by andesite. The southerly zone has a strike of about southeast and northwest, with dip to the northwest of apparently about 15°, but same probably will be found about 30° to 50° at depth, the surface dip being deceptive, due to erosion underneath the heavy iron capping. The southerly zone is frequently cut and faulted by cross dykes of andesite, with surface evidences of enrichment, and the footwall of both zones is a silicious schist. Both zones carry heavy gossans, ranging from 100′ to more than 500′ in width, the gossan of the southerly zone being marked by magnetite and silicified limestone carrying copper carbonates and traces of copper sulphides. The northerly zone, with similar cross dykes of andesite, lies practically east and west, running through 5 claims, with similar but wider gossans. The great extent of crushed limestone and iron cappings renders the surface indications unusually promising, and geological conditions favor extensive ore bodies at depth. Ores as developed by numerous pits and trenches remaining from exploratory workings, from which a little selected high-grade carbonate ore was shipped, show mainly copper carbonates, below commercial tenor, with occasional small masses of rich oxidized ores, all carrying small gold and silver values. Surface ore is mainly malachite, with some azurite, and sulphides in the bottom workings. Ores developed have assayed up to 14% in copper tenor, not including rich selected samples.

Old workings of the Ironwood & Arizona, on which about $25,000 was expended to rather poor advantage, included a short tunnel on the Columbia claim, showing a 6′ vein of leached ore, carrying copper carbonates below commercial tenor. The Ironwood & Arizona also sunk the 3-compartment Tribune shaft, on a line between the Tribune and Fraction claims, to depth of 68′ only, and indications are that this shaft would have to be continued to

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great depth to cut the underlay of the ore body, dip of which was mistakenly inferred from the outcrop.

The Carbonate shaft, with two 4x4′ compartments, on the eastern part of the property, was sunk vertically for 132′ by the former owners, and then deepened 140′ as an incline, on the dip of the formation, but this incline has been abandoned as worthless, and the shaft is being deepened vertically, and was 221′ deep, September, 1909. There are two winzes on the 134′ level of the Carbonate shaft, both showing ore of commercial tenor, mainly carbonates, but with some sulphides appearing in the bottom, and principal values should be developed in the sulphide zone. The west winze is bottomed in carbonate ore averaging 3.1% copper, with a paystreak assaying 8.7% copper. The leached zone in the west lateral of the Carbonate shaft is thoroughly oxidized, giving promise of commercial sulphide ore at a little greater depth, some narrow streaks of chalcocite showing in the bottom.

Equipment includes a 15-h. p. gasoline hoist and a 3-drill air-compressor. Improvements include an engine-house at the Carbonate shaft, an office building, laboratory, superintendent's dwelling, bunk-house, boarding-house and smithy, the principal buildings being substantially constructed. Water is supplied by a 140′ well, sunk in mica-schist, and a larger water supply could be developed in the valley below. Transportation between the mine and railroad is over a good mountain road without heavy grades, and railroad connection can be secured, with an easy grade, by a line of 5 miles or less. Management is excellent and property considered promising.

COMPAÑÍA MINERA ZACUALPAM, S. A. **MEXICO.**

Mine office: Zacualpam, Sultepec, Mexico, Mex. Organized June 22, 1907, under laws of Mexico, with capitalization 500,000 pesos, shares 100 pesos par, in 1,500 full-paid shares and 3,500 shares with 20 pesos paid in. Mines are San Agustin y Anexas, carrying ores of various metals.

ZALAMEA COPPER CO., LTD. **SPAIN.**

Office: Bush Lane House, London, E. C., Eng. Mine office: Zalamea la Real, Huelva, Spain. Arthur Lawrence, chairman; R. Beech Hall, secretary. Organized June 6, 1906, under laws of Great Britain, with capitalization £25,000, shares £1 par; issued, 10,400 shares fully paid and 11,538 shares 5s. paid. Lands, 242 acres, including the San Diego and San Eduardo mines and extensions, area 82 acres, bought for £5,000 cash, and another group of mines and leases subsequently acquired. Development work was in progress at last accounts.

CORRECTED DESCRIPTION.

Owing to the accidental misplacing of notes pertaining to the Ladysmith Copper Mining Co., written for Vol. VIII, the description of this company was reprinted with but small change from Vol. VII, and reappears in this volume on page 855, doing this company an unintentional injustice. For this reason, the following corrected description is given, to supercede the censorious description printed on page 855 of the present volume.

LADYSMITH COPPER MINING CO. **MONTANA.**

Office: 259 La Salle St., Chicago, Ills. Mine office: Elliston, Powell Co., Mont. Edw. R. Roe, president; G. F. Neuberg, treasurer; V. W. Hemala, secretary; Frank A. Smith, manager. Organized 1905, under laws of South Dakota, with capitalization $400,000, increased, 1908, to $1,600,000, shares $1 par. Lands, 10 claims, circa 12 miles northwest of Elliston, well timbered and

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watered. Property carries a contact deposit between limestone and granite up to about 15′ in maximum width. Development is by a 180′ two-compartment shaft and a 110′ shaft, with about 1,500′ of workings, sulphide ore occurring at depth of about 165′. Ore is estimated to average about 8% in copper tenor, and can be brought, by hand selection, to tenor of 20%. Company shipped, between October, 1908, and May, 1909, three carloads of ore to the Pittsmont smelter, Butte, and 1 carload to the Tacoma smelter, giving returns of about 11%, 14.5%, 15% and 32.5% respectively, netting above charges about $2,600.

The company alleged in its prospectus that dividends should be paid during 1906, which claim was unwarranted, and, by reason of an accident to the general manager, necessitating suspension of work for a year, development was greatly retarded. Notwithstanding the serious mistake made by the company in confidently predicting dividends for 1906, the management has stuck to the work of making a mine, and is entitled to commendation for its efforts.

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CHAPTER XXVI.

GENERAL COPPER STATISTICS.

This, the final chapter of the work, devoted to the statistics of the copper industry, contains a larger number of tables than in the earlier editions, and gives two or three times as much matter per page, it having been found possible to consolidate two and even three of the tables of the earlier editions into a single form. It will be found, in many cases, that a single table gives figures covering a half-dozen or more different but cognate points.

The exact order of precedence in which these tables are published is varied a trifle, from year to year, as required by mechanical exigencies. The task of "making-up" for the press upwards of forty different tables of statistics, each in somewhat different form from any other, and of greatly varying lengths, so as to appear in logical sequence, yet give full pages without awkward breaks or bad spacing, is one that can be appreciated only by an experienced printer, and the unusual degree of success that has been secured in the typographical handling of such extremely awkward matter also is to be fully appreciated only by those who have wrestled with similar problems. There is, however, a grouping of the statistics contained in this chapter, under nine sub-heads, which are given, in each edition, in the following invariable order, though there may be occasional transpositions of individual tables contained in a subdivision:

WORLD'S PRODUCTION: Eight tables covering a variety of features.

AMERICAN PRODUCTION: Two tables.

LAKE SUPERIOR PRODUCTION: Two tables.

AMERICAN IMPORTS: One table.

AMERICAN EXPORTS: Two tables.

WORLD'S COPPER TRADE: Eleven tables covering imports, exports, supplies and consumption, for the world and for all leading consuming countries.

PRICES AND VALUES: Six tables.

COPPER SHARE FINANCES: Eight tables, devoted to dividends, assessments, capitalization and sales of shares of American copper mining companies.

TWENTIETH CENTURY PRODUCTION: One table, giving comparative figures by arithmetical progression, based upon the figures of production and consumption of the preceding century.

All tables are fully entered, both by titles and by numerous cross-references, in the index at the end of the volume.

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WORLD'S COPPER PRODUCTION.

(*Long Tons.*)

Year.	United States.	Foreign.	Total.	Percentage of U. S. Production.
1880	27,000	126,959	153,959	17
1881	32,000	131,000	163,000	19
1882	40,467	141,155	181,622	22
1883	51,574	147,832	199,406	24
1884	64,708	155,141	220,249	29
1885	74,052	151,540	225,592	32
1886	70,430	146,656	217,086	32
1887	81,017	142,781	223,798	36
1888	101,054	156,972	258,026	39
1889	101,239	159,966	261,205	38
1890	115,966	153,489	269,455	43
1891	126,839	152,552	279,391	45
1892	154,018	156,454	310,472	49
1893	147,033	156,497	303,530	48
1894	158,120	166,385	324,505	49
1895	169,917	164,648	334,565	50
1896	205,384	167,979	373,363	54
1897	220,571	178,384	398,955	54
1898	235,050	194,106	429,156	54
1899	253,870	215,440	469,310	54
1900	269,111	216,743	485,854	57
1901	268,522	242,497	511,019	53
1902	294,297	247,870	542,167	54
1903	311,582	273,499	585,081	54
1904	362,739	278,955	641,694	56
1905	402,704	293,005	695,709	57
1906	409,414	303,200	712,614	57
1907	386,655	326,500	713,155	54
1908	420,953	328,300	749,253	56

COPPER PRODUCTION BY CONTINENTS.

(*Long Tons.*)

Year.	North America.	Europe.	South America.	Asia.	Australasia.	Africa.	Totals.
1896	222,524	88,948	26,340	21,000	11,272	7,450	377,534
1897	242,679	90,829	25,300	23,000	16,583	7,440	405,831
1898	261,625	89,461	30,065	25,175	15,943	7,110	429,379
1899	282,636	93,383	32,730	27,560	20,894	6,490	463,693
1900	303,784	91,009	36,095	28,121	21,270	6,720	486,999
1901	320,044	91,161	43,080	27,475	28,633	7,472	517,865
1902	355,280	91,552	40,266	29,775	27,281	4,450	548,604
1903	384,138	94,056	42,561	31,360	28,116	5,230	585,461
1904	445,557	90,820	41,265	34,850	26,657	7,775	648,924
1905	489,959	88,215	39,945	35,910	33,940	7,740	695,709
1906	497,794	91,995	36,855	42,740	36,250	6,980	712,614
1907	471,955	102,000	40,600	49,700	41,900	7,000	713,155
1908	489,653	112,100	56,800	43,700	40,100	6,900	749,253

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WORLD'S COPPER PRODUCTION BY COUNTRIES.

(Based on the figures of Henry R. Merton & Co. Ltd.)

(*Long Tons.*)

Country.	1890	1895	1900	1904	1905	1906	1907	1908
Algeria	120	35	.....	.....	415	440	100	.....
Argentina	150	150	775	155	155	105	200	200
Australasia	7,500	10,000	23,000	34,160	33,940	36,250	41,900	40,100
Austria	1,210	1,110	865	1,275	1,175	1,225	900	1,600
Bolivia	1,900	2,250	2,100	2,000	2,000	2,500	2,500	2,500
Canada	3,050	4,000	8,500	19,185	20,535	25,460	26,000	29,000
Cape Colony	6,450	7,080	6,720	7,775	7,325	6,540	6,900	6,900
Chile	26,120	22,075	25,700	30,110	29,165	25,745	27,100	38,900
Great Britain	935	580	650	500	715	500	700	700
Germany	17,625	16,555	20,410	21,045	22,160	20,340	20,800	20,500
Hungary	300	200	490	175	150	210	100	100
Italy	2,200	2,500	2,955	3,335	2,950	2,865	3,400	3,000
Japan	15,000	18,430	27,840	34,850	35,910	42,740	49,700	43,700
Mexico	4,325	11,620	22,050	50,945	64,440	60,625	57,500	38,200
Newfoundland	1,735	1,800	1,900	2,200	2,280	2,295	1,800	1,500
Norway	1,390	2,685	3,935	5,415	6,305	6,120	7,100	9,300
Peru	150	450	8,220	6,755	8,625	8,505	10,800	15,200
Russia	4,800	5,280	8,000	10,700	8,700	10,490	15,200	20,400
Sweden	830	515	450	390	550	500	2,000	2,000
Spain & Portugal	51,700	54,950	52,872	47,035	44,810	49,320	50,500	53,400
United States	115,966	169,917	269,111	362,739	402,704	409,414	386,655	420,953
Turkey	.....	.....	520	950	700	425	1,300	1,100
Venezuela	5,640	.....	.....	.....	.....	.....	.....	.....
Totals	269,096	332 182	486,363	641,694	695,709	712,614	713,155	749 253

WORLD'S PRODUCTION OF REFINED COPPER.

The following table, based upon figures of the Metallegesellschaft und Metallurgische Gesellschaft A.-G., gives estimated figures of production of raw copper of each country, whether from native or imported ores, matte or impure raw copper brought in for refining:

(*Metric Tons.*)

Country.	1895	1900	1903	1904	1905	1906	1907	1908
United States	170,100	286,900	327,100	380,900	411,000	429,400	421,400	449,500
Great Britain	78,246	80,000	71,400	65,300	68,000	72,700	72,400	71,400
Mexico	7,000	10,000	42,200	48,500	53,300	51,000	52,000	40,000
Japan	15,500	24,300	33,200	32,100	33,700	45,000	45,000	36,000
Germany	25,777	30,900	31,200	30,300	31,700	32,300	31,900	30,000
Australia	12,100	21,800	19,500	22,700	23,900	29,500	32,500	34,500
Chile	19,600	20,000	22,000	22,000	21,000	20,000	20,000	20,000
Canada	100	500	7,200	8,000	10,700	13,800	14,000	14,000
Russia	5,854	8,100	10,500	10,900	8,900	10,600	15,000	16,800
Europe, misc	1,500	2,600	12,200	11,500	11,000	12,000	7,500	11,400
France	8,245	6,400	6,900	6,900	6,200	7,100	11,000	8,000
So. America, misc.	3,800	4,000	4,000	4,000	4,000	4,000	5,500	2,000
Italy	2,375	2,800	3,600	3,600	3,600	3,600	4,000	4,000
Austria-Hungary	1,276	1,200	1,400	1,500	1,400	1,500	1,100	1,300
Totals	351,473	499,500	592,400	648,200	688,400	732,500	733,300	738,900

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ESTIMATE OF WORLD'S PRODUCTION FOR 1909.

This table, similar to estimates given in six preceding annual issues is merely an estimate, based upon the best data at command, of the probable output of copper by the world for the year 1909, compared with actual production of the two preceding years. As final figures are not obtainable until the latter half of each year, for the year preceding, the difficulties in the way of making a fairly accurate estimate of output for the current year, at the close of the year, are considerable. The previous estimates, when compared with final corrected figures, nearly a year later, proved to be 2.3% too high for 1902; 0.7% too low for 1903; 2.1% too low for 1904; 3.7% too high for 1905, 3.1% too low for 1907 and 2.6% too low for 1908.

Country.	1907	1908	1909
Algeria	100	.....	100
Argentina	200	200	500
Australasia	41,900	40,100	44,000
Austria	900	1,600	1,250
Bolivia	2,500	2,500	2,750
Canada	26,000	29,000	23,000
Cape Colony	6,900	6,900	7,000
Chile	27,100	38,900	37,500
Great Britain	700	700	500
Germany	20,800	20,500	20,000
Hungary	100	100	100
Italy	3,400	3,000	3,500
Japan	49,700	43,700	47,000
Mexico	57,500	38,200	56,000
Newfoundland	1,800	1,500	2,000
Norway	7,100	9,300	10,000
Peru	10,800	15,200	20,000
Russia	15,200	20,400	22,500
Sweden	2,000	2,000	1,500
Spain and Portugal	50,500	53,400	52,000
United States	386,655	420,953	491,000
Turkey	1,300	1,100	1,000
Totals	713,155	749,253	843,200

WORLD'S COPPER PRODUCTION FOR NINETEENTH CENTURY.

(*Long Tons.*)

Decade.	Average Price of Rough Copper.	World's Production of Each Decade.	Increase of Production over Previous Decades.	Average Annual Production for Each Decade.	Increase of Average Annual Production.
1801 to 1810	£160	91,000	.....	9,100	.....
1811 to 1820	130	96,000	5,000	9,600	500
1821 to 1830	101	135,000	39.000	13,500	3,900
1831 to 1840	94	218 400	83,400	21 840	8.340
1841 to 1850	83	291,000	72,600	29,100	7,260
1851 to 1860	111	506,999	215,999	50,699	21,599
1861 to 1870	87	900,000	393,001	90,000	39,300
1871 to 1880	79	1,189,000	289,000	118,900	28,900
1881 to 1890	60	2,373,398	1,084,398	237,339	108,439
1891 to 1900	52	3,708,901	1,335,503	370,890	133,550
Totals and Averages	£96	9,507,299	.....	95,073	361,790

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PRODUCTION OF WORLD'S LARGEST MINES.

(*Pounds Avoirdupois.*)

Year.	Calumet & Hecla.	Anaconda.	Rio Tinto.	Boston & Montana.	Mansfeld.	Copper Queen.
1867.....	1,315,173	.....	1,937,843	.....	5,865,898	.....
1868.....	5,098,375	.....	2,475,765	.....	7,442,226	.....
1869.....	12,315,771	.....	2,147,280	.....	8,084,140	.....
1870.....	14,031,584	.....	2,231,055	.....	8,384,980	.....
1871.....	16,222,590	.....	1,895,956	.....	8,718,480	.....
1872.....	16,162,183	.....	1,772,498	.....	12,070,542	.....
1873.....	18,848,265	.....	.....	.....	12,281,487	.....
1874.....	20,125,225	.....	.....	.....	11,372,905	.....
1875.....	21,473,954	.....	.....	.....	13,312,499	.....
1876.....	21,690,732	.....	11,731,708	.....	13,852,024	.....
1877.....	23,568,468	.....	41,057,139	.....	15,230,287	.....
1878.....	25,253,128	.....	54,245,564	.....	17,645,115	.....
1879.....	26,270,943	.....	50,228,595	.....	18,882,434	.....
1880.....	31,675,239	.....	58,775,915	.....	21,734,902	1,379,940
1881.....	31,360,781	.....	61,171,913	.....	24,377,210	3,866,581
1882.....	32,053,528	.....	38,951,360	.....	25,795,840	7,744,278
1883.....	33,125,045	.....	45,857,280	.....	28,310,320	7,523,981
1884.....	40,473,585	.....	48,303,360	.....	28,183,680	7,668,617
1885.....	47,247,990	36,000,000	52,604,160	7,500,000	27,888,000	6,663,782
1886.....	50,518,220	33,267,864	55,328,000	2,000,000	28,212,800	3,797,256
1887.....	46,016,123	57,000,000	63,840,000	1,500,000	29,176,000	5,707,728
1888.....	50,295,721	63,245,473	63,840,000	18,278,667	29,970,200	12,031,614
1889.....	48,668,296	61,647,000	66,080,000	25,425,228	34,733,440	12,152,910
1890.....	59,868,106	64,046,812	67,200,000	25,942,298	35,392,000	13,120,934
1891.....	63,586,620	46,500,000	71,680,000	25,000,000	30,920,000	13,022,957
1892.....	56,495,211	75,000,000	70,560,000	30,386,595	34,406,400	12,916,416
1893.....	60,427,913	75,256,657	69,664,000	31,800,000	31,696,000	13,795,618
1894.....	61,324,626	95,578,000	73,920,000	50,000,000	33,677,600	12,968,372
1895.....	79,137,399	99,775,294	75,040,000	55,000,000	33,286,400	16,235,723
1896.....	89,280,621	125,350,693	73,920,000	60,250,000	40,913,600	22,966,169
1897.....	83,248,054	131,471,127	75,936,000	60,000,000	40,230,400	23,999,873
1898.....	86,426,320	107,214,059	75,499,200	62,000,000	40,420,800	33,747,390
1899.....	89,610,963	107,914,357	76,988,800	65,000,000	46,558,400	36,901,684
1900.....	77,761,382	110,000,000	80,039,680	66,200,000	41,193,600	34,382,309
1901.....	82,519,676	101,850,224	79,179,520	70,000,000	41,067,200	39,781,333
1902.....	81,248,739	100,000,000	77,235,200	75,000,000	41,000,000	35,831,735
1903.....	76,490,869	93,500,000	80,214,400	90,750,000	42,500,278	36,385,000
1904.....	80,341,019	90,000,000	80,214,400	94,000,000	41,629,349	58,605,000
1905.....	95,100,610	95,000,000	72,307,200	89,000,000	43,824,141	64,570,847
1906.....100,023,420		95,997,440	72,000,000	93,461,344	40,000,000	79,536,416
1907.....	83,863,116	70,000,000	72,390,080	70,000,000	38,822,000	66,916,972

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PRODUCTION OF WORLD'S LEADING MINES.

In this table are given annual products, for latest years available, of all the really important copper mines of the world, and also of a great majority of the smaller mines making as much as 100,000 lbs. avoirdupois of fine copper yearly. The products in round numbers are estimates, based upon the best information available, the other figures being exact returns.

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
1	American S. & R. Co.	U. S. A. & Mexico.	1907	94,600,000
2	Anaconda	Montana	1909	82,000,000
3	Calumet & Hecla	Michigan	1908	81,660,723
4	Rio Tinto	Spain	1907	72,390,080
5	Boston & Montana	Montana	1909	72,000,000
6	Copper Queen	Arizona	1907	66,916,972
7	Utah Copper	Utah	1908	43,689,875
8	Butte Coalition	Montana	1909	40,000,000
9	Mansfeld	Germany	1907	38,822,000
10	United States	Calif. & Utah	1907	38,518,378
11	North Butte	Montana	1909	36,000,000
12	Arizona	Arizona	1908	34,686,615
13	Nevada Consolidated	Nevada	1908	34,527,823
14	United Verde	Arizona	1907	33,015,457
15	Copper Range	Michigan	1908	32,653,143
16	Calumet & Arizona	Arizona	1907	30,039,473
17	Mammoth	California	1909	27,000,000
18	Boleo	Mexico	1907	24,530,000
19	Chilena de Fundiciones	Chile	1903	23,968,609
20	Granby	British Columbia	1908	23,639,984
21	Old Dominion	Arizona	1907	23,294,496
22	Osceola	Michigan	1908	21,250,794
23	Quincy	Michigan	1908	20,600,361
24	Furukawa	Japan	1907	20,302,378
25	Cerro de Pasco	Perú	1907	20,258,689
26	Superior & Pittsburg	Arizona	1909	20,000,000
27	Wallaroo & Moonta	Australia	1907	19,314,480
28	Greene-Cananea	Mexico	1908	19,128,000
29	Original	Montana	1909	18,000,000
30	Champion	Michigan	1908	17,786,763
31	Baltic	Michigan	1908	17,724,854
32	Mt. Lyell	Tasmania	1907	17,664,640
33	Boston Consolidated	Utah	1909	17,500,000
34	Detroit	Arizona	1907	17,346,411
35	Kosaka	Japan	1907	16,397,061
36	Cape	Cape Colony &Nfld.	1905	16,358,720
37	Lota i Coronel	Chile	1903	15,653,906
38	Shannon	Arizona	1908	15,207,768
39	Ashio	Japan	1907	14,023,246
40	Tennessee	Tennessee	1909	14,000,000
41	Utah Consolidated	Utah	1907	13,987,557
42	Mitsu Bishi	Japan	1907	13,535,458
43	Tamarack	Michigan	1908	12,806,127
44	Mt. Morgan	Australia	1907	12,456,640
45	Sumitomo	Japan	1907	11,947,980
46	Besshi	Japan	1907	11,781,824
47	Bingham	Utah	1906	11,475,863
48	Bogoslovski	Russia	1908	10,500,000
49	Mohawk	Michigan	1908	10,295,881
50	Butte & Boston	Montana	1909	10,000,000

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
51	Wolverine	Michigan	1908	9,955,233
52	Tharsis	Spain	1907	9,878,400
53	Moctezuma	Mexico	1907	9,640,390
54	Great Cobar	Australia	1906	9,027,200
55	Washoe	Montana	1909	9,000,000
56	Guggenheim Expln. Co.	Mexico	1907	9,000,000
57	Balaklala	California	1909	9,000,000
58	St. Mary's M. L. Co.	Michigan	1908	8,893,381
59	Sulitelma	Norway	1907	8,140,562
60	Trenton	Montana	1909	8,000,000
61	Poderosa	Chile	1908	8,000,000
62	Bully Hill	California	1909	8,000,000
63	Teziutlán	Mexico	1905	7,512,252
64	Mazapil	Mexico	1906	7,250,000
65	Newhouse	Utah	1907	7,244,179
66	Imperial	Arizona	1909	7,000,000
67	British Columbia	British Columbia	1908	6,731,351
68	Cuba	Cuba	1907	6,483,000
69	Ahmeek	Michigan	1908	6,280,241
70	Ducktown	Tennessee	1907	6,238,952
71	Snowstorm	Idaho	1906	6,233,940
72	O'okiep	Cape Colony	1905	6,117,440
73	Trimountain	Michigan	1908	6,034,908
74	Otavi	German S.W. Africa	1908	6,000,000
75	Nijni-Tagilsk	Russia	1908	6,000,000
76	Cumberland-Ely	Nevada	1908	6,000,000
77	Namaqua	Cape Colony	1906	5,931,521
78	Montecatini	Italy	1905	5,892,895
79	Mason & Barry, Ltd.	Portugal	1906	5,421,600
80	Seville	Spain	1907	5,152,000
81	Nababiep	Cape Colony	1905	5,136,320
82	Tilt Cove	Newfoundland	1905	5,104,960
83	Shattuck-Arizona	Arizona	1907	5,091,542
84	Yampa	Utah	1907	5,001,255
85	Parrot	Montana	1909	5,000,000
86	Mountain	California	1909	5,000,000
87	Arghana Maaden	Turkey	1906	5,000,000
88	Descubridora	Mexico	1903	4,964,272
89	Pittsburg & Montana	Montana	1906	4,753,500
90	Queensland	Australia	1907	4,575,648
91	Penn-Wyoming	Wyoming	1908	4,500,000
92	Burro Mountain	New Mexico	1907	4,500,000
93	Catemou	Chile	1905	4,401,270
94	Canadian	Ontario	1905	4,326,000
95	East Butte	Montana	1909	4,250,000
96	Central Chili	Chile	1906	4,159,680
97	Dolores y Anexas	Mexico	1904	4,015,000
98	San Juan	Chile	1907	4,000,000
99	Katarski	Russia	1905	4,000,000
100	Canadian Smelting Works	British Columbia	1906	3,956,131
101	Franklin	Michigan	1908	3,703,421
102	Las Animas	Chile	1903	3,701,976
103	Taltal	Chile	1905	3,700,000
104	Santiago Vicuña	Chile	1903	3,698,291
105	Tyee	British Columbia	1908	3,568,486
106	Rammelsberg	Germany	1905	3,527,360
107	Copiapó	Chile	1909	3,500,000
108	Consolidated M. & S. Co.	British Columbia	1907	3,433,310
109	Jimulco	Mexico	1905	3,413,735
110	United Globe	Arizona	1907	3,399,084

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois*)

No.	Mine or Company.	Location.	Year.	Output.
111	Chillagoe	Australia	1907	3,391,360
112	O. K.	Australia	1906	3,351,197
113	Gibson	Arizona	1907	3,340,777
114	Snowshoe	British Columbia	1907	3,125,000
115	Democrata	Mexico	1907	3,067,039
116	Allouez	Michigan	1908	3,047,051
117	Isle Royale	Michigan	1908	3,011,664
118	Britannia	British Columbia	1907	3,011,410
119	Michigan	Michigan	1908	3,000,206
120	Demidoff	Russia	1905	2,962,250
121	Dominion	British Columbia	1907	2,910,695
122	Maipo	Chile	1903	2,822,990
123	Empire	Idaho	1907	2,750,000
124	Kedabeg	Russia	1907	2,750,000
125	"Lloyd"	Australia	1906	2,739,520
126	Mungana (Chillagoe)	Australia	1907	2,719,360
127	Mond	Ontario	1906	2,588,000
128	Gatico	Chile	1903	2,565,503
129	Osaruzawa	Japan	1907	2,537,710
130	Artola Hnos.	Chile	1905	2,500,000
131	Chañaral	Chile	1906	2,500,000
132	Le Roi	British Columbia	1907	2,500,000
133	Rudianski	Russia	1907	2,500,000
134	Santa Rita	New Mexico	1907	2,500,000
135	Tinto y Santa Rosa	Spain	1906	2,500,000
136	Amarilla	Chile	1907	2,450,000
137	Mt. Molloy	Australia	1906	2,441,846
138	Atacama	Chile	1903	2,396,252
139	Carrizal	Chile	1903	2,379,360
140	National Met. Co.	Mexico	1906	2,295,270
141	Tiro General	Mexico	1905	2,281,761
142	Vigsnes	Norway	1907	2,250,000
143	Salt Lake	Utah	1907	2,234,446
144	Centennial	Michigan	1908	2,196,377
145	Paramatta	Australia	1905	2,069,760
146	Peña	Spain	1907	2,036,160
147	Berthin	Bolivia	1903	2,028,232
148	Alverdski	Russia	1903	2,000,000
149	Akhtala	Russia	1903	2,000,000
150	Hadley	Alaska	1906	2,000,000
151	Santa Ines y Morococha	Perú	1905	2,000,000
152	Toldo	Chile	1904	2,000,000
153	New England & Clifton	Arizona	1907	1,981,189
154	Ikuno	Japan	1907	1,979,789
155	Hibira	Japan	1907	1,902,425
156	Yoshioka	Japan	1907	1,894,795
157	Mt. Lyell Blocks	Tasmania	1906	1,846,320
158	Superior	Michigan	1909	1,800,000
159	Hidachi	Japan	1907	1,767,169
160	Mass	Michigan	1908	1,766,920
161	Saddle Mountain	Arizona	1907	1,751,264
162	Braden	Chile	1907	1,750,000
163	Collahuasi	Chile	1907	1,750,000
164	Ramos	Mexico	1905	1,750,000
165	Spassky	Siberia	1907	1,750,000
166	Fenice Massetana	Italy	1905	1,735,020
167	Coro Coro	Bolivia	1907	1,700,000
168	Arakawa	Japan	1907	1,660,998
169	Great Fitzroy	Australia	1907	1,650,000
170	Besa y Ca	Chile	1903	1,644,573

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
171	Arizona Commercial	Arizona	1907	1,638,610
172	Felix Vicuña	Chile	1903	1,613,262
173	Carmen	Chile	1903	1,600,000
174	Hisanichi	Japan	1907	1,588,913
175	Obie	Japan	1907	1,555,929
176	Alaska Industrial	Alaska	1907	1,545,941
177	Atlantic	Michigan	1906	1,539,082
178	Castillo del Buitron	Spain	1906	1,500,000
179	Ani	Japan	1907	1,498,646
180	Nymagee	Australia	1906	1,491,840
181	Suc. C. J. Lambert	Chile	1903	1,481,491
182	Pánuco	Mexico	1902	1,466,059
183	Cochay-Cocha	Perú	1905	1,450,554
184	Ogoya	Japan	1907	1,426,969
185	Indian Queen	Montana	1903	1,400,000
186	Pishminsko-Kluchevski	Russia	1908	1,400,000
187	Rio Tinto Mexicano	Mexico	1907	1,400,000
188	San Miguel	Perú	1907	1,400,000
189	Warrior	Arizona	1907	1,397,612
190	Hirigane	Japan	1907	1,392,280
191	Bede	Spain & Norway	1905	1,370,880
192	Röros	Norway	1907	1,365,000
193	War Eagle	British Columbia	1907	1,350,000
194	Superior & Boston	Arizona	1908	1,350,000
195	Spruce Mountain	Nevada	1907	1,338,198
196	T. Marambio	Chile	1903	1,335,326
197	Stadtberger	Germany	1907	1,322,760
198	Verch-Kysshtim	Russia	1908	1,300,000
199	Victoria	Michigan	1908	1,290,040
200	Las Herrerias	Spain	1907	1,276,800
201	Capanne Vecchie	Italy	1905	1,261,031
202	Galizurski	Russia	1905	1,250,000
203	P. Gonzalez	Chile	1904	1,250,000
204	Kune	Japan	1907	1,250,000
205	Kyshtim	Russia	1908	1,250,000
206	Phillips River	Australia	1907	1,250,000
207	Torreón	Mexico	1907	1,250,000
208	Adventure	Michigan	1907	1,244,874
209	Mt. Andrew	Alaska	1907	1,234,876
210	Santa Fé	New Mexico	1907	1,223,457
211	Winona	Michigan	1907	1,207,237
212	Esperanza	Spain	1907	1,200,000
213	Orito	Chile	1904	1,200,000
214	Makimine	Japan	1907	1,185,297
215	Turgovski	Russia	1902	1,167,500
216	Mt. Cattlin	Australia	1907	1,147,020
217	Eclipse-Argo	Montana	1907	1,124,000
218	Centre Star	British Columbia	1904	1,121,644
219	Queen Bee	Australia	1907	1,104,320
220	Piedras Hnos	Chile	1903	1,080,346
221	Mitterberg	Austria	1906	1,059,520
222	Messina (Transvaal)	Transvaal	1907	1,044,219
223	Beatson's Bonanza	Alaska	1907	1,020,000
224	De Soto	Arizona	1907	1,016,170
225	Kusakura	Japan	1907	1,012,043
226	Anglo-Chilian	Chile	1904	1,000,000
227	Aguascalientes	Mexico	1907	1,000,000
228	Cabezas del Pasto	Spain	1905	1,000,000
229	Crowl Creek-Shuttleton	Australia	1906	1,000,000
230	Ellamar	Alaska	1907	1,000,000

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
231	Maitenes	Chile	1903	1,000,000
232	Sotiel-Coronada	Spain	1907	1,000,000
233	La Viuda	Chile	1903	992,579
234	Kano	Japan	1907	967,451
235	Yusenji	Japan	1907	960,052
236	Sucesion Cerveró	Chile	1903	923,458
237	Arizona Expln. Co.	Arizona	1907	922,268
238	Glassford Creek	Australia	1906	913,366
239	Whim Well	Australia	1907	911,232
240	Llaillai	Chile	1903	900,000
241	Blinman	Australia	1907	898,240
242	Libiola	Italy	1905	875,000
243	Niblack	Alaska	1905	850,000
244	Aljustrel	Portugal	1903	850,000
245	Bullwhacker	Montana	1906	850,000
246	Tacna	Chile	1903	806,839
247	Le Roi No. 2	British Columbia	1906	803,409
248	Komaki	Japan	1904	800,000
249	Equator	Arizona	1905	800,000
250	San Miguel	Spain	1907	797,440
251	Juan Muñoz	Chile	1903	791,958
252	Grafton	Australia	1907	790,840
253	Backus & Johnston	Perú	1907	785,381
254	Miculicich y Valentine	Perú	1904	757,950
255	Brown-Alaska	Alaska & B. C.	1906	750,000
256	San Platon	Spain	1907	750,000
257	Saavedra i Besa	Chile	1903	740,000
258	East Gwanda	Rhodesia	1906	725,000
259	Twin Buttes	Arizona	1906	700,329
260	J. K. Child & Co., Ltd.	Bolivia	1907	700,000
261	Homanzan	Japan	1907	699,331
262	Majestic	Utah	1903	693,600
263	Daly West	Utah	1907	673,890
264	Furokura	Japan	1907	656,893
265	Española de Fundicion	Chile	1904	650,000
266	Grafter	Yukon	1907	650,000
267	Carlos Riesco	Chile	1903	650,000
268	Stora Kopparberg	Sweden	1907	650,000
269	Yamagatatokito	Japan	1906	641,120
270	Altens	Norway	1907	625,000
271	Kap-San	Korea	1906	625,000
272	Nagamatsu	Japan	1907	610,590
273	Geisse Hnos	Chile	1903	603,919
274	Copper King	California	1905	600,000
275	Carreras Hnos	Bolivia	1906	600,000
276	Tacoma Co.	British Columbia	1907	600,000
277	Live Oak	Arizona	1907	588,347
278	Shawmut	Colorado	1907	576,696
279	Verchoturski	Russia	1908	575,000
280	Innai	Japan	1907	573,692
281	Yenisei	Siberia	1907	563,319
282	Cordova	Arizona	1907	528,000
283	Levant	England	1907	527,385
284	Killingdal	Norway	1905	512,960
285	Caucasus	Russia	1905	511,920
286	Omori	Japan	1907	511,419
287	Omodani	Japan	1907	507,189
288	Bufa	Mexico	1905	500,000
289	Edmundian	Port. East Africa	1906	500,000
290	Kargalinski	Russia	1906	500,000

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
291	Kupferplatte	Austria	1905	500,000
292	Magistral	Mexico	1907	500,000
293	Peak Downs	Australia	1907	500,000
294	F. de P. Perez	Chile	1905	500,000
295	Polieff-Systerski	Russia	1908	500,000
296	Tzarevo-Alexandrovski	Siberia	1904	500,000
297	Yelta	Australia	1905	500,000
298	Takilma	Oregon	1906	499,662
299	Standard	Arizona	1907	497,286
300	G. Carvallo	Chile	1903	496,035
301	Mizusawa	Japan	1907	490,047
302	Mt. Hope	Australia	1906	485,280
303	San Luis	Mexico	1905	450,000
304	Astilleros	Chile	1903	450,000
305	Huillca	Perú	1907	444,116
306	Pike Hill	Vermont	1907	425,367
307	Brixlegg	Austria	1907	425,000
308	Funatsu	Japan	1904	425,000
309	Lost Packer	Idaho	1907	425,000
310	Dogamaru	Japan	1907	423,371
311	Duquesne	Arizona	1907	421,487
312	Hamley	Australia	1903	400,000
313	Los Bronces	Chile	1903	400,000
314	Yakuki	Japan	1907	394,490
315	Utah & Eastern	Utah	1907	391,779
316	Gertrudis	Peru	1907	370,372
317	Ideal	Arizona	1907	361,257
318	United Copper Mg. Co	Washington	1908	360,000
319	Tsuboi	Japan	1907	354,855
320	Nichols	Quebec	1908	350,000
321	Ruddygore	Australia	1907	337,276
322	Tasmanian	Australia	1904	337,075
323	Itsuki	Japan	1907	330,262
324	Takara	Japan	1907	327,266
325	Cobar Chesney	Australia	1904	325,000
326	Otto Harnecker	Chile	1904	325,000
327	Mt. Hector	Australia	1907	325,000
328	Nafverberg	Sweden	1905	325,000
329	Monitor	Montana	1906	320,000
330	Nevada-Douglas	Nevada	1907	319,748
331	Oxide	Arizona	1907	319,591
332	Hall	British Columbia	1904	318,124
333	Otto Harnecker	Chile	1903	310,848
334	Sasagatini	Japan	1907	308,358
335	Anaconda	Australia	1906	300,000
336	Etruscan	Italy	1905	300,000
337	Osorio i Ca	Chile	1903	300,000
338	Quintera	Mexico	1907	300,000
339	Yale	British Columbia	1907	300,000
340	Tip Top	Arizona	1906	298,890
341	Girilambone	Australia	1906	293,440
342	Maple Bay	British Columbia	1906	293,269
343	Mihara	Japan	1906	293,045
344	Esperanza	Mexico	1905	275,000
345	J. de C. Ribillo	Chile	1903	275,000
346	Phoenix	Michigan	1905	273,219
347	Oarasawa	Japan	1907	265,730
348	Otori	Japan	1907	264,526
349	José R. Espinoza	Chile	1903	264,243
350	American-Mexico	Mexico	1904	261,531

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
351	Francisco Greve G.	Chili	1903	254,477
352	Iwaya	Japan	1907	252,971
353	Bundarra	Australia	1907	250,000
354	Burra Burra	Australia	1904	250,000
355	Carisa	Utah	1906	250,000
356	Chewelah Copper King	Washington	1907	250,000
357	Durazno	Chile	1903	250,000
358	Lynda	Australia	1905	250,000
359	Standard	California	1906	250,000
360	Rambler	Wyoming	1903	249,196
361	Arizona United	Arizona	1907	245,040
362	Hirotani	Japan	1907	237,587
363	Burnie	Tasmania	1906	236,880
364	Vidal i Videla	Chile	1903	233,044
365	Takara	Japan	1907	231,838
366	Churruca	Perú	1903	228,683
367	Sawatari	Japan	1903	227,684
368	Aïn-Barbar	Algeria	1906	225,000
369	Wissener	Germany	1905	225,000
370	Bonanza Belt	Arizona	1907	220,840
371	Daiji	Japan	1907	219,650
372	Mendoza y Ca.	Mexico	1903	218,874
373	A. Vannoni	Perú	1907	216,050
374	Monterey S. & R. Co	Mexico	1903	215,568
375	Keystone	Arizona	1907	208,801
376	New Anniversary	Australia	1907	208,320
377	Natividad	Perú	1907	204,938
378	Cucharas	Mexico	1903	200,618
379	Copper Belle	Arizona	1908	200,000
380	Francisco Vergara I.	Chile	1903	200,000
381	Weimer	Idaho	1907	200,000
382	Kokusei	Japan	1907	196,929
383	Ota	Japan	1907	195,665
384	Ate	Japan	1907	194,305
385	Tsubaki	Japan	1907	192,845
386	Helvetia	Arizona	1907	191,666
387	Coahuila	Mexico	1903	178,865
388	Ray Central	Arizona	1907	178,516
389	Capillitas	Argentina	1905	176,960
390	Silver Spur	Australia	1907	176,960
391	J. M. Echevarria	Chile	1904	175,000
392	Maximilian	Germany	1905	175,000
393	Merisski	Russia	1905	175,000
394	Wanibuchi	Japan	1907	175,000
395	Oregon S. & R. Co	Oregon	1905	174,458
396	Mineral Hill	Arizona	1907	169,538
397	Nishinokawa	Japan	1907	166,156
398	Castellanos y Ca.	Chile	1905	165,000
399	Huanchaca	Bolivia	1907	160,000
400	Pikedale	Australia	1907	160,000
401	Rosario i Providencia	Chile	1903	160,000
402	Boston & Corbin	Montana	1907	157,000
403	Ajax	Utah	1907	150,000
404	Gulf Creek	Australia	1906	150,000
405	Irvinebank	Australia	1906	150,000
406	Utsonomiya	Japan	1907	150,000
407	Huachuamachay	Perú	1906	149,030
408	Unekura	Japan	1907	145,979
409	Yaeger Cañon	Arizona	1907	145,849
410	Kanasaka	Japan	1907	143,346
411	Kanayama	Japan	1907	142,743

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PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(*Pounds Avoirdupois.*)

No.	Mine or Company.	Location.	Year.	Output.
412	Queenslander	Australia	1907	142,260
413	Mt. Elliott	Australia	1906	140,000
414	Vancouver	British Columbia	1907	140,000
415	Mt. Cannindah	Australia	1906	139,776
416	L. A. Proaño	Perú	1907	139,551
417	Northern Territories	Australia	1904	136,640
418	Eureka Hill	Utah	1904	134,000
419	Okuzu	Japan	1907	132,412
420	Commercial Mg. Co.	Arizona	1907	125,598
421	Awaya-Ikeda	British Columbia	1907	125,000
422	Lorenzo Mena	Chile	1903	125,000
423	North American	Missouri	1907	125,000
424	Peñuelas	Spain	1907	125,000
425	Soto	Spain	1907	125,000
426	Bogan River	Australia	1906	124,440
427	José Larraguibel	Chile	1903	123,457
428	Keweenaw	Michigan	1908	122,474
429	Standard	Alaska	1907	120,000
430	Mozumi	Japan	1906	119,044
431	Marinovitch y Linguardo	Perú	1904	118,956
432	N. Azalia	Perú	1907	115,609
433	Tsunatori	Japan	1907	114,411
434	Culgoa	Australia	1906	114,388
435	True Blue	Australia	1906	112,000
436	Kitsunezuka	Japan	1907	111,129
437	Gila Valley	Arizona	1907	110,859
438	Silver Queen	Arizona	1907	108,027
439	Puquios	Chile	1907	104,000
440	Tomobuchi	Japan	1907	101,191
441	Amazon-Butte	Montana	1907	100,000
442	Akutozawa	Japan	1908	100,000
443	Cons. White Bear	British Columbia	1907	100,000
444	Cootamundra	Australia	1907	100,000
445	Copper Butte	Arizona	1907	100,000
446	Eureka	British Columbia	1907	100,000
447	Flag	Australia	1907	100,000
448	Suc. Francisco Geisse	Chile	1903	100,000
449	Great Australian	Australia	1907	100,000
450	Karatoya	Japan	1907	100,000
451	Marcionelle y Hanza	Perú	1905	100,000
452	Mona y Paris	Wales	1905	100,000
453	Reins	Montana	1907	100,000
454	Subeni	Natal	1907	100,000
455	Yakuwoji	Japan	1907	100,000
456	Yukon-Pueblo	Yukon	1907	100,000

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AMERICAN COPPER PRODUCTION.

(*Long Tons.*)

Year.	United States Total Production	Michigan		Montana		Arizona	
		Production	Per cent of total	Production	Per cent of total	Production	Per cent of total
1850	650	572	88	.....	..	.....	..
1851	900	779	86	.....	..	.....	..
1852	1,100	792	72	.....	..	.....	..
1853	2,000	1,297	65	.....	..	.....	..
1854	2,250	1,819	81	.....	..	.....	..
1855	3,000	2,593	86	.....	..	.....	..
1856	4,000	3,666	91	.....	..	.....	..
1857	4,800	4,255	88	.....	..	.....	..
1858	5,500	4,088	74	.....	..	.....	..
1859	6,300	3,985	63	.....	..	.....	..
1860	7,200	5,388	74	.....	..	.....	..
1861	7,500	6,713	89	.....	..	.....	..
1862	9,000	6,065	67	.....	..	.....	..
1863	8,500	5,797	68	.....	..	.....	..
1864	8,000	5,576	69	.....	..	.....	..
1865	8,500	6,410	75	.....	..	.....	..
1866	8,900	6,138	69	.....	..	.....	..
1867	10,000	7,824	78	.....	..	.....	..
1868	11,600	9,346	80	.....	..	.....	..
1869	12,500	11,886	95	.....	..	.....	..
1870	12,600	10,992	87	.....	..	.....	..
1871	13,000	11,942	91	.....	..	.....	..
1872	12,500	10,961	87	.....	..	.....	..
1873	15,500	13,433	86	.....	..	.....	..
1874	17,500	15,327	87	.....	..	.....	..
1875	18,000	16,089	89	.....	..	.....	..
1876	19,000	17,085	89	.....	..	.....	..
1877	21,000	17,422	83	.....	..	.....	..
1878	21,500	17,719	82	.....	..	.....	..
1879	23,000	19,129	83	.....	..	.....	..
1880	27,000	22,204	82	.....	..	.....	..
1881	32,000	74,363	76	.....	..	.....	..
1882	40,467	25,439	62	.....	..	.....	..
1883	51,574	26,653	51	11,011	21	10,658	21
1884	64,708	30,961	47	19,256	30	11,935	18
1885	74,052	32,209	43	30,267	41	10,137	14
1886	70,430	36,124	51	25,362	36	6,990	10
1887	81,017	33,941	42	35,133	43	7,910	10
1888	101,054	38,604	38	43,704	43	14,195	14
1889	101,239	39,364	38	43,849	43	13,654	13
1890	115,966	45,273	39	50,437	43	15,534	13
1891	126,839	50,992	40	50,028	39	17,800	14
1892	154,018	54,999	36	72,860	47	17,160	11
1893	147,033	50,270	34	69,290	47	19,200	13
1894	158,120	51,031	32	81,729	52	19,873	13
1895	169,917	57,737	34	84,900	50	21,408	13
1896	205,384	63,418	31	99,071	48	32,560	16
1897	220,571	63,706	29	102,807	47	36,398	17
1898	235,050	66,056	28	92,041	39	49,624	21
1899	253,870	65,603	26	100,503	40	59,399	23
1900	269,111	63,461	24	120,865	45	52,820	20
1901	268,522	69,501	26	102,620	38	58,383	22
1902	294,297	76,050	26	128,975	44	53,546	18
1903	311,582	85,848	27	121,677	39	65,914	21
1904	362,739	93,001	26	133,176	38	85,179	23
1905	402,704	102,874	25	140,514	35	105,316	26
1906	409,414	102,514	25	131,563	32	117,216	29
1907	386,655	96,480	25	100,118	26	114,633	30
1908	420,953	99,408	23	112,724	27	129,251	30

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UNITED STATES COPPER PRODUCTION BY STATES.

(Based on figures of United States Geological Survey.)

(*Pounds Avoirdupois.*)

State.	1904.	1905.	1906.	1907.	1908.
Alaska	2,043,586	4,900,866	8,685,646	7,034,763	4,438,836
Arizona	191,602,958	235,908,150	262,566,103	256,778,437	289,523,267
California	28,529,023	16,697,489	28,153,202	33,696,602	39,643,835
Colorado	9,506,944	9,404,830	7,427,253	13,998,496	13,943,878
Idaho	2,158,858	7,321,585	8,578,046	9,216,299	7,256,086
Michigan	208,355,935	230,437,992	229,632,608	216,116,747	222,647,918
Montana	298,314,804	314,750,582	294,701,252	224,263,789	252,503,651
Nevada	.....	413,292	1,090,635	1,998,789	12,241,372
New Mexico	5,368,666	5,334,192	7,099,842	10,140,140	4,991,351
North Carolina	.....	.....	582,209	544,040	29,391
Oregon	.....	.....	545,859	518,694	271,191
South Dakota	100,000	38	.....	.....	5,471
Tennessee	.....	.....	17,809,442	19,745,119	19,710,103
Utah	47,062,889	58,153,393	50,329,119	66,418,370	71,370,370
Vermont	.....	.....	240,315	696,102	.....
Washington	363,694	223,328	290,823	122,263	162,201
Wyoming	5,565,629	2,530,531	106,177	3,026,004	2,416,197
East & South	1,211,086	15,134,960	149,102	147,663	173,490
Miscellaneous	120,118	846,615	647,583	1,356,051	1,580,831
Totals	812,563,954	902,057,843	918,635,216	865,818,368	942,936,449
From imported ores and mattes	38,947,772	50,105,300	191,370,022	163,519,756	218,705,487
Grand Totals	851,511,726	952,163,143	1,110,005,238	1,029,338,124	1,161,641,936

LAKE SUPERIOR COPPER PRODUCTION BY MINES.

(*Pounds Avoirdupois.*)

	1904.	1905.	1906.	1907.	1908
Adventure	1,380,480	1,606,208	1,552,628	1,244,874	90,870
Ahmeek	376,687	1,552,957	3,077,507	5,510,985	6,280,241
Alloues	.....	1,167,957	3,486,900	2,934,116	3,047,051
Atlantic	5,321,859	4,049,731	1,439,082	.....	.....
Baltic	12,177,729	14,384,684	14,397,557	16,704,868	17,724,854
Calumet & Hecla	80,341,019	95,100,610	100,023,420	83,863,116	81,660,723
Centennial	641,294	1,446,584	2,253,015	2,373,572	2,196,377
Champion	12,212,954	15,707,426	16,954,986	16,489,436	17,786,763
Franklin	4,771,050	4,206,085	4,571,570	4,401,248	3,703,421
Isle Royale	2,442,905	2,973,761	2,937,098	2,667,608	3,011,664
Keweenaw	.....	.....	.....	.....	122,474
Mass	2,182,931	2,007,950	2,106,739	2,078,677	1,766,930
Michigan	2,746,127	2,891,796	2,875,341	2,665,404	3,000,206
Mohawk	8,149,515	9,387,614	9,352,252	10,107,266	10,295,881
Osceola	20,472,429	18,938,965	18,588,451	14,134,753	21,250,794
Phœnix	1,162,201	273,219	.....	.....	.....
Quincy	18,343,160	18,827,557	16,194,838	19,796,058	20,600,361
Tamarack	14,961,885	15,824,008	9,832,644	11,078,604	12,806,127
Tecumseh	.....	.....	58,008	* 60,000	.....
Trimountain	10,211,230	10,476,462	9,507,933	8,190,711	6,034,908
Victoria	.....	.....	546,334	1,207,237	1,290,040
Winona	646,025	.....	278,182	1,285,863	.....
Wolverine	9,764,455	9,464,418	9,548,123	9,272,351	9,955,233
Miscellaneous	* 50,000	* 150,000	* 50,000	* 50,000	*50,000
Totals	208,355,935	230,437,992	229,632,608	216,116,747	222,674,918

*Estimated.

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PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.

Year.	Gross product fine copper (Pounds).	Gross value of production (Dollars).	Total dividends paid (Dollars).	Percentage of dividends to gross value.	Dividends per pound of copper (Cents).
1845.....	24,880	5,000	.....	....	.....
1846.....	58,240	10,000	.....	....	.....
1847.....	297,120	55,000	.....	....	.....
1848.....	1,032,640	200,900	.....	....	.....
1849.....	1,505,280	336,000	60,000	17.0	3.98
1850.....	1,281,280	286,000	84,000	29.0	6.55
1851.....	1,744,960	289,500	60,000	12.0	3.43
1852.....	1,774,080	396,000	60,000	15.0	3.38
1853.....	2,905,280	648,500	90,000	14.0	3.09
1854.....	4,074,560	909,500	198,000	21.0	4.85
1855.....	5,809,334	1,586,160	168,000	10.0	2.89
1856.....	8,217,392	2,218,320	380,000	17.0	4.62
1857.....	9,530,830	2,382,500	480,000	20.0	5.03
1858.....	9,159,916	2,129,235	460,000	21.0	5.00
1859.....	8,937,995	1,950,355	360,000	18.0	4.02
1860.....	12,068,375	2,654,960	120,000	5.0	0.99
1861.....	15,182,837	3,487,995	260,000	7.0	1.70
1862.....	13,586,318	3,634,255	440,000	12.0	3.23
1863.....	12,985,444	4,415,600	720,000	16.0	5.54
1864.....	12,491,965	5,870,300	1,150,000	19.0	9.20
1865.....	14,358,592	5,635,515	510,000	9.0	3.55
1866.....	13,750,063	4,629,375	170,000	3.7	1.23
1867.....	17,515,607	4,442,841	110,000	2.4	0.63
1868.....	20,934,124	4,940,424	100,000	2.0	0.47
1869.....	26,625,301	6,230,016	210,000	3.4	0.78
1870.....	24,622,759	5,096,752	700,000	13.0	2.86
1871.....	25,746,448	5,728,485	1,640,000	29.0	6.34
1872.....	24,553,523	7,979,400	3,080,000	38.0	11.54
1873.....	30,291,505	8,726,100	2,330,000	27.0	7.69
1874.....	34,334,389	8,009,356	1,940,000	24.0	5.06
1875.....	36,039,497	8,180,625	1,920,000	23.0	5.32
1876.....	38,270,997	7,998,430	1,870,000	23.0	4.88
1877.....	39,026,671	7,327,880	1,840,000	25.0	4.71
1878.....	41,687,266	6,920,540	1,860,000	27.0	4.46
1879.....	42,671,529	7,327,350	1,818,620	25.0	4.26
1880.....	49,718,337	9,947,673	3,080,000	30.9	6.19
1881.....	54,548,909	9,971,702	2,665,000	26.7	4.88
1882.....	57,155,980	10,522,416	2,850,000	27.1	4.99
1883.....	59,702,404	9,457,853	2,670,000	28.1	4.47
1884.....	69,353,202	9,494,306	1,327,500	12.9	1.91
1885.....	72,147,889	7,942,597	1,970,000	24.8	2.73
1886.....	80,918,460	8,788,476	1,900,000	21.5	2.34
1887.....	76,028,697	8,530,342	1,370,000	16.1	1.80
1888.....	86,472,034	14,510,001	3,260,000	22.4	3.77
1889.....	88,175,675	11,894,942	2,670,000	22.4	3.03
1890.....101,410,277		15,819,960	3,415,000	21.6	3.36
1891.....114,222,709		14,574,727	3,540,000	24.3	3.10
1892.....123,198,460		12,431,624	3,260,000	26.2	2.64
1893.....112,605,078		12,105,145	3,520,000	29.1	3.12
1894.....114,308,870		10,852,122	2,380,000	21.9	2.08
1895.....129,330,749		13,877,109	3,280,000	23.6	2.54
1896.....142,057,500		15,758,935	3,985,000	25.3	2.80
1897.....142,702,586		16,530,843	5,431,000	32.8	3.80

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PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER. (Continued.)

Year.	Gross product fine copper (Pounds).	Gross value of production (Dollars).	Total dividends paid (Dollars).	Percentage of dividends to gross values.	Dividends per pound of copper (Cents).
1898	147,965,738	17,829,871	6,857,250	38.4	4.63
1899	146,950,338	26,098,382	12,318,450	47.2	8.39
1900	142,151,571	23,691,928	9,811,200	41.3	6.90
1901	155,716,848	26,038,857	7,496,900	28.8	4.81
1902	170,325,598	20,711,592	3,440,000	16.6	2.02
1903	192,299,191	26,383,449	4,980,000	18.8	2.59
1904	208,355,935	27,107,107	5,432,300	20.0	2.64
1905	230,437,992	36,616,586	9,224,600	25.2	4.02
1906	229,632,608	43,044,732	13,911,500	30.9	6.07
1907	216,116,747	43,319,940	13,469,950	31.1	6.23
1908	222,674,918	30,239,253	4,837,300	16.0	2.17
Totals	4,669,099,701	$666,520,748	$169,541,570	25.4	3.63

The average price received for all Lake Superior copper, from 1845 to 1907, inclusive, was 13.86 cents per pound, with average dividends of 3.7 cents per pound, leaving an estimated cost of 10.16 cents for all years. While this may be accepted as an arbitrary figure, the cost might be figured much higher, or materially higher. By adding $60,000,000 to the cost of production, for money lost in unproductive ventures, the cost of copper produced would be made almost exactly 11.5 cents per pound. By adding another $15,000,000 for assessments on mines that have since repaid in dividends the original assessments, cost of copper would be increased to about 11.85 cents per pound, leaving a net margin of profit, for the entire production, of almost exactly 2 cents per pound, plus the present aggregate values of the mines, which would be about equal to total dividend disbursements to date, or about 3.7 cents per pound.

Omitting the production of mines that have not proven profitable, the average cost of copper produced by dividend-paying Lake Superior mines probably has been about 9.5 cents per pound, for all years.

AMERICAN COPPER IMPORTS.

The following table, showing imports of copper, in various forms, into the United States, is summarized from the official figures of the United States government. The government statisticians have seen fit to vary the methods employed in presenting these figures, from time to time, but the present plan of giving contents in fine copper of imported ore and matte is preferable to the old plan of giving actual weight of imported ore and matte:

(*Pounds Avoirdupois.*)

Year.	Copper Contents. Ore & Matte.	Raw Copper.	Old Copper.	Total Fine Copper.
1890	3,448,237	5,189	284,789	3,960,053
1891	8,931,554	2,556	134,407	11,472,436
1892	7,669,978	22,097	71,485	8,066,647
1893	7,256,015	554,348	59,375	11,045,297
1894	4,804,614	606,415	160,592	11,445,441
1895	5,300,000	7,979,322	1,336,901	14,616,223
1896	5,900,000	9,074,379	2,422,554	17,396,933
1897	12,000,000	12,646,552	1,780,390	28,923,098
1898	19,750,000	5,892,944	1,986,133	73,916,467
1899	23,800,000	64,282,583	6,678,145	95,722,340
1900	36,380,000	62,404,489	3,354,756	105,176,808
1901	64,000,000	71,001,713	2,818,757	137,826,406
1902	40,000,000	112,420,253	2,119,031	194,501,757
1903	32,000,000	133,472,398	3,235,597	168,707,995
1904	38,947,772	142,344,433	4,000,000	181,292,205
1905	50,105,300	156,358,243	4,561,142	210,724,685
1906	49,034,891	176,558,390	6,487,226	225,843,281
1907	59,718,787	192,901,267	.....	252,620,054
1908	56,481,343	162,224,144	.....	218,705,487

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AMERICAN COPPER EXPORTS.

The United States government estimates of exports of copper, including ingot and various forms of refined copper, matte, blister copper and ores, and manufactured products, are as follows:

(*Pounds Avoirdupois.*)

Year Ending—	Ore and Matte.	Refined.	Value.
June 30, 1864	10,958,100	102,831	$ 432,570
1865	22,519,700	1,572,382	1,544,870
1866	21,508,000	123,444	936,211
1867	8,773,100	4,637,867	791,901
1868	9,261,200	1,350,896	922,409
1869	12,141,800	1,134,360	592,698
1870	1,919,800	2,214,658	1,042,246
1871	5,444,500	581,650	915,431
1872	3,556,400	267,868	287,735
1873	4,525,200	38,958	259,076
1874	1,332,600	503,160	467,208
1875	5,130,500	5,123,470	1,815,266
1876	1,530,400	14,304,160	3,526,410
1877	2,143,200	13,461,553	3,023,394
1878	3,294,700	11,297,876	2,488,921
1879	2,307,000	17,207,739	2,933,205
1880	2,162,300	4,206,258	849,218
1881	995,800	4,865,407	876,395
1882	2,593,600	3,340,531	748,456
1883	11,292,300	8,221,363	2,348,004
1884	38,614,000	17,044,760	5,595,859
1885	43,230,000	44,731,858	10,187,024
Dec. 31, 1886	41,752,000	19,553,421	4,380,322
1887	50,128,000	12,471,393	4,114,456
1888	79,496,000	31,706,527	11,897,240
1889	81,850,000	16,813,410	10,209,722
1890	43,141,100	10,971,899	5,918,395
1891	67,212,000	69,279,024	15,703,543
1892	94,304,000	30,515,736	10,162,870
1893	83,504,000	138,984,128	18,935,497
1894	8,704,000	162,393,000	16,143,094
1895	27,648,000	121,328,390	14,938,309
1896	41,426,500	259,223,924	31,035,211
1897	18,128,000	277,255,742	32,755,053
1898	18,686,000	291,955,905	35,545,251
1899	7,454,000	246,826,331	43,485,654
1900	20,014,000	337,973,751	58,875,439
1901	24,602,592	194,249,828	36,071,448
1902	40,398,400	354,668,849	46,811,729
1903	27,531,840	310,729,524	44,365,155
1904	42,396,480	554,550,030	74,816,934
1905	84,421,320	534,907,619	86,408,731
1906	106,666,560	454,752,018	
1907	222,075,840	508,929,401	
1908	141,453,760	661,876,127	

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AMERICAN COPPER EXPORTS BY DESTINATIONS.

(*Pounds Avoirdupois.*)

Destination.	1900.	1905.	1907.	1908.
Holland	101,398,394	130,675,386	156,562,270	195,562,619
Germany	67,348,848	104,575,864	107,575,864	137,453,392
France	67,725,989	74,604,044	93,075,145	115,690,381
Great Britain	63,522,445	60,945,794	81,409,441	117,810,314
Italy	5,550,285	15,800,967	21,192,908	25,512,267
Russia	5,650,423	18,418,982	4,341,386	4,657,077
Belgium	12,554,191	4,997,206	3,822,551	5,560,366
China	.....	79,940,250	10,003,592	13,735,899
British North America	1,616,778	3,019,450	3,747,410	3,977,142
Mexico	296,684	290,763	362,411	35,895
Miscellaneous Europe	11,258,115	25,279,162	26,221,024	39,433,674
Miscellaneous	1,051,599	16,359,751	493,873	2,447,101
Totals	337,973,751	534,907,619	508,929,401	661,876,127

AMERICAN COPPER EXPORTS BY PORTS.

(*Pounds Avoirdupois.*)

Ports.	1900.	1903.	1904.	1905.
New York	230,178,643	211,879,055	360,644,287	332,569,733
Baltimore	86,264,231	88,296,071	171,386,493	160,006,001
Puget Sound	.....	3,698	62,789	28,352,769
Newport News	2,016,000	1,969,177	7,626,951	6,002,955
Philadelphia	12,468,680	3,845,307	9,718,814	2,486,003
New Orleans	3,937,350	3,014	121,835	1,208,926
Detroit	469,819	611,327	1,187,706	1,032,541
Port Huron	149,525	261,820	532,841	597,712
Boston	1,496,387	512,053	838,321	383,811
Burlington, Vt	678,589	491,921	700,561	264,377
Norfolk	.....	1,771,993	560,536	.....
Miscellaneous	314,527	1,087,786	1,231,685	2,002,791
Totals	337,973,751	310,729,524	554,550,030	534,907,619

AMERICAN COPPER SUPPLY.

(*Pounds Avoirdupois.*)

Year.	Domestic Production.	Imports.	Total Supply.	Exports.	Net Supply.
1892	344,998,679	8,066,647	353,065,326	96,515,736	256,549,590
1893	329,354,398	11,045,297	340,399,695	188,984,128	151,415,567
1894	354,188,374	11,445,441	365,633,815	168,143,000	197,490,815
1895	380,613,404	14,616,223	395,229,627	136,528,390	258,701,237
1896	460,061,430	17,297,272	477,358,702	282,105,860	195,252,842
1897	494,078,274	28,578,420	522,656,694	288,662,340	233,994,354
1898	526,512,987	73,916,467	600,429,454	321,023,873	279,405,581
1899	568,666,921	95,722,340	664,389,261	252,876,480	411,512,781
1900	606,117,166	105,176,808	711,293,974	348,402,853	362,891,121
1901	602,072,519	137,826,406	739,898,925	222,137,911	517,761,014
1902	659,225,014	194,501,757	853,726,771	354,668,849	499,057,922
1903	729,943,131	168,707,995	898,651,126	310,729,524	587,921,602
1904	812,537,267	181,292,205	993,829,472	554,550,030	439,279,442
1905	902,057,843	210,724,685	1,112,782,528	534,907,619	577,874,909
1906	917,086,889	225,843,281	1,142,930,170	454,752,018	688,178,152
1907	865,818,368	238,031,320	1,103,849,688	508,924,401	594,925,287
1908	942,936,449	218,705,487	1,161,641,936	661,876,127	499,765,809

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AMERICAN COPPER TRADE.

1897-1908.

This table, compiled from the figures of the Metallegesellschaft und Metallurgische Gesellschaft A.-G., of Frankfort-on-Main, gives all figures in round hundreds of tons:

(*Metric Tons.*)

Year.	Production.	Imports.	Total Supply.	Gross Exports.	Net Supply.	Consumption
1897	224,100	12,200	236,300	130,900	105,400	117,400
1898	238,900	34,700	273,600	145,600	128,000	120,500
1899	258,000	46,500	304,500	114,600	189,900	169,000
1900	275,000	47,300	322,300	157,900	164,400	168,400
1901	273,000	80,100	353,100	100,800	252,300	189,800
1902	299,200	73,400	372,600	171,200	201,400	213,400
1903	316,600	75,900	392,500	145,400	247,100	236,100
1904	368,600	82,200	450,800	257,400	193,400	211,400
1905	395,300	95,700	491,000	250,300	240,700	276,300
1906	415,000	102,500	517,500	215,000	302,500	300,000
1907	405,900	115,000	520,000	243,300	276,700	232 600
1908	431,900	99,200	531,100	308,500	222,600	210,600

BRITISH AND FRENCH STOCKS OF COPPER.

This table, based on the compilations of Messrs. Henry R. Merton & Co., Ltd., of London, gives estimates of the stocks of refined copper on hand in Great Britain and France on the first day of each year named. The "visible supply" given in the last column includes also shipments afloat from Chile and Australia to European ports:

(*Long Tons.*)

Year.	Public Stocks.	Increase.	Decrease.	Visible Supply.
1888	35,001	.....	.....	.....
1889	96,198	61,197	.....	104,105
1890	94,942	.....	1,256	98,847
1891	62,449	.....	32,493	65,366
1892	53,486	.....	8,963	56,044
1893	51,556	.....	1,930	55,745
1894	43,428	.....	8,128	47,295
1895	51,575	8,147	.....	54,664
1896	43,604	.....	7,971	45,817
1897	31,776	.....	11,828	34,927
1898	27,895	.....	3,881	31,955
1899	22,346	.....	5,549	27,896
1900	17,517	.....	4,829	22,817
1901	24,435	6,918	.....	28,860
1902	15,701	.....	8,734	22,051
1903	11,215	.....	4,486	16,540
1904	5,601	.....	5,614	13,851
1905	10,009	4,408	.....	16,734
1906	5,683	.....	4,326	12,983
1907	9,324	3,641	.....	16,924
1908	13,060	3,736	.....	19,710
1909	46,227	33,167	.....	55,677
1910	101,972	55,745	.....	109,022

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ENGLISH COPPER TRADE.

(*Long Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption
1880	3,662	92,734	96,396	59,482	36,914	.....
1881	3,875	86,227	90,102	61,689	28,413	.....
1882	3,464	93,875	97,339	55,683	41,656	.....
1883	2,620	99,146	101,766	59,350	42,416	.....
1884	3.350	109,390	112,740	64,691	48,049	.....
1885	2,733	123,549	126,282	62,080	64,202	.....
1886	1,471	108,015	109,486	60,511	48,975	.....
1887	389	103,089	103,478	69,453	34,025	.....
1888	1,456	135,470	136,926	72,066	64,860	3,667
1889	905	139,983	140,888	75,627	65,261	66,513
1890	935	141,249	142,184	89,747	52,437	84,930
1891	900	138,616	139,515	76,056	63,459	72,422
1892	495	134,371	134,866	82,542	52,324	54,254
1893	425	129,832	130,257	70,986	59,271	67,399
1894	445	125,008	125,453	54,689	70,764	62,617
1895	580	119,941	120,521	65,990	54,531	62,502
1896	580	135,856	136,436	59,334	57,102	61,370
1897	518	136,555	137,073	56,542	80,531	86,245
1898	640	139,704	140,344	63,256	77,088	81,312
1899	637	141,610	142,247	75,271	66,976	61,042
1900	765	154,941	155,706	56,997	98,709	105,586
1901	532	149,578	150,110	70,396	79,714	83,935
1902	482	160,201	160,683	69,156	91,527	97,639
1903	536	132,926	133,462	76,305	57,157	54,050
1904	493	157,897	158,390	73,447	84,943	88,039
1905	700	155,200	155,900	77,800	78,100	74,578
1906	700	145,400	146,100	66,300	79,800	76,159
1907	700	153,100	153,800	42,800	111,000	88,300
1908	700	193,000	193,700	34,400	159,300	128,900

FRENCH COPPER TRADE.

The following table is based upon the compilations of the Metallegesellschaft und Metallurgische Gesellschaft A.-G.:

(*Metric Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption
1892	6,400	24,154	30,554	2,116	28,438	25,580
1893	6,600	26,060	32,660	2,204	30,456	28,596
1894	6,400	26,756	33,156	2,467	30,689	28,854
1895	8,245	32,656	40,901	3,163	37,738	32,388
1896	6,544	40,136	46,680	3,456	43,224	35,099
1897	7,400	48,028	55,428	3,559	51,868	43,100
1898	7,800	45,575	53,375	4,044	49,331	39,700
1899	6,600	49,515	56,115	6,882	49,233	42,600
1900	6,400	51,962	58,362	5,736	52,626	46,500
1901	7,000	41,196	48,196	5,122	43,074	34,300
1902	7,300	49,094	56,394	3,485	52,909	43,900
1903	6,900	46,834	53,734	4,658	49,076	42,700
1904	6,900	56,526	63,426	5,369	58,057	45,300
1905	6,200	56,500	62,700	6,600	56,100	50,200
1906	7,100	64,700	71,800	6,100	65,700	58,100
1907	7,500	62,800	70,30	4,900	65,400	65,000
1908	8,000	74,400	82,400	5,200	77,200	73,900

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GERMAN COPPER TRADE.

The following table is based upon the compilations of the Metallegesellschaft und Metallurgische Gesellschaft A.-G.:

(*Metric Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption
1884	18,113	13,819	31,932	6,906	25,026	25,000
1885	19,928	13,168	33,096	5,706	27,390	27,250
1886	19,314	11,913	31,227	6,510	24,717	25,000
1887	20,192	12,427	32,619	5,154	27,465	27,250
1888	21,017	8,082	29,099	4,530	24,569	24,500
1889	24,160	29,643	53,803	7,135	46,668	46,500
1890	24,427	31,408	55,835	8,428	47,407	47,000
1891	24,092	34,182	58,274	6,247	52,027	52,000
1892	24,781	32,498	57,279	6,598	50,681	50,000
1893	24,011	38,455	62,466	7,517	54,949	55,000
1894	25,722	37,032	62,754	6,609	56,145	56,000
1895	25,777	44,365	70,142	6,329	63,813	64,000
1896	29,319	56,814	86,133	5,996	80,137	80,000
1897	29,408	67,573	96,981	7,183	89,798	90,000
1898	30,695	73,291	103,986	6,972	97,014	97,000
1899	34,634	70,091	104,725	7,061	97,664	98,000
1900	30,929	83,503	114,432	5,505	108,927	107,000
1901	31,317	58,620	89,937	5,097	84,840	85,000
1902	30,578	76,050	106,628	4,678	101,950	100,000
1903	31,214	83,261	114,475	4,333	110,142	110,000
1904	30,264	110,231	140,495	4,223	136,272	135,000
1905	31,717	102,218	133,935	5,958	127,977	130,000
1906	32,275	126,066	158,341	7,243	151,098	150,000
1907	31,854	124,072	155,926	6,112	149,814	150,000
1908	30,001	157,434	187,435	6,778	180,657	175,000

AUSTRO-HUNGARIAN COPPER TRADE.

The following table is based on the figures of the Metallegesellschaft und Metallurgische Gesellschaft A.-G.:

(*Metric Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption.
1892	1,295	8,644	9,939	342	9,597	.....
1893	1,396	11,822	13,218	434	12,784	.....
1894	1,726	13,383	15,109	255	14,854	.....
1895	1,276	11,747	13,023	151	12,872	.....
1896	1,366	13,666	15,032	228	14,804	.....
1897	1,426	15,926	17,352	159	17,193	17,000
1898	1,343	17,442	18,785	173	18,612	18,300
1899	1,479	16,185	17,664	534	17,130	16,500
1900	1,200	18,970	20,170	471	19,699	18,700
1901	1,150	17,504	18,654	435	18,219	18,200
1902	1,350	18,256	19,606	436	19,170	19,200
1903	1,400	18,704	20,104	1,226	18,878	18,700
1904	1,463	22,532	23,995	747	23,248	23,100
1905	1,439	22,535	23,974	1,253	22,721	21,900
1906	1,457	24,488	25,945	1,271	24,674	24,200
1907	1,066	26,181	27,247	619	26,628	26,500
1908	1,338	33,259	34,597	1,125	33,472	33,000

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RUSSIAN COPPER TRADE.

This table is based upon the compilations of the Metallegesellschaft und Metallurgische Gesellschaft A.-G.:

(*Metric Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption.
1892	4,978	6,568	11,546	.....	11,546	11,500
1893	5,100	8,756	13,856	.....	13,856	13,750
1894	5,409	6,666	12,075	.....	12,075	12,250
1895	5,854	8,100	13,954	.....	13,954	14,000
1896	5,832	12,433	18,265	.....	18,265	18,000
1897	6,941	12,507	19,448	.....	19,448	19,500
1898	7,291	14,450	21,741	.....	21,741	22,000
1899	7,533	11,100	18,633	.....	18,633	18,500
1900	8,100	12,300	20,400	.....	20,400	20,500
1901	8,100	10,900	19,000	.....	19,000	19,000
1902	8,800	17,500	26,300	.....	26,300	26,250
1903	10,500	14,450	24,950	.....	24,950	25,000
1904	10,900	20,300	31,200	.....	31,200	31,250
1905	8,900	18,700	27,600	.....	27,600	27,500
1906	10,600	16,000	26,600	400	26,200	26,000
1907	15,000	4,500	19,500	1,500	18,000	18,000
1908	16,800	4,800	21,600	20	21,580	21,000

ITALIAN COPPER TRADE.

This table is based upon the compilations of the Metallegesellschaft und Metallurgische Gesellschaft A.-G.:

(*Metric Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption.
1892	2,564	2,139	4,703	168	4,535	4,500
1893	2,371	3,043	5,414	157	5,257	5,250
1894	2,670	3,706	6,376	32	6,344	6,250
1895	2,375	4,350	6,725	84	6,641	6,750
1896	2,842	4,509	7,351	383	6,968	7,000
1897	2,980	5,032	8,012	222	7,790	7,750
1898	3,230	5,028	8,258	462	7,796	8,000
1899	3,032	5,006	8,038	1,355	6,683	6,500
1900	2,797	6,224	9,021	676	8,345	6,250
1901	3,483	5,982	9,465	100	9,365	9,500
1902	3,863	7,050	10,913	165	10,748	10,500
1903	3,620	6,096	9,716	162	9,554	9,750
1904	3,593	11,492	15,085	180	14,905	15,000
1905	3,578	13,795	17,373	170	17,203	17,250
1906	3,600	15,350	18,950	450	18,500	18,250
1907	4,000	21,000	25,000	300	24,700	25,000
1908	4,000	19,623	23,623	172	23,451	23,000

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MISCELLANEOUS EUROPEAN COPPER TRADE.

This table is based upon the compilations of the Metallegesellschaft und Metallurgische Gesellschaft A.-G. It includes Sweden, Norway, Denmark, Holland, Belgium, the Balkan States and Spain and Portugal, but does not include copper production of the two latter named countries:

(*Metric Tons.*)

Year.	Production.	Imports.	Gross Supply.	Exports.	Net Supply.	Consumption.
1892	1,400	1,100	2,500	.....	2,500	2,500
1893	1,600	1,400	3,000	.....	3,000	3,000
1894	1,600	1,400	3,000	.....	3,000	3,000
1895	1,500	1,400	2,900	.....	2,900	2,900
1896	1,700	1,400	3,100	.....	3,100	3,100
1897	1,700	2,500	4,200	.....	4,200	4,200
1898	1,500	2,700	4,200	.....	4,200	4,200
1899	2,300	2,800	5,100	.....	5,100	5,000
1900	2,500	3,600	6,100	.....	6,100	6,000
1901	3,100	5,200	8,300	.....	8,300	8,500
1902	6,200	5,300	11,500	.....	11,500	11,250
1903	8,000	4,500	12,500	.....	11,900	12,000
1904	7,000	7,000	14,000	.....	14,200	14,000
1905	7,700	8,000	15,700	.....	15,000	15,000
1906	7,100	8,000	15,100	.....	15,400	15,500
1907	7,500	7,500	15,000	.....	15,000	15,000
1908	13,200	2,200	15,400	.....	15,400	15,000

WORLD'S CONSUMPTION OF RAW COPPER.

This table is based upon the compilations of the Metallegesellschaft und Metallurgische Gesellschaft A.-G.:

(*Metric Tons.*)

Country.	1895.	1900.	1903.	1904.	1905.	1906.	1907.	1908.
United States	118,835	168,400	236,100	211,400	276,300	300,000	232,600	210,600
Germany	63,813	108,900	110,100	136,200	128,000	151,100	149,800	180,700
Great Britain	91,551	108,500	107,600	127,900	103,300	107,600	108,200	128,900
France	38,174	51,600	48,600	56,600	56,400	65,500	65,000	73,900
Asia, Africa, Australia	8,000	10,200	17,600	38,800	73,000	28,000	32,600	9,400
Russia	14,000	20,400	25,000	31,200	27,600	26,600	18,000	21,600
Austria-Hungary	12,872	19,700	18,900	23,200	22,700	24,700	26,600	33,500
Italy	6,641	8,300	9,600	14,900	17,200	18,500	24,700	23,500
Belgium	5,000	6,300	6,100	7,800	8,600	9,000	9,500	11,000
Misc. Europe	1,800	2,100	3,400	4,000	4,000	4,000	4,500	5,200
Holland	2,400	2,400	2,400	2,400	2,400	2,400	2,500	1,000
Misc. America	700	1,300	1,700	2,400	1,900	2,200	2,000	2,400
Totals	363,786	508,100	587,100	656,800	721,400	739,600	676,000	701,700

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AVERAGE AMERICAN AND ENGLISH PRICES.

The following table of average annual prices of copper in England and the United States is based upon the New York price for Lake copper and the London price for Standard copper. The two last columns give the American prices in cents and fractions and the English equivalent in sterling. English prices are for long tons of 2,240 pounds, and American prices for pounds avoirdupois, the last column, giving English equivalent of the American prices, being figured in long tons.

	English Prices.												American Prices.			
Year.	Lowest.			Highest.			Fluctuation.			Average.			Average	Average.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	Cents.	£	s.	d.
1880	54	10	0	74	0	0	10	10	0	62	14	7	21.438	99	0	8
1881	57	0	0	72	10	0	15	10	0	61	16	9	18.188	84	0	8
1882	63	0	0	71	10	0	8	10	0	66	10	5	19.125	88	6	11
1883	57	0	0	67	10	0	9	10	0	62	17	11	16.500	76	3	7
1884	47	5	0	58	0	0	10	15	0	53	17	6	13.000	59	19	0
1885	38	10	0	61	12	6	23	2	6	43	11	0	10.838	49	6	5
1886	38	10	0	43	15	0	5	5	0	40	1	8	11.063	51	1	10
1887	38	7	6	85	5	0	46	17	6	46	0	6	13.850	64	0	0
1888	73	0	0	105	0	0	32	0	0	81	11	3	16.775	77	10	1
1889	35	0	0	80	0	0	45	0	0	49	14	8	13.490	62	6	5
1890	46	10	0	61	12	6	15	2	6	54	5	3	15.600	72	1	10
1891	44	1	3	56	10	0	12	8	9	51	9	4	12.760	58	19	1
1892	43	10	0	47	18	9	4	8	9	45	13	2	11.560	53	8	4
1893	40	12	6	46	16	3	6	3	9	43	15	6	10.750	49	13	10
1894	37	17	6	43	0	0	5	2	6	40	7	4	9.520	44	0	0
1895	38	13	9	47	8	9	8	15	0	42	19	7	10.730	49	12	0
1896	40	10	0	50	8	9	9	18	9	46	18	1	10.790	50	14	9
1897	47	0	0	51	15	0	4	15	0	49	2	6	11.980	52	10	2
1898	49	5	0	57	8	9	8	3	9	51	16	7	12.360	55	13	10
1899	58	1	3	79	2	6	21	1	3	73	13	9	17.050	82	0	11
1900	70	14	2	78	7	1	7	12	11	73	12	6	16.650	76	18	2
1901	47	0	0	72	17	6	25	17	6	66	19	8	16.720	77	4	7
1902	47	10	0	56	15	0	9	5	0	52	11	5	12.160	56	3	8
1903	53	13	7	64	0	7	10	7	0	58	3	2	13.720	63	4	8
1904	55	5	0	68	7	6	13	2	6	62	12	2	13.010	60	2	6
1905	64	2	6	80	12	6	16	10	0	69	9	2	15.890	73	7	9
1906	78	5	1	105	4	3	26	19	2	87	8	6	19.610	90	4	10
1907	55	0	0	113	0	0	58	0	0	84	0	0	20.004	91	19	10
1908	57	7	8	63	8	10	6	1	2	59	18	3	13.500	62	7	0
1909	54	15	0	63	17	6	9	1	6	58	15	3	13.480	62	5	10

PRICES OF ELECTROLYTIC COPPER.

The following table gives the average monthly prices of electrolytic wire-bars, on the New York Metal Exchange, for the years named:

(*Cents.*)

Month.	1900.	1904.	1905.	1906.	1907.	1908.	1909.
January	16.250	12.670	15.150	18.310	24.404	13.955	14.085
February	16.250	12.415	15.200	17.869	24.869	13.230	13.215
March	16.250	12.640	15.200	18.361	25.065	12.910	12.585
April	16.875	13.185	15.180	18.375	24.224	12.890	12.670
May	16.750	13.080	15.000	18.475	24.048	12.820	13.025
June	16.250	12.650	15.000	18.442	22.665	12.850	13.260
July	16.250	12.675	15.110	18.190	21.130	12.880	12.970
August	16.375	12.630	15.875	18.380	18.356	13.610	13.060
September	16.500	12.700	16.225	19.033	15.565	13.585	12.930
October	16.625	13.140	16.500	21.203	13.169	13.525	12.810
November	16.625	14.425	16.845	21.833	13.391	14.210	13.240
December	16.625	14.890	18.590	22.885	13.163	14.210	13.480
Yearly Average	16.545	13.110	15.980	19.775	20.860	13.390	13.110

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MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(*January-June.*)

Year.	January.		February.		March.		April.		May.		June.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860	24	23½	24	23¾	23¾	23	23½	23	23¼	22¾	22½	21¾
1861	20	19	19½	19	19¾	19¼	19¾	19	19¾	19¼	19	18
1862	28	27	28	25	25	23	23	21½	21½	20¾	23	20¾
1863	35	31	37	35	37	31	31	30	30½	30	30½	30
1864	41¼	39	42	41¼	42½	41½	44	42½	44	43	49	44
1865	50½	46	46	44	44½	34	35	34	34	30	30½	28½
1866	42	38	38	35½	35½	29½	30	28½	31	29	33	31
1867	29¼	27	27¾	27½	27½	24	24½	23½	24¼	24	24½	24
1868	23½	21½	24	22½	24	23¼	24¼	23¼	24¼	24	24	23⅛
1869	26¼	23¾	27	26	26¾	24	24	23¼	24¼	23¾	23¾	22
1870	22	21⅛	21¼	20⅞	20¾	19	19¾	19¼	19½	19	20⅝	19
1871	22⅝	22	22⅝	21⅝	22	21½	21¾	21¼	21¾	21⅛	21½	21¼
1872	28½	27⅛	28⅜	28¼	30½	28⅜	44	30½	42	36	34¾	33
1873	35	32½	35	34	35	34½	34½	30½	33½	32	31½	29⅛
1874	25	24½	25	24⅛	24¾	24	25	24¾	25	24½	24¾	24¼
1875	23½	21½	22¾	21¾	21¾	21½	21¾	21½	23¼	22⅝	23	23
1876	23¼	23	22⅞	22½	22¼	22	22⅝	22	22⅛	21	21	19¾
1877	19½	19	20½	19½	19¼	19	19½	19¼	19¼	19	19⅜	19
1878	17⅝	17¼	17½	17⅛	17⅛	16⅞	17	16⅞	16¾	16¼	16⅜	16¼
1879	16	15½	15½	15½	15¾	15¾	16	15¾	16¼	16	16¼	16⅛
1880	25	21⅜	24½	24	24	22¾	22½	21	21	18	18½	17⅝
1881	19⅜	19⅜	19⅜	19⅛	19⅜	19	19	18¾	18⅞	18¼	18¼	16⅜
1882	20⅜	20¼	20	19	19¼	18⅞	18⅞	17⅞	18¼	18	18¼	18
1883	18⅛	18	17⅝	17¾	17⅝	17⅛	16	15¾	16	15⅞	15¾	15
1884	15	14⅞	15	14⅞	15	14⅝	15	14½	14¼	14⅛	14¼	14
1885	11½	10⅜	11⅞	10⅝	11⅛	10⅜	11¼	10 1/10	11½	10⅛	11½	11
1886	11⅝	11⅜	11⅝	11⅜	11½	11⅜	11½	11⅜	11⅛	10	10⅛	10
1887	12	11⅛	11⅛	10⅛	10⅛	10⅜	10⅛	10	10	9 3/10	10¼	10
1888	17⅖	15 17/20	16 6/10	16	16 7/20	15 9/10	16 9/10	16	16¾	16 3/10	16½	16 9/20
1889	17½	16½	16¾	16½	15¾	15	16	15½	12½	12	12 13/20	12
1890	14½	14¼	14¼	14¼	14¼	14	14½	14¼	15¼	14⅝	16¼	15¼
1891	15	14⅝	14⅞	14¼	14¼	13⅝	13¾	13½	13¾	12¾	13	12⅞
1892	11	10⅜	10¾	10½	12	10¾	12	11¾	12¼	12	11⅞	11¼
1893	12½	12¼	12¼	12	12	11¾	11½	11¼	11⅛	11	11	10¾
1894	10¼	10	10	9⅝	9⅝	9⅜	9½	9⅜	9⅜	9½	9⅛	9
1895	10	9⅞	9⅞	9½	9½	9¼	9¾	9⅜	10⅛	9⅜	10¼	10¼
1896	10⅛	9¼	11¼	10	11¼	10⅞	11	10¾	11½	10⅞	11¼	11½
1897	12	11½	12	11	11⅞	11½	11½	11	11⅛	10¾	11⅛	10⅞
1898	11	10 9/10	11¾	11⅞	12	11⅝	12⅛	11⅞	12⅛	12	11⅞	11¾
1899	17	13¼	18½	17	18	17¼	19⅜	18	19¼	18½	18½	17⅞
1900	16½	16¼	16½	16	17	16¼	17¼	17	17¼	16½	16½	16¼
1901	17	17	17	17	17	17	17	17	17	17	17	17
1902	11	13	12¼	13½	12¼	12½	12	12¼	12	12¾	12¼	12¾
1903	12¾	12¼	13½	12¾	15⅜	13¾	15⅛	14¾	15¼	14¾	15¼	14
1904	13	12½	12¾	12¼	13	12½	13⅝	13	13⅜	13	13⅜	12½
1905	15⅜	15⅛	15⅜	15⅜	15⅜	15⅜	15⅜	15⅛	15	15	15	15
1906	19	18⅛	18¾	17⅝	18¾	18½	18¾	18¾	18⅞	18¾	18⅞	18¾
1907	25⅞	25	25⅞	25⅝	26¼	25¾	25¾	25¼	25¼	25⅛	24⅞	24¼
1908	14 1/4	13¾	14½	12½	13½	12½	13½	13	13½	12¾	13½	12½
1909	14¾	14	14½	12¾	13¼	12½	13¼	13	13¾	13	13¾	13¼

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MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER. (Continued.)

(*July-December.*)

Year.	July.		August.		September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860	21¾	21½	21½	21½	22	21¼	22	21½	21½	20¼	20¼	19¾
1861	18	17½	19	17¾	20¼	19	20½	20	22½	20½	27	22½
1862	24½	22½	24½	24	27	24¼	32⅝	27	32⅞	30½	31½	30½
1863	32	29	31	29	32¼	31	34¼	32¼	38½	34½	38¾	38½
1864	55	49	52½	50	52½	47½	48	47	49	47	50	48½
1865	30¼	28	32	30½	32¾	31½	33	32½	45½	33	45½	39¼
1866	33½	31	31	30	31½	30¾	31	30¾	30¼	26½	29	26½
1867	26	24	26¼	25¾	27¼	26¼	26¾	22¾	23	22¾	23	21½
1868	24½	23⅛	24¼	24	24	23¾	24	23	24	22½	24½	23¾
1869	22¼	21⅞	23⅛	21⅞	23	22	22¾	22	22½	22	22	21½
1870	20½	20⅜	21⅜	20⅜	21½	20¾	21¾	21½	23⅜	21¾	22⅝	22¼
1871	22¼	21⅝	23	22⅜	22⅞	22⅞	23⅞	23¼	24¼	23¼	27	24½
1872	34	33	35	32½	35¼	33	34⅜	31¼	32¼	30¼	32½	30½
1873	29	26⅜	27½	27	27	25½	25½	24	24	21	25	23
1874	24¼	20	21	19	21¼	21	22¼	21¼	23¾	22¼	23¼	23¼
1875	23	22⅝	23⅜	23	23⅞	23⅛	23¼	23	23¼	23	23⅜	23⅜
1876	20	19½	19½	18¾	21	18¾	21¼	20½	20½	20	20	19⅝
1877	19¼	19	19	17⅞	18½	17⅞	18	17¾	17¾	17⅝	17¾	17½
1878	16¼	16	16	16	16¼	16	16	15½	15⅞	15½	16	15⅝
1879	16⅛	16	16⅜	16	17	16¼	21½	18	21¾	21	21½	21
1880	18⅞	18½	19⅛	19	18⅞	18¾	18⅞	18¾	18⅞	18¾	19⅛	18⅞
1881	16½	16	16⅝	16⅜	18⅛	16¾	18⅜	18	19	18⅛	20⅜	19¼
1882	18¼	18⅛	18¼	18⅛	18¼	18	18⅛	18	18⅛	18	18	17⅝
1883	15⅛	15	15	15	15¼	15⅛	15¼	15⅛	15	14⅞	15	14⅞
1884	14⅛	13⅞	14	13⅞	13⅛	13	13⅛	12⅞	13	12½	12¼	11
1885	11¼	10⅝	11¼	11	11½	10 19/20	11⅛	10⅝	11⅛	10⅝	11½	11 1/10
1886	10⅛	10	10¼	10	11⅛	10¼	11⅜	11⅛	12	11⅜	12⅛	11⅞
1887	10¾	10⅛	10¾	10⅜	11	10⅝	12 3/20	10 3/10	14 19/20	11 11/10	17¾	14 19/20
1888	16 9/10	16 3/20	17	16⅝	17 7/10	16 9/10	17⅝	17 7/20	17⅜	17¼	17 9/20	17 1/10
1889	12	12	12	12	12	11	11	11	13¼	11¼	14½	14
1890	17¼	16½	17¼	17	17	17	16⅞	16¾	16¾	16¾	16	15
1891	12⅞	12½	12⅜	12	12½	12⅛	12⅝	11⅜	11½	11	11⅛	10¼
1892	11¾	11¼	11¾	11⅜	11⅜	11 1/10	11¾	11 1/10	12	11⅜	12⅜	12¼
1893	10½	10¼	10⅝	9⅜	9⅞	9¼	9¼	9¼	10¼	9½	10½	10⅜
1894	9⅛	9	9⅛	9	9⅞	9⅛	9¾	9½	9½	9⅜	10	9½
1895	11¾	10½	12¼	11¾	12¼	12	12	11¾	11⅝	11	11	10
1896	11¾	11	11⅛	10⅞	10⅞	10⅜	10⅞	10½	11½	10⅞	11½	11¼
1897	11⅛	11	11¼	11	11⅜	11¼	11¼	11	11	10¾	11	10⅝
1898	11¾	11½	12⅛	11⅜	12¼	12⅛	11½	12¼	11¾	12½	12⅞	12⅝
1899	18⅛	18¼	18¾	18¼	18½	18⅜	18⅛	17	17¼	17	17	16¾
1900	16½	16⅛	16¾	16½	16⅞	16¾	16⅞	16¾	17	16¾	17	16¾
1901	17	16¾	16⅜	16¾	16¾	16⅜	16 15/16	16¾	16 15/16	16 15/16	17	13
1902	12	12½	11⅝	12⅛	11¾	12¼	11¼	12¼	11½	12	11⅝	12
1903	14¼	13	13⅞	13	13¾	13¼	14	13	13¾	12¼	12⅝	12
1904	12⅞	12⅝	12⅞	12⅝	13	12¾	14	12⅞	15⅜	13⅝	15½	14⅞
1905	15⅜	15	16⅝	15½	16½	16⅜	16½	16½	17¾	16½	18⅞	17⅝
1906	18⅝	18½	18⅞	18¾	20⅛	18⅝	22½	20¼	22¾	22½	24	22¾
1907	24⅞	22¼	22¼	20	19¼	15¼	15¼	12½	14⅞	13½	14	13¼
1908	13½	12¾	14	13½	14	13½	14	13¾	14¾	14	14¾	14½
1909	13¾	13¼	13¾	13¼	13¾	13	13½	12⅞	14	13⅛	14⅛	13½

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HIGH, LOW AND AVERAGE PRICES OF LAKE COPPER.

1860–1909.

(*Cents.*)

Year.	Highest. Price.	Highest. Month.	Lowest. Price.	Lowest. Month.	Average.
1860	24.000	January	19.750	December	22.875
1861	27.000	December	17.500	July	22.250
1862	32.875	November	20.750	May	21.875
1863	38.750	December	29.000	July	33.875
1864	55.000	July	39.000	January	47.000
1865	50.500	January	28.000	July	39.250
1866	42.000	January	26.500	November	34.250
1867	29.250	January	21.500	December	25.375
1868	24.500	December	21.500	January	23.000
1869	27.000	February	21.500	December	24.250
1870	23.375	November	19.000	March	21.188
1871	27.000	December	21.250	April	24.125
1872	44.000	April	27.125	January	35.563
1873	35.000	January	21.000	November	28.000
1874	25.000	January	19.000	August	22.000
1875	23.875	September	21.500	January	22.688
1876	23.250	January	18.750	August	21.000
1877	20.500	February	17.500	December	19.000
1878	17.625	January	15.500	October	16.563
1879	21.750	November	15.500	January	18.625
1880	25.000	January	17.875	June	21.438
1881	20.375	December	16.000	July	18.188
1882	20.375	January	17.875	April	19.125
1883	18.125	January	14.875	November	16.500
1884	15.000	December	11.000	December	13.000
1885	11.875	February	9.800	May	10.838
1886	12.125	December	10.000	May	11.063
1887	17.750	December	9.950	May	13.850
1888	17.600	November	15.850	January	16.775
1889	17.500	January	11.000	September	13.490
1890	17.250	July	14.000	March	15.600
1891	15.000	January	10.250	December	12.760
1892	12.375	December	10.500	February	11.560
1893	12.500	January	9.600	August	10.750
1894	10.250	January	9.000	June	9.520
1895	12.250	August	9.375	April	10.730
1896	12.000	June	9.750	January	10.980
1897	12.000	January	10.750	November	11.360
1898	13.250	December	11.000	January	12.050
1899	19.375	April	13.250	January	17.760
1900	17.250	April	16.000	February	16.650
1901	17.000	January	13.000	December	16.720
1902	13.500	February	11.000	January	12.160
1903	15.375	March	12.000	December	13.720
1904	15.375	November	12.250	February	13.010
1905	18.875	December	15.000	May	15.890
1906	24.000	December	17.875	February	19.616
1907	26.250	March	12.500	October	20.004
1908	14.750	December	12.500	February	13.500
1909	14.750	January	12.500	March	13.480

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CONVERSION TABLE FOR AMERICAN AND ENGLISH PRICES.

This table gives the equivalents, in American and English currency, for the prices of copper, from £35 to £150 per ton. The American basis of weight is the avoirdupois pound; the English basis is the long ton of 2,240 pounds avoirdupois. The rate of exchange is figured at £1=$4.85:

(*Pounds Sterling and Cents.*)

£35.... 7.58c.	£64....13.86c.	£ 93....20.14c.	£122....26.41c.
£36.... 7.80c.	£65....14.07c.	£ 94....20.35c.	£123....27.63c.
£37.... 8.01c.	£66....14.29c.	£ 95....20.57c.	£124....27.85c.
£38.... 8.23c.	£67....14.51c.	£ 96....20.79c.	£125....27.06c.
£39.... 8.45c.	£68....14.72c.	£ 97....21.00c.	£126....27.28c.
£40.... 8.66c.	£69....14.94c.	£ 98....21.22c.	£127....27.50c.
£41.... 8.88c.	£70....15.16c.	£ 99....21.43c	£128....27.71c.
£42.... 9.10c.	£71....15.37c.	£100....21.65c.	£129....27.93c.
£43.... 9.31c.	£72....15.59c.	£101....21.87c.	£130....28.14c
£44.... 9.53c.	£73....15.81c.	£102....22.08c.	£131....28.36c.
£45.... 9.75c.	£74....16.02c.	£103....22.30c.	£132....28.58c.
£46.... 9.96c.	£75....16.24c.	£104....22.52c.	£133....28.80c.
£47....10.18c.	£76....16.46c.	£105....22.73c.	£134....29.01c.
£48....10.39c.	£77....16.67c.	£106....22.95c.	£135....29.23c.
£49....10.61c.	£78....16.89c.	£107....23.16c.	£136....29.45c.
£50....10.83c.	£79....17.10c.	£108....23.38c.	£137....29.66c.
£51....11.04c.	£80....17.32c.	£109....23.60c.	£138....29.88c.
£52....11.26c	£81....17.54c.	£110....23.82c.	£139....30.10c.
£53....11.48c.	£82....17.75c.	£111....24.03c.	£140....30.31c.
£54....11.69c.	£83....17.97c.	£112....24.25c.	£141....30.53c.
£55....11.91c.	£84....18.19c.	£113....24.47c.	£142....30.75c.
£56....12.12c	£85....18.40c.	£114....24.68c.	£143....30.96c.
£57....12.34c.	£86....18.62c.	£115....24.90c.	£144....31.18c.
£58....12.56c.	£87....18.84c.	£116....25.12c.	£145....31.39c.
£59....12.77c.	£88....19.05c.	£117....25.33c.	£146....31.61c.
£60....12.99c.	£89....19.27c.	£118....25.55c.	£147....33.83c.
£61....13.21c.	£90....19.49c.	£119....25.77c.	£148....34.04c.
£62....13.42c.	£91....19.70c.	£120....25.98c.	£149....34.26c
£63....13.64c.	£92....19.92c.	£121....26.20c.	£150....32.48c.

PROPORTION OF COPPER TO AMERICAN METAL PRODUCTION.

Year.	Total Value of Metallic Products.	Total Value of Copper Production.	Production of Copper in Pounds.	Percentage of Copper Values
1888	$253,731,822	$ 33,833,954	231,270,622	13.3
1889	267,247,033	26,907,809	231,246,214	10.0
1890	305,735,670	30,848,797	265,115,133	10.1
1891	300,232,798	38,455,300	295,812,076	12.1
1892	307,936,189	37,977,142	352,971,744	12.3
1893	250,207,406	32,054,601	339,785,972	12.8
1894	218,382,494	33,141,142	364,866,808	15.2
1895	282,149,808	38,682,347	392,639,964	13.8
1896	287,860,155	49,456,603	460,061,430	17.2
1897	302,531,147	54,080,180	494,078,274	17.9
1898	343,748,268	61,865,276	526,375,591	18.0
1899	525,797,557	101,222,712	581,319,091	19.0
1900	550,425,286	98,494,039	602,808,839	17.9
1901	524,873,284	86,629,266	601,499,886	16.5
1902	642,258,584	76,568,954	659,508,644	11.9
1903	624,318,008	91,506,006	698,044,517	15.3
1904	542,081,983	105,629,845	812,537,267	19.5
1905	702,453,101	139,795,716	902,057,843	19.9
1906	886,110,856	177,595,888	918,635,216	20.0
1907	903,802,244	173,799,300	866,308,743	19.2
1908	549,923,116	124,419,335	942,936,449	22.6

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PRICES AND SALES OF AMERICAN COPPER SHARES.

Company.	1903 Highest.	1903 Lowest.	1903 Sales.	1904 Highest.	1904 Lowest.	1904 Sales
Adventure	$18.00	$ 2.00	50,070	$ 7.87	$ 1.75	55,094
Allouez	7.50	3.13	152,262	21.00	3.37	258,301
Amalgamated	79.50	35.50	1,717,341	82.75	43.13	.....
Anaconda	31.12	15.63	7,791	29.75	15.37	.....
Arcadian	6.13	.75	92,842	3.00	.25	30,208
Arnold	.95	.25	4,582	1.50	.16	.....
Atlantic	15.00	7.00	34,087	22.25	7.00	126,120
Bingham	39.00	20.00	126,200	38.75	19.00	257,516
Boston Cons.	.....	.....	.....	7.87	6.12	126,859
British Columbia	7.50	2.50	2,018	3.75	3.25	.....
Calumet & Hecla	550.00	400.00	5,371	700.00	435.00	4,395
Centennial	31.75	12.00	301,086	33.00	14.63	202,483
Copper Range	75.00	37.00	1,226,036	74.50	38.00	684,467
Daly-West	48.56	30.50	46,749	36.50	11.63	106,904
Elm River	5.38	2.00	67,078	4.00	1.75	.....
Franklin	14.00	6.75	23,377	15.00	7.87	37,315
Granby	5.25	3.63	53,639	5.88	3.00	436,287
Isle Royale	17.50	5.00	44,485	35.50	7.00	206,101
Mass.	18.00	3.00	65,717	10.00	3.00	59,746
Mayflower	2.50	.50	15,634	2.00	.45	.....
Michigan	11.50	4.50	29,087	11.00	4.25	48,159
Mohawk	58.00	31.00	120,526	57.75	34.12	111,480
Montreal & Boston	2.88	.55	88,432	1.62	.40	.....
National	1.25	.75	820	2.00	.40	.....
Old Colony	2.50	.50	20,106	2.50	.87	15,723
Old Dominion	23.50	3.75	119,849	29.00	9.00	136,134
Osceola	79.00	43.00	83,419	98.00	53.00	77,537
Parrot	34.00	16.00	59,512	33.50	21.00	72,217
Phœnix	7.50	2.75	23,522	5.00	.50	.....
Quincy	126.50	80.00	6,438	125.00	80.00	10,023
Rhode Island	3.75	.75	15,815	3.00	1.00	11,594
Santa Fe	3.00	1.00	42,370	3.50	1.12	.....
Shannon	15.00	7.00	133,571	10.50	6.50	555,011
Tamarack	189.50	75.00	15,239	140.00	94.00	10,236
Tecumseh	1.80	.40	7,505	4.25	.25	.....
Tennessee	33.00	17.25	11,030	43.25	30.00	.....
Trinity	14.00	4.00	135,573	18.50	4.63	337,510
United Copper	32.75	4.00	6,520	7.00	6.00	.....
United States	.....	.....	.....	28.75	19.75	633,140
Utah Cons.	33.63	22.00	400,247	47.00	30.00	1,553,158
Victoria	9.00	1.50	52,925	6.37	2.12	.....
Washington	.50	.15	2,240	1.00	.10	.....
Winona	13.50	5.50	181,253	13.50	5.00	93,029
Wolverine	77.00	54.00	28,794	110.00	68.00	20,899
Wyandot	2.88	.75	54,552	3.00	.50	.....

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DIVIDENDS OF AMERICAN COPPER MINES.

Company.	1907.	1908.	1909.	Total.
Anaconda	$ 7,500,000	$ 2,400,000	$ 1,200,000	$ 43,800,000
Arizona	1,994,865	1,167,584	573,860	13,399,284
Atlantic	.....	.....	.....	990,000
Baltic	1,000,000	900,000,	1,000,000	5,550,000
Boston & Montana	5,750,000	1,800,000	1,800,000	59,575,000
Bullwhacker	20,000	.....	.....	20,000
Butte & Boston	.....	.....	.....	1,800,000
Butte Coalition	1,650,000	.....	250,000	2,700,000
Calumet & Arizona	3,300,000	800,000	800,000	10,900,000
Calumet & Hecla	6,500,000	2,000,000	2,700,000	109,600,000
Carisa	.....	.....	.....	55,000
Centennial-Eureka	.....	.....	.....	2,767,700
Central	.....	.....	.....	2,130,000
Champion	1,000,000	500,000	500,000	4,700,000
Cliff	.....	.....	.....	2,518,620
Columbus Cons	226,832	.....	.....	226,832
Colusa-Parrot	.....	.....	.....	1,760,000
Copper Falls	.....	.....	.....	100,000
Dalton & Lark	.....	.....	.....	350,000
Daly-West	378,000	.....	162,000	6,119,000
Franklin	.....	.....	.....	1,240,000
Granby	1,217,430	540,000	270,000	4,181,051
Greene Cons	.....	.....	.....	7,450,580
Horn Silver	80,000	.....	.....	5,642,000
Iron Silver	300,000	.....	50,000	4,150,000
Kearsarge	.....	.....	.....	160,000
Le Roi No. 2	210,000	180,000	115,200	1,195,200
Mammoth (Utah)	80,000	40,000	.....	2,180,000
Minnesota	.....	.....	.....	1,820,000
Mohawk	900,000	250,000	300,000	1,950,000
Montana O. P. Co	1,212,495	.....	.....	9,437,274
Mountain	.....	.....	.....	3,776,250
National	.....	.....	.....	320,000
Nevada Cons	.....	.....	431,700	431,700
Newhouse	600,000	.....	.....	600,000
North Butte	2,400,000	1,200,000	1,200,000	8,200,000
Old Dominion	281,589	146,623	586,488	1,295,543
Osceola	1,249,950	192,300	769,200	8,381,750
Parrot	172,398	.....	.....	6,807,649
Pewabic	.....	.....	.....	1,000,000
Phœnix	.....	.....	.....	20,000
Quincy (Mich.)	1,350,000	495,000	440,000	18,890,000
Quincy (Utah)	.....	.....	.....	959,370
Red Bird	.....	.....	.....	72,000
Ridge	.....	.....	.....	100,000
Santa Rita	.....	.....	.....	100,000
Shannon	300,000	.....	.....	450,000

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DIVIDENDS OF AMERICAN COPPER MINES. (Continued.)

Company.	1907.	1908.	1909.	Total.
Snowstorm	$ 450,000	$ 150,000	$ 225,000	$ 825,000
Standard	.....	.....	.....	40,000
Tamarack	420,000	.....	.....	9,420,000
Tennessee	568,750	500,000	250,000	2,306,250
Trimountain	.....	500,000	.....	800,000
United Globe	.....	.....	.....	149,500
United States	3,598,730	2,402,324	2,402,476	9,656,238
United Verde	2,700,000	2,700,000	449,890	27,555,570
Utah Cons	2,100,000	600,000	600,000	7,800,000
Utah Copper	.....	735,000	1,464,036	2,199,036
Wolverine	1,050,000	600,000	600,000	5,700,000
Totals	$50,561,039	$20,798,831	$19,138,850	$426,123,397
Amalgamated	10,716,153	3,077,580	3,077,756	60,332,769
Copper Range Cons	2,304,810	1,536,740	1,536,740	7,682,446
Philps, Dodge & Co. Inc	.....	.....	5,392,152	5,392,152
St. Mary's M. L. Co	750,000	.....	160,000	3,640,000
United Copper	2,662,500	.....	.....	6,412,500
Grand Totals	$66,994,502	$25,413,151	$29,305,498	$509,583,264

TOTAL LAKE SUPERIOR DIVIDENDS.

1849—1909

Name of Company.	Present Status.	Dates Paid. First.	Last.	Number of Dividends.	Total Amount.
Atlantic	*a*	1878	1905	19	$ 990,000
Baltic	*b*	1905	1909	10	5,550,000
Calumet	*c*	1870	1871	3	300,000
Calumet & Hecla	*b*	1871	1909	148	109,600,000
Central	*c*	1864	1905	31	2,130,000
Champion	*b*	1903	1909	43	5,700,000
Cliff	*d*	1849	1867	37	2,518,620
Copper Falls	*a*	1864	1871	3	100,000
Franklin	*b*	1863	1894	21	1,240,000
Hecla	*c*	1869	1871	7	650,000
Kearsarge	*e*	1890	1897	3	160,000
Minnesota	*f*	1854	1876	19	1,820,000
Mohawk	*b*	1906	1909	7	1,950,000
National	*a*	1861	1872	9	320,000
Osceola	*b*	1878	1909	64	8,381,750
Pewabic	*g*	1862	1873	11	1,000,000
Phœnix	*a*	1877	1877	1	20,000
Quincy	*b*	1862	1909	90	18,890,000
Ridge	*h*	1873	1880	4	100,000
Tamarack	*b*	1888	1907	43	9,420,000
Trimountain	*b*	1903	1908	3	800,000
Wolverine	*b*	1898	1909	23	5,700,000
Totals				588	$177,340,370
Copper Range Cons	*i*	1905	1909	24	9,219,186
Copper Range Co.	*i*	1905	1909	12	2,050,000
St Mary's M. L. Co	*i*	1886	1909	29	3,640,000
Grand Totals				626	$192,249,556

a. Idle.
b. Active.
c. Absorbed by Calumet & Hecla.
d. Absorbed by Tamarack.
e. Absorbed by Osceola.
f. Absorbed by Michigan.
g. Absorbed by Quincy.
h. Absorbed by Mass.
i. Not a direct copper producer.

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DIVIDENDS OF LAKE SUPERIOR MINES.

1849–1872.

	1849.	1850.	1851.	1852.
Cliff	$ 60,000	$ 84,000	$ 60,000	$ 60,000
Totals	$ 60,000	$ 84,000	$ 60,000	$ 60,000

	1853.	1854.	1855.	1856.
Cliff	$ 90,000	$ 108,000	$ 78,000	$ 180,000
Minnesota	.....	90,000	90,000	200,000
Totals	$ 90,000	$ 198,000	$ 168,000	$ 380,000

	1857.	1858.	1859.	1860.
Cliff	$ 180,000	$ 160,000	$ 180,000	$ .....
Minnesota	300,000	300,000	180,000	120,000
Totals	$ 480,000	$ 460,000	$ 360,000	$ 120,000

	1861.	1862.	1863.	1864.
Cliff	$ 80,000	$ 80,000	$ 180,000	$ 320,000
Minnesota	100,000	160,000	160,000	60,000
National	80,000	80,000	.....	80,000
Pewabic	.....	60,000	120,000	200,000
Quincy	.....	60,000	200,000	280,000
Franklin	.....	.....	60,000	100,000
Central	.....	.....	.....	50,000
Copper Falls	.....	.....	.....	60,000
Totals	$ 260,000	$ 440,000	$ 720,000	$1,150,000

	1865.	1866.	1867.	1868.
Cliff	$ 200,000	$ 120,000	$ 60,000	$ .....
National	40,000	.....	.....	.....
Quincy	160,000	.....	.....	60,000
Franklin	60,000	.....	.....	.....
Central	50,000	50,000	50,000	40,000
Totals	$ 510,000	$ 170,000	$ 110,000	$ 100,000

	1869.	1870.	1871.	1872.
Cliff	$	$	$ 100,000	$ 100,000
Minnesota	.....	.....	.....	50,000
National	.....	.....	20,000	20,000
Pewabic	.....	.....	20,000	40,000
Quincy	40,000	120,000	140,000	350,000
Franklin	.....	.....	20,000	40,000
Central	70,000	80,000	50,000	80,000
Copper Falls	.....	.....	40,000	.....
Hecla	100,000	300,000	250,000	.....
Calumet	.....	200,000	100,000	.....
Calumet & Hecla	.....	.....	900,000	2,400,000
Totals	$ 210,000	$ 700,000	$1,640,000	$3,080,000

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DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1873–1888.

	1873.	1874.	1875.	1876.
Minnesota	$.....	$.....	$.....	$ 10,000
Pewabic	20,000	.....	.....	.....
Quincy	100,000	160,000	220,000	160,000
Central	160,000	160,000	80,000	100,000
Calumet & Hecla	2,000,000	1,600,000	1,600,000	1,600,000
Ridge	50,000	20,000	20,000	.....
Totals	$ 2,330,000	$1,940,000	$1,920,000	$1,870,000

	1877.	1878.	1879	1880.
Cliff	$.....	$.....	$ 38,620	$ .....
Quincy	80,000	100,000	40,000	220,000
Central	140,000	100,000	80,000	100,000
Calumet & Hecla	1,600,000	1,600,000	1,600,000	2,500,000
Ridge	.....	.....	.....	10,000
Phœnix	20,000	.....	.....	.....
Atlantic	.....	20,000	.....	40,000
Osceola	.....	40,000	60,000	210,000
Totals	$ 1,840,000	$1,860,000	$1,818,620	$3,080,000

	1881.	1882.	1883.	1884.
Quincy	$ 320,000	$ 520,000	$ 380,000	$ 280,000
Franklin	.....	.....	.....	80,000
Central	120,000	50,000	60,000	40,000
Calumet & Hecla	2,000,000	2,000,000	2,000,000	800,000
Atlantic	.....	80,000	80,000	40,000
Osceola	225,000	200,000	150,000	87,500
Totals	$ 2,665,000	$2,850,000	$2,670,000	$1,327,500

	1885.	1886.	1887.	1888.
Quincy	$ 180,000	$ 240,000	$ 200,000	$ 360,000
Franklin	40,000	80,000	40,000	120,000
Central	30,000	40,000	40,000	70,000
Calumet & Hecla	1,700,000	1,500,000	1,000,000	2,000,000
Atlantic	20,000	40,000	40,000	120,000
Osceola	.....	.....	50,000	150,000
Tamarack	.....	.....	.....	440,000
Totals	$ 1,970,000	$1,900,000	$1,370,000	$3,260,000

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DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1889–1904.

	1889.	1890.	1891.	1892.
Quincy	$ 280,000	$ 320,000	$ 450,000	$ 350,000
Franklin	80,000	80,000	80,000	160,000
Central	40,000	20,000	20,000	.....
Calumet & Hecla	1,500,000	2,000,000	2,000,000	2,000,000
Atlantic	80,000	100,000	40,000	.....
Osceola	50,000	225,000	150,000	150,000
Tamarack	640,000	590,000	800,000	600,000
Kearsarge	.....	80,000	.....	.....
Totals	$2,670,000	$3,415,000	$3,540,000	$3,260,000

	1893.	1894.	1895.	1896.
Pewabic	$ 400,000	$.....	$ 140,000	$.....
Quincy	300,000	400,000	600,000	1,000,000
Franklin	120,000	80,000	.....	.....
Calumet & Hecla	2,000,000	1,500,000	2,000,000	2,500,000
Osceola	100,000	.....	100,000	125,000
Tamarack	600,000	400,000	400,000	360,000
Kearsarge	.....	.....	40,000	.....
Totals	$3,520,000	$2,380,000	$3,280,000	$3,985,000

	1897.	1898.	1899.	1900.
Quincy	$ 800,000	$1,000,000	$ 950,000	$ 900,000
Calumet & Hecla	4,000,000	5,000,000	10,000,000	7,000,000
Atlantic	40,000	40,000	.....	80,000
Osceola	191,000	277,250	558,450	571,200
Tamarack	360,000	480,000	600,000	1,020,000
Kearsarge	40,000	.....	.....	.....
Wolverine	.....	60,000	210,000	240,000
Totals	$5,431,000	$6,857,250	$12,318,450	$9,811,200

	1901.	1902.	1903.	1904.
Quincy	$ 900,000	$ 700,000	$ 550,000	$ 500,000
Calumet & Hecla	4,500,000	2,500,000	3,500,000	4,000,000
Atlantic	80,000	.....	.....	.....
Osceola	576,900	.....	.....	192,300
Tamarack	1,200,000	.....	.....	90,000
Wolverine	240,000	240,000	330,000	450,000
Champion	.....	.....	300,000	200,000
Trimountain	.....	.....	300,000	.....
Totals	$7,496,900	$3,440,000	$4,980,000	$5,432,300

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DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1905–1909.

	1905.	1906.	1907.	1908.
Quincy	$ 600,000	$ 1,250,000	$ 1,350,000	$ 495,000
Central	160,000	.....	.....	.....
Calumet & Hecla	5,000,000	7,000,000	6,500,000	2,000,000
Atlantic	50,000	.....	.....	.....
Osceola	384,600	961,500	1,249,950	192,300
Tamarack	120,000	480,000	420,000	.....
Wolverine	660,000	1,020,000	1,050,000	600,000
Champion	1,000,000	1,200,000	1,000,000	500,000
Baltic	1,250,000	1,400,000	1,000,000	900,000
Mohawk	.....	500,000	900,000	250,000
Trimountain	.....	.....	.....	500,000
Totals	$ 9,224,600	$13,811,500	$13,469,950	$ 4,837,300
Copper Range Cons	1,536,086	2,304,810	2,304,810	1,536,740
Copper Range Co.	300,000	600,000	450,000	300,000
St. Mary's M. L. Co.	300,000	600,000	750,000	.....
Grand Totals	$11,360,686	$17,316,310	$16,974,760	$ 6,674,040

	1909.
Quincy	$ 440,000
Calumet & Hecla	2,700,000
Osceola	769,200
Wolverine	600,000
Champion	500,000
Baltic	1,000,000
Mohawk	300,000
Total	$ 6,309,200
Copper Range Cons	1,536,740
Copper Range Co	400,000
St. Mary's Mineral Land Co	160,000
Grand Total	$ 8,405,940

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES.

1849–1909.

Company.	Assessments.	Dividends.	Dr. Balance.	Cr. Balance.
Adventure Cons.	$ 2,350,000	$.....	$ 2,350,000	$.....
Ahmeek	850,000	.....	850,000	.....
Albany & Boston	840,000	.....	840,000	.....
Allouez	2,225,000	.....	2,225,000	.....
Atlantic	1,180,000	990,000	190,000	.....
Arcadian	1,800,000	.....	1,800,000	.....
Arnold	810,000	.....	810,000	.....
Ashbed	40,000	.....	40,000	.....
Aztec	150,000	.....	150,000	.....
Baltic	1,800,000	5,550,000	.....	3,750,000
Belt	1,300,000	.....	1,300,000	.....
Bohemian	180,000	.....	180,000	.....
Caledonia	140,000	.....	140,000	.....
Calumet & Hecla	1,200,000	109,600,000	.....	108,400,000
Centennial (Old)	1,135,000	.....	1,135,000	.....
Centennial (New)	1,755,000	.....	1,755,000	.....

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DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES. (Continued.)

1849-1909.

Company.	Assessments.	Dividends.	Dr. Balance.	Cr. Balance.
Central	$ 100,000	$ 2,130,000	$	$ 2,030,000
Champion	2,500,000	4,700,000		2,200,000
Cliff (Old)	111,000	2,518,620		2,407,620
Conglomerate	1,300,000		1,300,000	
Copper Falls	1,000,000	100,000	900,000	
Copper Range Cons	2,300,000	7,682,446		5,382,446
Delaware	2,000,000		2,000,000	
Elm River	1,200,000		1,200,000	
Evergreen Bluff	225,000		225,000	
Flint Steel	264,000		264,000	
Forest	180,000		180,000	
Franklin	1,020,000	1,240,000		220,000
Hancock	1,400,000		1,400,000	
Humboldt	120,000		120,000	
Huron	240,000		240,000	
Indiana (Old)	200,000		200,000	
Isle Royale	2,750,000		2,750,000	
Kearsarge	180,000	160,000	20,000	
Keweenaw	2,800,000		2,800,000	
King Philip	800,000		800,000	
Lake	300,000		300,000	
La Salle	1,000,000		1,000,000	
Mass. Cons	1,900,000		1,900,000	
Mayflower	800,000		800,000	
Michigan	2,000,000		2,000,000	
Miners	2,000,000		2,000,000	
Minnesota	456,000	1,820,000		1,364,000
Mohawk	1,800,000	1,950,000		150,000
National	350,000	320,000	30,000	
New Arcadian	75,000		75,000	
Nonesuch	400,000		400,000	
Northwest	283,000		283,000	
Norwich	230,000		230,000	
Ohio Trap Rock	150,000		150,000	
Ojibway	840,000		840,000	
Old Colony	1,100,000		1,100,000	
Osceola	1,700,000	8,381,750		6,681,750
Pennsylvania	126,000		126,000	
Peninsula	400,000		400,000	
Pewabic	585,200	1,000,000		414,800
Phœnix (Old)	1,037,500	20,000	1,017,500	
Phœnix Cons	1,350,000		1,350,000	
Quincy	200,000	18,890,000		18,690,000
Ridge	470,000	100,000	370,000	
Rhode Island	1,000,000		1,000,000	
Superior	100,000		100,000	
Tamarack	780,000	9,420,000		8,640,000
Tamarack Junior	640,000		640,000	
Tecumseh	500,000		500,000	
Trimountain	2,000,000	800,000	1,200,000	
Toltec	500,000		500,000	
Victoria	1,200,000		1,200,000	
Winona	2,000,000		2,000,000	
Wolverine	780,000	5,700,000		4,920,000
Wyandot	1,000,000		1,000,000	
Miscellaneous	10,000,000		10,000,000	
Totals	$78,497,700	$183,072,816	$60,675,500	$165,250,616
Credit Balance				$104,575,116

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ASSESSMENTS OF LAKE SUPERIOR MINES.

1897–1908

Company.	1897.	1898.	1899.	1900.
Adventure	$	$	$	$ 200,000
Allouez	.....	80,000	.....	.....
Arnold	.....	180,000	180,000	.....
Baltic	100,000	100,000	300,000	.....
Centennial	120,000	270,000	.....	270,000
Copper Range	.....	.....	.....	300,000
Humboldt	20,000	.....	.....	.....
Mass	.....	.....	.....	200,000
Mohawk	.....	.....	.....	250,000
National	.....	200,000	.....	.....
Tecumseh	40,000	.....	.....	.....
Trimountain	.....	.....	.....	300,000
Union	50,000	.....	.....	.....
Washington	.....	8,000	.....	.....
Totals	$ 330,000	$ 838,000	$ 480,000	$ 1,520,000

Company.	1901.	1902.	1903.	1904.
Adventure	$ 700,000	$ 200,000	$ 200,000	$ 50,000
Allouez	300,000	.....	.....	300,000
Baltic	300,000	.....	.....	.....
Centennial	180,000	.....	.....	360,000
Mass	500,000	100,000	100,000	100,000
Michigan	100,000	200,000	300,000	.....
Mohawk	300,000	300,000	200,000	.....
Old Colony	.....	.....	100,000	.....
Phœnix	.....	100,000	100,000	100,000
Rhode Island	.....	100,000	.....	.....
Tecumseh	55,000	.....	.....	.....
Trimountain	200,000	300,000	.....	.....
Victoria	.....	200,000	100,000	.....
Winona	.....	100,000	100,000	.....
Wyandot	.....	.....	.....	100,000
Totals	$ 2,635,000	$ 1,600,000	$ 1,200,000	$ 1,010,000

Company.	1905.	1906.	1907.	1908.
Adventure	$	$ 50,000	$ 150,000	$ .....
Ashbed	40,000	.....	.....	.....
Centennial	360,000	.....	.....	.....
Mass	100,000	.....	.....	.....
Michigan	.....	.....	.....	200,000
Phœnix	.....	.....	150,000	.....
Rhode Island	.....	.....	100,000	.....
Victoria	100,000	.....	.....	.....
Winona	100,000	300,000	200,000	100,000
Wyandot	.....	.....	50,000	50,000
Totals	$ 70,0000	$ 350,000	$ 650,000	$ 350,000

Company.	1909.
Atlantic	$ 200,000
Hancock	200,000
Keweenaw	200,000
Michigan	200,000
National	30,000
New Arcadian	75,000
Victoria	100,000
Winona	300,000
Total	$ 1,305,000

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CAPITALIZATION OF LAKE SUPERIOR COPPER COMPANIES.

Name of Company	Organised under laws	Authorised Capitalization	No. Shares Authorised	No. Shares Issued	No. Shares Unissued
Adventure	Michigan	$2,500,000	100,000	100,000	.....
Ahmeek	Michigan	1,250,000	50,000	50,000	.....
Alloues	Michigan	2,500,000	100,000	100,000	.....
Arcadian	New Jersey	3,750,000	150,000	150,000	.....
Arnold	Michigan	2,500,000	100,000	62,000	38,000
Ashbed	Michigan	1,000,000	40,000	40,000	.....
Atlantic	Michigan	2,500,000	100,000	100,000	.....
Baltic	Michigan	2,500,000	100,000	100,000	.....
Calumet & Hecla	Michigan	2,500,000	100,000	100,000	.....
Centennial	Michigan	2,500,000	100,000	90,000	10,000
Champion	Michigan	2,500,000	100,000	100,000	.....
Cliff (New)	Michigan	2,500,000	100,000	60,000	40,000
Copper Range Co	Michigan	2.500,000	100,000	100,000	.....
Copper Range Cons	New Jersey	38,500,000	385,000	384,185	815
Elm River	New Jersey	1,200,000	100,000	100,000	.....
Franklin	Michigan	5,000,000	200,000	100,000	100,000
Hancock	Michigan	5,000,000	200,000	100,000	100,000
Houghton	Michigan	2,500,000	100,000	67,000	33,000
Humboldt	Michigan	1,000,000	40,000	40,000	.....
Indiana	Michigan	2,500,000	100,000	80,000	20,000
Isle Royale	New Jersey	3,750,000	150,000	150,000	.....
Keweenaw	Michigan	10,000,000	400,000	200,000	200,000
King Philip	Michigan	2,500,000	100,000	100,000	.....
Lake	Michigan	2,500,000	100,000	86,500	13,500
La Salle	Michigan	10,000,000	400,000	302,977	97,023
Mass	Michigan	2,500,000	100,000	100,000	.....
Mayflower	Michigan	2,500,000	100,000	100,000	.....
Michigan	Michigan	2,500,000	100 000	100,000	.....
Mohawk	Michigan	2,500,000	100,000	100,000	.....
National	Michigan	2,500,000	100,000	75,000	25,000
New Arcadian	Michigan	3,750,000	150,000	150,000	.....
New Baltic	Michigan	2,500,000	100,000	70,000	30,000
North Lake	Michigan	2,500,000	100,000	100,000	.....
Ojibway	Michigan	2,500,000	100,000	84,000	16,000
Old Colony	Michigan	2,500,000	100,000	100,000	.....
Oneco	Michigan	2,500,000	100,000	70,000	30,000
Osceola	Michigan	2,500,000	100,000	96,150	3,850
Phœnix	Michigan	2,500,000	100,000	100,000	.....
Quincy	Michigan	3,750,000	150,000	110,000	40,000
Rhode Island	Michigan	2,500,000	100,000	100,000	.....
St. Mary's M. L. Co.	New Jersey	5,000,000	200,000	150,000	50,000
Seneca	Michigan	1,000,000	40,000	40,000	.....
South Lake	Michigan	2,500,000	100,000	60,000	40,000
Superior	Michigan	2,500,000	100,000	100,000	.....
Tamarack	Michigan	1,500,000	60,000	60,000	.....
Tecumseh	Michigan	2,500,000	100,000	54,959	45,041
Trimountain	Michigan	2,500,000	100,000	100,000	.....
Union C. L. & M. Co.	Michigan	2,500,000	100,000	80,000	20,000
Victoria	Michigan	2,500,000	100,000	100,000	.....
Winona	Michigan	2,500,000	100,000	100,000	.....
Wolverine	Michigan	1,500,000	60,000	60,000	.....
Wyandot	Michigan	2,500,000	100,000	100,000	.....

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NUMBER OF SHAREHOLDERS IN LAKE COPPER COMPANIES.

1896–1908

(*By Years*)

Company	1896	1898	1900	1902	1904	1906	1907	1908
Adventure	.....	....	1,046	1,050	1,283	1,093	1,162	1,185
Ahmeek	.....	....	....	....	114	195	214	238
Allouez	.....	....	465	554	726	537	542	549
Arcadian	.....	....	....	....	....	1,047	1,488	....
Atlantic	364	401	374	417	633	488	602	517
Baltic	.....	....	513	177	10	12	16	16
Calumet & Hecla	2,464	2,716	3,080	3,425	3,258	3,651	3,867	3,903
Centennial	.....	438	439	597	636	516	587	536
Central	.....	....	203	189	224	....	....	....
Champion	.....	....	....	8	8	8	8	8
Copper Crown	.....	....	....	....	....	621	....	....
Eagle River	.....	....	....	....	....	....	....	....
Elm River	.....	....	....	....	562	163	649	631
Franklin	458	442	945	1,311	1,429	880	1,044	936
Frontenac	.....	....	....	....	....	6	6	6
Gratiot	.....	....	....	....	....	....	14	14
Hancock	.....	....	....	....	....	570	796	840
Hulbert	.....	....	....	....	....	19	19	....
Isle Royale	.....	....	....	....	....	....	....	943
Keweenaw	.....	....	....	....	....	1,239	2,035	2,226
King Philip	.....	....	....	....	....	11	11	17
Lake	.....	....	....	....	....	173	....	371
La Salle	.....	....	....	....	....	....	1,279	1,440
Laurium	.....	....	....	....	....	40	35	40
Manitou	.....	....	....	....	....	7	7	7
Mass	.....	....	477	....	....	1,005	1,066	1,033
Mayflower	.....	....	399	587	594	638	677	679
Michigan	.....	....	592	933	937	872	1,128	1,161
Middle Range	.....	....	....	....	....	4	4	4
Mohawk	.....	....	594	951	1,076	1,434	1,934	1,998
North Lake	.....	....	....	....	....	....	....	146
Ojibway	.....	....	....	....	....	....	260	441
Old Colony	.....	....	598	721	747	770	802	733
Oneco	.....	....	....	....	....	192	219	219
Osceola	823	1,477	1,512	1,985	2,089	1,544	1,570	1,538
Pacific	.....	....	....	....	....	122	115	126
Phœnix	.....	....	352	582	642	....	....	....
Quincy	978	1,445	1,540	1,557	1,657	1,561	2,174	2,155
Rhode Island	.....	....	1,100	1,216	1,339	980	1,043	1,072
St. Louis	.....	....	....	....	....	8	8	8
Seneca	.....	....	....	....	69	....	....	....
South Range	.....	....	....	....	....	30	38	38
Superior	.....	....	....	....	....	216	295	419
Tamarack	1,178	1,353	1,169	1,286	1,136	909	975	978
Tecumseh	.....	....	....	....	....	379	23	12
Torch Lake	.....	....	....	....	....	23	23	22
Trimountain	.....	....	780	730	41	23	21	18
Union	.....	....	....	....	....	327	330	343
Victoria	.....	....	796	1,206	1,324	1,245	1,485	1,341
Whealkate	.....	....	....	....	....	5	8	8
Winona	.....	....	637	909	878	801	1,047	985
Wolverine	333	625	892	1,223	1,292	1,342	1,595	1,622
Wyandot	.....	....	....	....	....	657	814	786
Totals	6,598	8,897	18,503	21,735	22,714	25,203	32,035	32,308

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TWENTIETH CENTURY COPPER PRODUCTION.

1901–2000.

Under this title an effort is made to forecast the future production of copper in the light of the figures of output of the past. Defective in details as such an estimate necessarily must prove, when compared with actual figures of output, the principle is by no means fallacious.

The following table gives the copper production of the Twentieth Century, by decades, with the percentages of increase of each decade compared with the first decennium, and with the preceding decade:

(*Long Tons.*)

Decade.	Total Production.	Yearly Av'ge Production.	Percentage of First decade.	Increase Preceding decade.
1801–1810	91,000	9,100	.....	.....
1811–1820	96,000	9,600	5.50	5.50
1821–1830	135,000	13,500	48.35	40.62
1831–1840	218,400	21,840	140.00	61.77
1841–1850	291,000	29,100	219.77	33.24
1851–1860	506,999	50,699	457.13	74.22
1861–1870	900,000	90,000	889.01	77.51
1871–1880	1,189,000	118,900	1,206.59	32.11
1881–1890	2,373,398	237,339	2,508.12	99.44
1891–1900	3,708,901	370,890	3,975.71	56.22

Analysis of these figures shows that the average decennial percentage of increase for the century was 53.91%; for the last half of the century, 67.90%, and for the last twenty years, during which the electrical industry became a great consumer of copper, the average decennial increase in copper output was 77.83%. Measured by decades the increase in copper production during the Nineteenth Century was forty-fold, from the first decennium to the last, while measured by years, and estimating the production of 1801 at 9,000 tons, the production of 1900, which amounted to 486,363 tons, was just fifty-fold as great as one hundred years earlier. A fifty-fold increase in production during the present century would give an output of 24,318,150 tons of copper for the year 2000.

The actual annual percentage of increase for the Nineteenth Century was a very small fraction more than 4%, measuring outputs by decades, and a fraction over 4%, measuring annual products from 1801 to 1900, inclusive. In order to show the actual increase in production by decades, as compared with the theoretical increase at 4% yearly, the appended table is given, 4% being figured as equal to 50% increase in 10 years, though actually but 48.02%:

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TWENTIETH CENTURY COPPER PRODUCTION. (Continued.)

1901–2000

Long Tons.

Years.	Yearly Averages Theoretical	Actual	Actual Gain	Loss	Percentage Theoretical Production
1801–1810	9,000	9,100	100	.....	101.11
1811–1820	13,500	9,600	.....	3,900	71.11
1821–1830	19,750	13,500	.....	6,250	68.35
1831–1840	29,625	21,840	.....	7,785	73.72
1841–1850	44,437	29,100	.....	15,337	65.48
1851–1860	66,656	50,699	.....	15,957	76.05
1861–1870	99,984	90,000	.....	9,984	90.00
1871–1880	149,992	118,900	.....	31,092	78.66
1881–1890	224,964	237,339	12,375	.....	105.99
1891–1900	337,447	370,890	33,443	.....	109.99

The foregoing table shows very plainly the effect of electrical demand for the metal, which first became a factor of importance in the ninth decade, shortly after 1880. Previous to that decade the theoretical increase of 4% annually, compounded, exceeds the actual increase in every decade, but after 1880 the actual increase exceeds the theoretical ratio. The actual copper output of 1900 was 486,732 tons, and the theoretical output for that year, based on the average of the decade 1890–1900, with 21⅓% increase for 5 years from the mean of 1895, would have been 410,560 tons. It is evident that the average ratio of increase of slightly more than 4% yearly, which ruled during the Nineteenth Century, is not the factor of the present electrical age. What that factor may be is uncertain. The electrification of the globe, while wonderful progress has been made, is not yet a sufficiently established fact to give accurate data for an average ratio of increase in consumption. The theoretical increase of 8% yearly, compounded, based upon the actual output of 486,732 long tons in 1900, would give a theoretical production of 811,404 long tons in 1907, whereas the output actually was only 713,155 long tons— or very materially less than the theoretical production on the basis of 8% compounded yearly, though the 8% increase was very fairly maintained during the first lustrum of the Twentieth Century.

In this connection it may be remarked that the highly valuable statistical compilations of the late M. Georges de la Bouglise, never published, but which M. de la Bouglise gave the author of this work the opportunity of inspecting, show, from 1840 to 1900, inclusive, an average annual increase, compounded yearly, of about 6.5% for all the leading commercial metals, including iron, copper, lead, tin and zinc, with a nearly similar percentage of increase in the output of coal, so necessary a concomitant of the metals. Following 1880, owing to the electrical demand, now consuming nearly one-half the world's production, copper made rapid gains over all the other commercial metals, except nickel and aluminum, metals so comparatively new in extensive commercial use that the percentages of gain are too abnormal to be used as a basis for forecasting future consumption.

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TWENTIETH CENTURY COPPER PRODUCTION. (Continued.)

1901–2000

The ratio of increase in copper production of the world has been 6 to 8% for several years past. It has grown to be considered an axiom in the copper trade that the normal increase is 8% yearly, but this ratio, while it may be considered the present factor, has not been established for a sufficiently long time to be assured for an indefinite period in the future. The following table gives hypothetical outputs for every tenth year during the Twentieth Century, based upon various percentages of increase, all figured from the actual production of the closing year of the Nineteenth Century. The compound increases, for facility in computation, are taken at slight changes from their actual value, as, for instance, 4% compounded for ten years is figured as 50% increase, instead of 48.02%, the actual figure; 5% is figured at 60%, instead of 62.89%; 7% compounded is figured as 80% in ten years, instead of 79.02%; 8% is figured as only 110% instead of 115.89%.

(*Long Ton.*)

Year.	At 4%.	At 5%	At 7%.	At 8%.
1900	486,732	486,732	486,732	486,732
1910	730,098	778,771	876,117	1,022,137
1920	1,095,147	1,246,033	1,577,011	2,146,488
1930	1,642,720	1,993,654	2,838,621	4,507,625
1940	2,464,080	3,189,846	5,126,317	9,466,012
1950	3,696,121	5,103,754	9,227,372	19,878,626
1960	5,544,181	8,166,007	16,609,269	41,745,115
1970	8,316,272	13,065,612	29,896,685	87,664,741
1980	12,474,408	20,904,980	53,914,033	184,095,956
1990	18,711,613	33,447,968	97,045,260	386,601,507
2000	28,067,419	52,516,748	174,681,468	811,803,165

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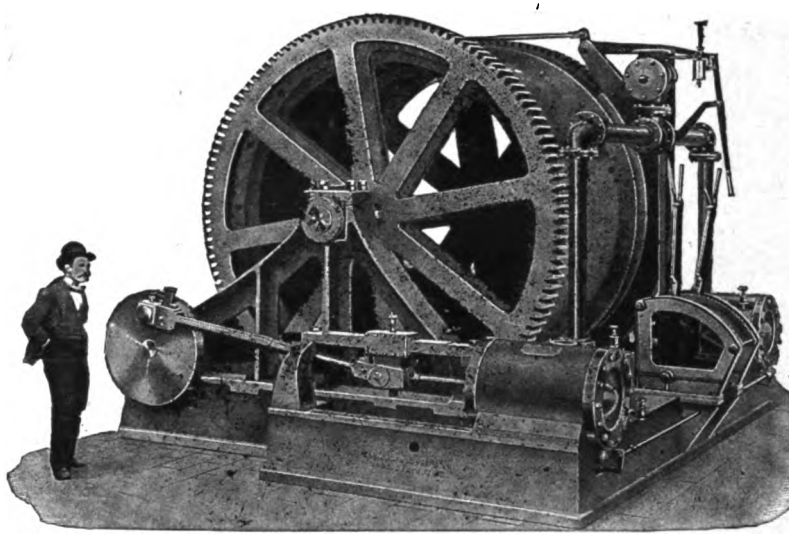

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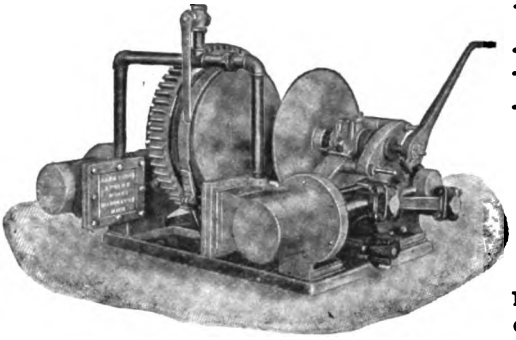

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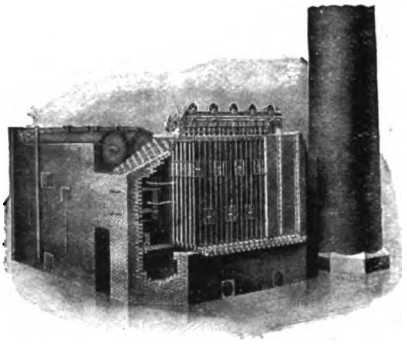

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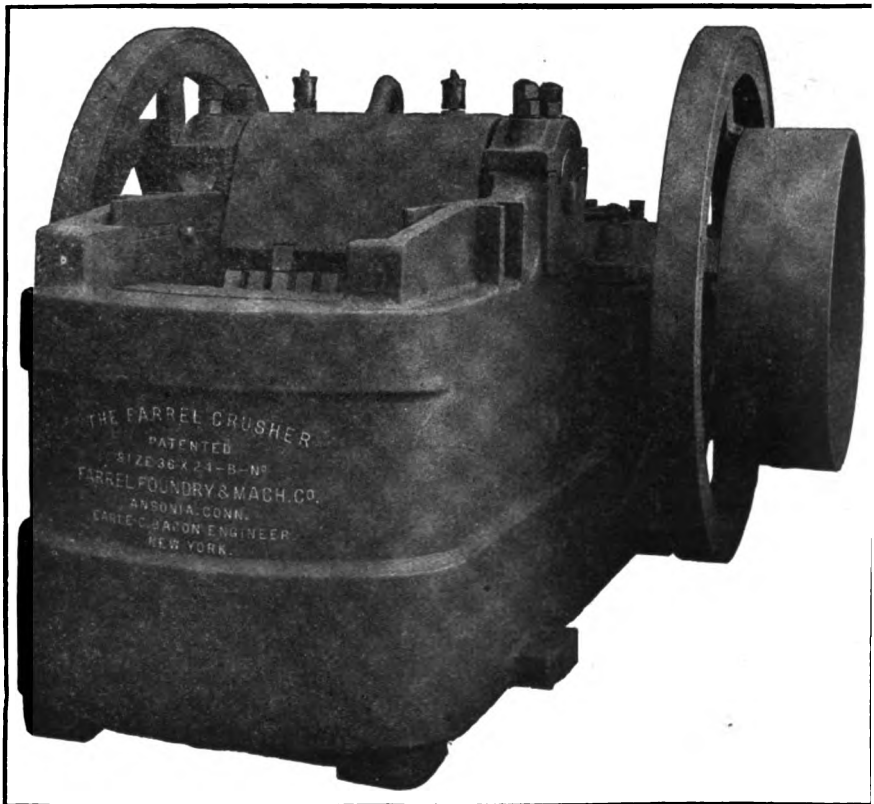

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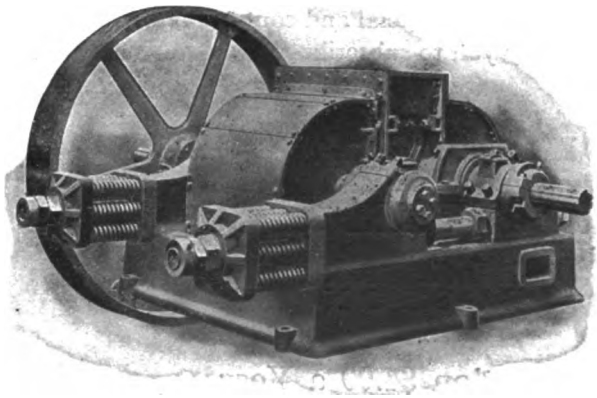

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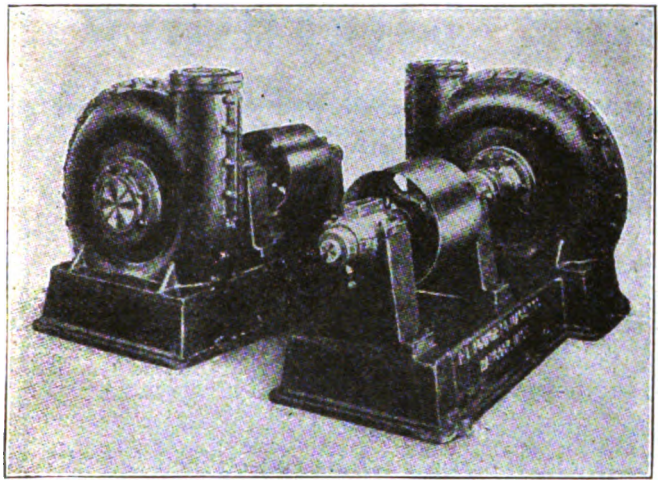

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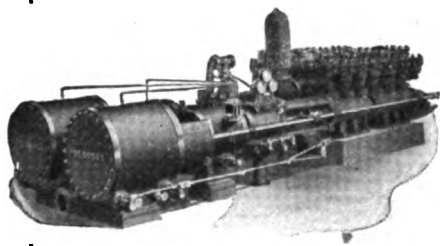

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